Bethany Home Outfall Channel

FCD CONTRACT NO. 98-46

Technical Data Notebook Conditional Letter of Map Revision (CLOMR)

Volume I

Prepared for:

Flood Control District of Maricopa County

Prepared by:

DMJM HARRIS

JANUARY 2003

BETHANY HOME OUTFALL CHANNEL

(Bethany Home/Grand Canal Flood Control Project)

Glendale, Phoenix and Unincorporated Maricopa County, Arizona

Conditional Letter of Map Revision Technical Data Notebook

(Volume I)

Prepared for:

Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009-6399

FCD CONTRACT NO. 98-46

Phone (602) 506-1501
Fax (602) 506-4601

Prepared by:

DMJM HARRIS

2777 East Camelback Road, Suite 200
Phoenix, Arizona 85016-4302
Project No. 6888

Phone (602) 337-2777
Fax (602) 337-2620

Registered Professional Engineer (Civil)
CERTIFICATE NO. 24999
JEFFREY R. MINCH
DATE SIGNED 1-14-03
ARIZONA, U.S.A.

January 2003

Federal Emergency Management Agency

Washington, D.C. 20472

JAN 06 2004

FLOOD CONTROL DISTRICT
RECEIVED
JAN 09 '04

CH & GM	FINANCE
PIO	LANDS
ADMIN	O & M
REG	P & PM
ENG	FILE
CONTRACTS	
ROUTING	

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 03-09-0640R

The Honorable Elaine Scruggs
Mayor, City of Glendale
5850 West Glendale Avenue
Glendale, AZ 85301

Community: City of Glendale
Community No.: 040045

104

Dear Mayor Scruggs:

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) and Flood Insurance Study (FIS) report for Maricopa County, Arizona and Incorporated Areas (the effective FIRM and FIS report for your community), in accordance with Part 65 of the National Flood Insurance Program (NFIP) regulations. In a letter dated March 5, 2003, Mr. Michael Duncan, P.E., CFM, Senior Civil Engineer, Flood Delineation Branch, Flood Control District of Maricopa County, requested that FEMA evaluate the effects that an updated detailed hydrologic analysis, updated detailed and approximate hydraulic analyses, updated topographic information, and the proposed Bethany Home Outfall Channel (BHOC) project along the north and east side of Grand Canal from the confluence with the New River to 63rd Avenue would have on the flood hazard information shown on the effective FIRM and FIS report. The BHOC project includes an existing concrete-lined trapezoidal channel that runs parallel to Grand Canal from the New River to the Agua Fria Freeway (Loop 101) and the existing Sunset Detention Basin at the intersection of Indian School Road and 64th Avenue. Proposed project elements will include channelization from the Agua Fria Freeway to approximately 600 feet upstream of 83rd Avenue; a concrete-lined rectangular channel from just upstream to approximately 1,200 feet upstream of Camelback Road; concrete box culverts; conveyance facilities; storm drains; an offline detention basin at 87th Avenue; and the Maryvale Detention Basin at 67th Avenue.

All data required to complete our review of this request for a Conditional Letter of Map Revision (CLOMR) were submitted with letters from Mr. Jeffrey R. Minch, P.E, Project Manager, DMJM+Harris, and Mr. Duncan.

Because this revision request also affects the City of Phoenix and the unincorporated areas of Maricopa County, separate CLOMRs for those communities were 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. The submitted existing conditions HEC-RAS hydraulic computer model, dated January 17, 2003, based on updated topographic information, was used as the base conditions model in our review of the proposed

conditions model for this CLOMR request. We believe that, if the proposed project is constructed as shown on the drawings entitled "Bethany Home Outfall Channel SR 101L to 83RD Avenue," dated September 2002, and "Bethany Home Outfall Channel, Phase II," dated December 2002, and as described in the submitted Technical Data Notebook entitled "Bethany Home Outfall Channel, Conditional Letter of Map Revision," Volumes I and II, dated January 2003, all prepared by DMJM+Harris, and the data listed below are received, a revision to the FIRM would be warranted.

As a result of the proposed project, Special Flood Hazard Areas (SFHAs), areas that would be inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood), will be added along Grand Canal from the confluence with the New River to 107th Avenue, from just upstream of Bethany Home Road to approximately 200 feet upstream of 99th Avenue, and from approximately 100 feet upstream of 91st Avenue to approximately 600 feet upstream of 83rd Avenue. In addition, a new SFHA will be established for the new offline detention basin that will be located approximately 2,600 feet downstream of 83rd Avenue.

As a result of the proposed project, the width of the SFHA for the ponding area along Grand Canal will increase in some areas and decrease in other areas compared to the effective SFHA width from approximately 600 feet upstream of 83rd Avenue to approximately 100 feet upstream of Camelback 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 and FIS report.

- 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"

  Hydraulic analyses, for as-built conditions, of the base flood, together with a topographic work map showing the revised floodplain boundaries, must be submitted with Form 2.

- 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
- An officially adopted maintenance and operation plan for the detention basins. This plan, which may be in the form of a written statement from the community Chief Executive Officer, an ordinance, or other legislation, must describe the nature of the maintenance activities, the frequency with which they will be performed, and the title of the local community official who will be responsible for ensuring that the maintenance activities are accomplished.

After receiving appropriate documentation to show that the project has been completed, FEMA will initiate a revision to the FIRM and FIS report. Because the BFEs would change as a result of the project, a 90-day appeal period would be initiated, during which community officials and interested persons may appeal the revised BFEs based on scientific or technical data.

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,

MHC for Lynn

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 R. Fulton Brock
Chairman, Maricopa County
Board of Supervisors

The Honorable Skip Rimsza
Mayor, City of Phoenix

Mr. Larry Broyles, P.E.
City Engineer
City of Glendale

Mr. Michael S. Ellegood, P.E.
Chief Engineer and General Manager
Flood Control District of Maricopa County

Hasan Mushtaq, Ph.D., P.E., CFM
Floodplain Manager
Street Transportation Department
City of Phoenix

Ms. Shanna Yager
Principal
Floodplain Administration
Flood Control District of Maricopa County

Ms. Lynn M. Thomas, P.E.
Branch Manager
Floodplain Management
Flood Control District of Maricopa County

Mr. Michael Duncan, P.E., CFM
Senior Civil Engineer
Flood Delineation Branch
Flood Control District of Maricopa County

Mr. Brian Cosson
NFIP Coordinator
Arizona Department of Water Resources

Federal Emergency Management Agency

Washington, D.C. 20472

JAN 06 2004

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 03-09-0640R

The Honorable R. Fulton Brock
Chairman, Maricopa County
Board of Supervisors
301 West Jefferson, 10th Floor
Phoenix, AZ 85003

Community: Maricopa County, AZ
Community No.: 040037

104

Dear Mr. Brock:

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) and Flood Insurance Study (FIS) report for Maricopa County, Arizona and Incorporated Areas, in accordance with Part 65 of the National Flood Insurance Program (NFIP) regulations. In a letter dated March 5, 2003, Mr. Michael Duncan, P.E., CFM, Senior Civil Engineer, Flood Delineation Branch, Flood Control District of Maricopa County, requested that FEMA evaluate the effects that an updated detailed hydrologic analysis, updated detailed and approximate hydraulic analyses, updated topographic information, and the proposed Bethany Home Outfall Channel (BHOC) project along the north and east side of Grand Canal from the confluence with the New River to 63rd Avenue would have on the flood hazard information shown on the effective FIRM and FIS report. The BHOC project includes an existing concrete-lined trapezoidal channel that runs parallel to Grand Canal from the New River to the Agua Fría Freeway (Loop 101) and the existing Sunset Detention Basin at the intersection of Indian School Road and 64th Avenue. Proposed project elements will include channelization from the Agua Fria Freeway to approximately 600 feet upstream of 83rd Avenue; a concrete-lined rectangular channel from just upstream to approximately 1,200 feet upstream of Camelback Road; concrete box culverts; conveyance facilities; storm drains; an offline detention basin at 87th Avenue; and the Maryvale Detention Basin at 67th Avenue.

All data required to complete our review of this request for a Conditional Letter of Map Revision (CLOMR) were submitted with letters from Mr. Jeffrey R. Minch, P.E, Project Manager, DMJM+Harris, and Mr. Duncan.

Because this revision request also affects the Cities of Glendale and Phoenix, separate CLOMRs for those communities were 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. The submitted existing conditions HEC-RAS hydraulic computer model, dated January 17, 2003, based on updated topographic information, was used as the base conditions model in our review of the proposed conditions model for this CLOMR request. We believe that, if the proposed project is constructed as shown on the drawings entitled "Bethany Home Outfall Channel SR 101L to 83RD Avenue," dated September 2002, and "Bethany Home Outfall Channel, Phase II," dated December 2002, and as described in the submitted Technical Data Notebook entitled "Bethany Home Outfall Channel, Conditional Letter of Map Revision," Volumes I and II, dated January 2003, all prepared by DMJM+Harris, and the data listed below are received, a revision to the FIRM would be warranted.

As a result of the proposed project, Special Flood Hazard Areas (SFHAs), areas that would be inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood), will be

added along Grand Canal from approximately 200 feet upstream of 99th Avenue to approximately 100 feet upstream of 91st Avenue.

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 and FIS report.

- 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"

  Hydraulic analyses, for as-built conditions, of the base flood, together with a topographic work map showing the revised floodplain boundaries, must be submitted with Form 2.

- 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

- An officially adopted maintenance and operation plan for the detention basins. This plan, which may be in the form of a written statement from the community Chief Executive Officer, an ordinance, or other legislation, must describe the nature of the maintenance activities, the frequency with which they will be performed, and the title of the local community official who will be responsible for ensuring that the maintenance activities are accomplished.

After receiving appropriate documentation to show that the project has been completed, FEMA will initiate a revision to the FIRM and FIS report. Because the BFEs would change as a result of the project, a 90-day appeal period would be initiated, during which community officials and interested persons may appeal the revised BFEs based on scientific or technical data.

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
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Enclosures

cc: The Honorable Elaine Scruggs
Mayor, City of Glendale

The Honorable Skip Rimsza
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Mr. Brian Cosson
NFIP Coordinator
Arizona Department of Water Resources

Federal Emergency Management Agency

Washington, D.C. 20472

JAN 06 2004

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RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 03-09-0640R

The Honorable Skip Rimsza
Mayor, City of Phoenix
200 West Washington Street, 11th Floor
Phoenix, AZ 85003-1611

Community: City of Phoenix, AZ
Community No.: 040051

104

Dear Mayor Rimsza:

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) and Flood Insurance Study (FIS) report for Maricopa County, Arizona and Incorporated Areas (the effective FIRM and FIS report for your community), in accordance with Part 65 of the National Flood Insurance Program (NFIP) regulations. In a letter dated March 5, 2003, Mr. Michael Duncan, P.E., CFM, Senior Civil Engineer, Flood Delineation Branch, Flood Control District of Maricopa County, requested that FEMA evaluate the effects that an updated detailed hydrologic analysis, updated detailed and approximate hydraulic analyses, updated topographic information, and the proposed Bethany Home Outfall Channel (BHOC) project along the north and east side of Grand Canal from the confluence with the New River to 63rd Avenue would have on the flood hazard information shown on the effective FIRM and FIS report. The BHOC project includes an existing concrete-lined trapezoidal channel that runs parallel to Grand Canal from the New River to the Agua Fria Freeway (Loop 101) and the existing Sunset Detention Basin at the intersection of Indian School Road and 64th Avenue. Proposed project elements will include channelization from the Agua Fria Freeway to approximately 600 feet upstream of 83rd Avenue; a concrete-lined rectangular channel from just upstream to approximately 1,200 feet upstream of Camelback Road; concrete box culverts; conveyance facilities; storm drains; an offline detention basin at 87th Avenue; and the Maryvale Detention Basin at 67th Avenue.

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As a result of the proposed project, Special Flood Hazard Areas (SFHAs), areas that would be inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood), will be added along Grand Canal from 107th Avenue to just upstream of Bethany Home Road.

As a result of the proposed project, the width of the SFHA for the ponding area along Grand Canal will increase in some areas and decrease in other areas compared to the effective SFHA width from approximately 100 feet upstream of Camelback Road to 63rd Avenue. In addition, the entire base flood along Grand Canal will be contained within a concrete-lined channel from approximately 100 feet upstream to approximately 1,200 feet upstream of Camelback Road and within a reinforced-concrete box culvert from just downstream of 67th Avenue to just upstream of Indian School Road. The maximum increase in SFHA width, approximately 400 feet, will occur just downstream of 75th Avenue. The maximum decrease in SFHA width, approximately 1,300 feet, will occur at Mariposa Street.

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 and FIS report.

- 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.)

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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 R. Fulton Brock
Chairman, Maricopa County
Board of Supervisors

The Honorable Elaine Scruggs
Mayor, City of Glendale

Hasan Mushtaq, Ph.D., P.E., CFM
Floodplain Manager
Street Transportation Department
City of Phoenix

Mr. Michael S. Ellegood, P.E.
Chief Engineer and General Manager
Flood Control District of Maricopa County

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Mr. Michael Duncan, P.E., CFM
Senior Civil Engineer
Flood Delineation Branch
Flood Control District of Maricopa County

Mr. Brian Cosson
NFIP Coordinator
Arizona Department of Water Resources

FLOOD CONTROL DISTRICT of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009-6399
(602) 506-1501
FAX: (602) 506-4601
TT: (602) 506-5897

LETTER OF TRANSMITTAL

TO: Hasan Mushtaq
Floodplain Manager
City of Phoenix

10-20-03

SUBJECT: CLOMR package for Bethany Home Outfall Channel

WE ARE SENDING YOU THE FOLLOWING ITEMS: ☒ Enclosed ☐ Under separate cover

☐ Shop Drawings ☐ Prints ☐ Legal Description ☐ Samples ☐ Reports
☐ Specification ☐ Change Order ☐ Copy of Letter ☐ Plans ☐ Other

COPIES	DATE	NO.	DESCRIPTION
1			2-volume CLOMR package for Bethany Home Outfall Channel, by DMJM+Harris

THESE ARE TRANSMITTED:

☐ For approval
☒ For your use
☐ As requested
☐ Resubmit copies for approval
☐ Submit copies for distribution
☐ FOR ESTIMATE DUE:

☐ Approved as submitted
☐ Approved as noted
☐ Returned for corrections
☐ For review and comments
☐ Return corrected prints
☐ Borrowed prints being returned

Remarks:

SIGNED: Mike Duncan
Mike Duncan, PE, CFM, Flood Delineation Group

NATIONAL FLOOD INSURANCE PROGRAM
FEMA MAP COORDINATION CONTRACTOR

October 8, 2003

Mr. Michael Duncan, P.E., CFM
Senior Civil Engineer
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

IN REPLY REFER TO:
Case No.: 03-09-0640R
Communities: Cities of Glendale and Phoenix
and Maricopa County, AZ
Community Nos.: 040045, 040051, and 040037

316-AD/ACK

OCT 10 '03
FINANCE
LANDS
E & M
P & PM
FILE
CONTRACTS
ROUTING

Dear Mr. Duncan:

This acknowledges receipt of additional data in support of your request for a Conditional Letter of Map Revision for the above-referenced communities. Our review of the submitted data indicates we have the minimum data needed to continue our evaluation. If we need additional data to complete our evaluation, or if delays are encountered, we will notify you in writing within 60 days of the date of this letter.

If you write to us about your request, please include the case number shown above in your letter. If you have general questions about your request, Federal Emergency Management Agency (FEMA) policy, or the National Flood Insurance Program, please call the FEMA Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627). If you have specific questions concerning your request, please call the Revisions Coordinator for your State, Pernille Buch-Pedersen, who may be reached at (703) 317-6224.

Sincerely,

Andrea L. Ryon, P.E., Director
Engineering Division
Michael Baker Jr., Inc.

cc: Mr. Larry Broyles, P.E.
City Engineer
City of Glendale

Hasan Mushtaq, Ph.D., P.E., CFM
Floodplain Manager
Street Transportation Department
City of Phoenix

Mr. Michael S. Ellegood, P.E.
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Flood Control District of
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Ms. Lynn M. Thomas
Branch Manager
Floodplain Management
Flood Control District of Maricopa County

Ms. Terri Miller
Executive Consultant
Mitigation Section
Arizona Division of Emergency Management

3601 Eisenhower Avenue, Alexandria, Virginia 22304-6425 PH: 703.960.8800 FX: 703.960.9125

FLOOD CONTROL DISTRICT
of
Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009-6399
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5897

BOARD OF DIRECTORS
Fulton Brock
Andrew Kunasek
Don Stapley
Mary Rose Garrido Wilcox
Max W. Wilson

October 3, 2003

Pernille Buch-Pedersen, Regional Manager
Michael Baker Jr. Inc.
3601 Eisenhower Avenue, Suite 600
Alexandria, Virginia 22304-6425

CLOMR Case No.:	03-09-0640R
Name:	Bethany Home Outfall Channel Projects
Communities:	Cities of Phoenix and Glendale and Maricopa County, AZ
Community Nos.:	040051, 040045, and 040037

SUBJECT: Responses to your letter of July 11, 2003

Dear Ms. Buch-Pedersen:

I have enclosed a letter and supplemental items from DMJM+Harris, that respond to the 7 comments in your letter of July 11, 2003. As-builts for the 4 major detention basins of the watershed are included.

The enclosures include:

1) Paper-copy as-builts of Maryvale Baseball Park at 51st Ave. and the Grand Canal, with the detention occurring at Ball Fields # 5 and # 6 and Parking Area B.
2) Paper-copy as-builts of Sunset Basin at 64th Ave. and Indian School Road.
3) A CD with: a) "Glendale As-Built Drawings" (in tif format) for the basin at Northern Ave. and 63rd Ave., and for the basin at Orangewood Ave. and 69th Ave.
   b) A revised HEC-RAS model for Phase II and Future
   c) A pdf file of the 91st Avenue Basin calculations
   d) A pdf file of your letter of July 11, 2003

If you have any questions, please contact me at 602-506-4732 or mwd@mail.maricopa.gov.

Yours truly,

Mike Duncan

Mike Duncan, P.E., CFM
Senior Civil Engineer
Flood Delineation Section

Enclosures

Copies to:

Dan Sherwood, P.E.
Engineering Department
City of Glendale
5850 W. Glendale Av., 3rd Floor
Glendale, AZ 85301-2599

Hasan Mushtaq, P.E.
Floodplain Manager
St. Trans. Dept., City of Phoenix
200 W. Washington St, 5th Floor
Phoenix, AZ 85003-1611

Jeffrey Minch, P.E.
DMJM+Harris
2777 E. Camelback Road, Suite 200
Phoenix, AZ 85016-4302

DMJM HARRIS

2777 East Camelback Road, Suite 200
Phoenix, Arizona 85016-4302

Tel: (602) 337-2700
Fax: (602) 337-2620

October 2, 2003

Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009-6399

FLOOD CONTROL DISTRICT
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PIO | LANDS
ADMIN | O & M
✓ REG | P & PM
ENG | FILE
MWD

ATTN: Mr. Michael Duncan, P.E., C.F.M.
Senior Civil Engineer

RE: Bethany Home Outfall Channel (BHOC)
Conditional Letter of Map Revision
Case No.: 03-09-0640R
Communities: Cities of Phoenix and Glendale and Maricopa County, AZ
Community Nos.: 040051, 040045 and 040037
316-AD

SUBJECT: FEMA Request for Additional Data

Dear Mr. Duncan:

On July 14, 2003, the Flood Control District of Maricopa County (FCDMC) received a letter from the FEMA Map Coordination Contractor regarding the Conditional Letter of Map Revision (CLOMR) for the above-referenced project. This letter indicated that additional data was required to complete the review of the CLOMR request.

The FCDMC and DMJM+HARRIS met on August 11, 2003 to review and discuss the seven items listed in the letter and clarify our understanding of the data request. At this meeting, it was decided that DMJM+HARRIS would prepare a letter in support of the FCDMC submittal to the FEMA Map Coordination Contractor addressing the items listed in the request for additional data. In September, the FCDMC contracted with DMJM+HARRIS to provide this technical support.

The responses provided below directly correspond to the numbered list in the attached FEMA letter.

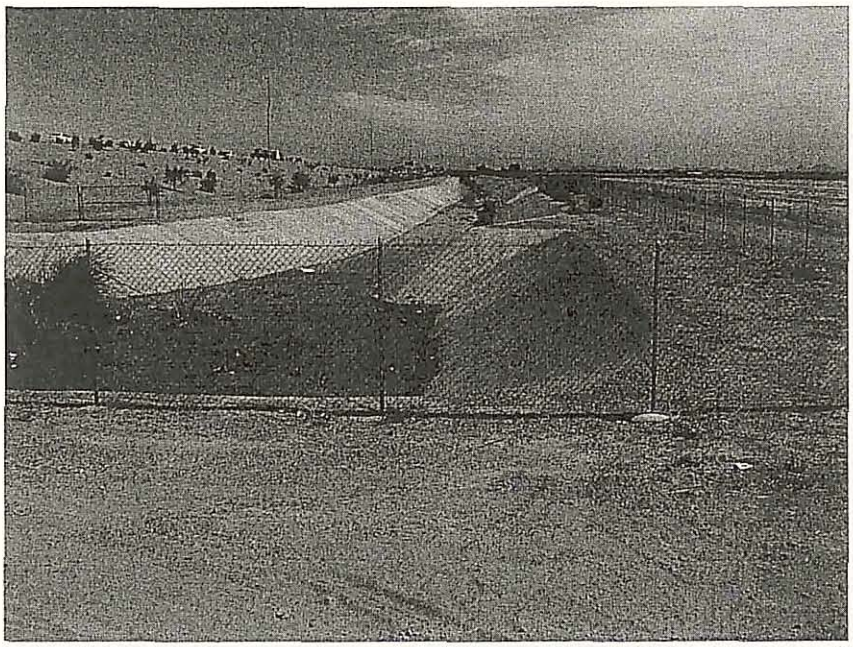
1. Based on your discussion of the supplemental data request with the FEMA reviewer, Craig Kennedy, we have collected the as-built construction plans of the Maryvale Baseball Basin at the northeast corner of 51st Avenue and the Grand Canal; the Sunset Basin at 63rd Avenue and Indian School Road; and the Northern/Orangewood Basins at 63rd Avenue between Northern Avenue and Orangewood Drive for your submittal. Please note that the Northern/Orangewood Basins as-built plans are provided electronically on the attached CD.

2. The main conveyance facility of the BHOC project extends from the New River to approximately 63rd Avenue and the Grand Canal, a distance of approximately six miles. The facility is proposed to consist of a series of detention basins, open channels and closed conduits with a maximum width of 230 feet. In an attempt to clarify the proposed floodplain limits considering the magnitude of the length to width scale differential of the proposed project and the width of the existing floodplain limits, DMJM+HARRIS used the Maryvale Area Drainage Master Plan topographic mapping as the background mapping for the CLOMR work maps. Details of the development of the work maps are presented in Section 5.2 of the Technical Data Notebook (TDN).

   It is apparent from this comment that we did not sufficiently explain that the mapping used to develop the hydraulic model for the CLOMR is based on the detailed topographic mapping illustrated on the construction and concept plans presented in Appendix E.1 of the TDN.

Cross-sections 1415 through 1588:

The indication of areas of high ground along the right bank of the BHOC is not an accurate depiction of existing conditions. The channel plan and profile drawing from Station 15+00 to Station 23+00 in Appendix E.1 illustrates the updated topographic mapping. The supporting topographic survey for this portion of the project is provided in Appendix C.3 in the TDN. Provided with this letter is a revised HEC-RAS hydraulic model for the Phase II and future construction which better illustrates the existing condition along the right bank. It should be noted that this location is the confluence of two open channels, the BHOC from the east and the Agua Fria Freeway (101L) channel from the north. A photograph of this channel confluence is provided below prior to the construction of the BHOC to the east.



Looking north at the Agua Fria Freeway channel and the proposed BHOC confluence (June 21, 2002)

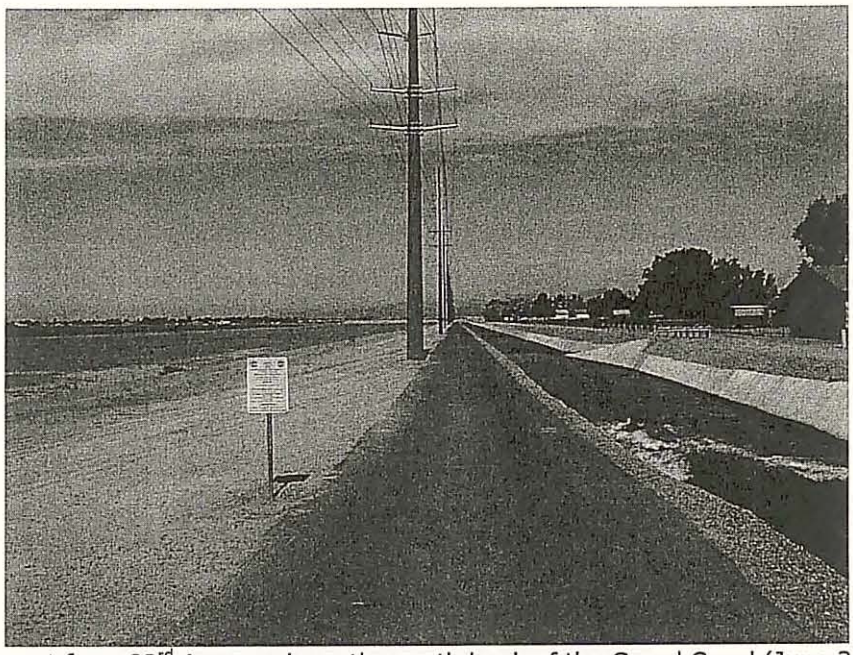
The hydraulic model was also modified to add a new cross-section at the flume structure over the channel to better represent the cross-section geometry at this location. During our review of the hydraulic model at this location, we realized that the hydraulic model did not accurately depict the proposed channel geometry upstream of the confluence of these two channels. The channel bottom width under construction is actually 16.5 feet wider than depicted with the original submittal from approximately Station 17+41 to Station 56+33. This channel bottom width modification is included in the revised hydraulic model submitted with this letter and results in a lower water-surface elevation (WSEL).

Cross-sections 9400 through 9600:

The topography illustrated along the right bank of these sections is actually the south bank of the Grand Canal and the canal WSEL at the time the detailed mapping was developed. There is no actual levee at this location. The limits of the cross-sections in the HEC-RAS model extend into the Grand Canal. The channel plan and profile drawing from Station 93+00 to Station 103+00 in Appendix E.1 illustrates the Grand Canal along the right bank of the BHOC. A photograph of the existing conditions prior to the construction BHOC is provided on the following page. The disked portion of the agricultural field to the left of the paved canal maintenance road illustrates the width of the BHOC right-of-way south of the Grand Canal.

Cross-section 20400:

The low point on the right side of the cross-section is a local low point in a street in the adjacent subdivision near the intersection of Highland Avenue and Wolf Street. The concept channel plan and profile drawing from Station 195+00 to Station 215+00 in Appendix E.1 illustrates the existing adjacent development at this location. The adjacent local streets convey runoff to the proposed facility from the contributing watershed. The updated hydraulic model has been modified to indicate that this portion of the cross-section is ineffective. This modification does not change the calculated WSEL in the hydraulic model.



Looking west from 83rd Avenue down the south bank of the Grand Canal (June 21, 2003)

The Grand Canal is a large irrigation distribution channel with banks that are raised several feet above adjacent ground in some locations. During large storm events under existing conditions, water ponds along the bank of the Grand Canal and floods adjacent properties. The BHOC is generally sited on the upstream side of the Grand Canal at these ponding locations to intercept and convey the stormwater runoff from the contributing watershed to the New River. There are no levee conditions adjacent to the proposed BHOC facility.

3. Please see response to item 2. This location is actually the confluence of two channels and the supporting topographic mapping is provided in Appendix C.3 in the TDN.

4. Please note that DMJM+HARRIS executed the CHECKRAS (Version 1.1) program on the HEC-RAS hydraulic models submitted with the CLOMR TDN. A discussion of the warnings generated by this software is provided in Section 5.7.2 of the TDN. The levee function was used to facilitate proper hydraulic modeling and to prevent the calculation of divided flow conditions for the conveyance facility. Typical locations where levees were used to define ineffective flow include adjacent off-line detention or retention basins and the Grand Canal.

   Cross-Sections 6600 to 7660:
   The cross-sections along this reach of the BHOC illustrate the adjacent detention basin near 87th Avenue and the Bethany Home Road Alignment (91st Avenue Detention Basin). No vertically extended cross-section warnings or errors are noted by the HEC-RAS model along this section of the project. The channel plan and profile drawings from Station 63+00 to Station 73+00 and the following construction drawing in Appendix E.1 illustrates the 91st Avenue Detention Basin adjacent to the BHOC. The hydraulic model submitted with this letter was modified to remove the adjacent detention basin from the cross-section geometry.

   Cross-Sections 27810 to 28590:
   The cross-sections along this reach of the BHOC illustrate the elevated bank of the Grand Canal adjacent to the Sunset Detention Basin. No vertically extended cross-section warnings or errors are noted by the HEC-RAS model along this section of the project. The concept channel plan and profile drawings from Station 270+00 to Station 277+00 in Appendix E.1 illustrates the existing Sunset Detention Basin adjacent to the Grand Canal. The hydraulic model submitted with this letter was modified to remove the adjacent Grand Canal from the cross-section geometry.

5. The calculations supporting the high-water elevation for the 91st Avenue Detention Basin are attached to this letter. The attached calculations illustrate the development of the stage-storage-discharge rating curve for this detention basin. The combined rating curve conservatively assumes the approximate 100-year WSEL in the

BHOC channel for the three pipes which discharge from the basin to the BHOC. The hydraulic capacity analysis of the main 36-inch diameter outlet pipe was performed using HY8. The smaller 18-inch diameter storm drains were evaluated based on the lower discharge capacity of either the inlet hydraulics or the pipe capacity. The combined rating curve was then input into the HEC-1 model. The output from the HEC-1 analysis indicates that the 100-year peak inflow of 176 cfs (D1021S) is attenuated by the detention basin to a peak outflow rate of 88 cfs and a storage volume of approximately 20.6 acre-feet. The corresponding water-surface elevation for the detention basin is approximately 1068.49 based on interpolation of the combined rating curve for 88 cfs.

6. I spoke with Craig Kennedy about this comment on September 15th and explained the basis of the proposed boundary delineations for the SFHA designated Zone A along the Grand Canal from Bethany Home Road and 83rd Avenue to 75th Avenue. Since the design of this reach of the BHOC has only been completed to a conceptual level (15%), the adjacent City Park right-of-way was conservatively designated as a Zone A SFHA. During the final design of this reach of the project, the inflow concentration points and peak discharges will be developed along with the supporting hydraulic calculations for the inlet designs. It is likely that the final design of these inlet facilities will reduce the actual SFHA as part of the LOMR documentation. Based on a voice mail from Craig Kennedy and FEMA confirmation, these future calculations will become a condition of the CLOMR. The hydraulic analysis presented with the CLOMR illustrates that the proposed box culvert has the capacity to convey the 100-year flood.

7. It is my understanding of the conversation with Craig Kennedy that a revised work map will not be required. The reviewer is referenced to the future construction concept plans presented in Appendix E.1. These plan and profile drawings illustrate the existing topography used to develop the HEC-RAS model and define the new SFHA. If it would be of assistance to the District and the reviewer, DMJM+HARRIS can plot these concept plans at full size. However, it should be noted that the plan view window of these concept plans do not provide sufficient coverage of the entire limits of the proposed or existing SFHA presented with the CLOMR documentation.

If you have any questions on the supplemental data or require additional information, please do not hesitate to call me at (602) 337-2540.

Sincerely,

DMJM+HARRIS, Inc.

Jeffrey R. Minch

Jeffrey R. Minch, P.E.
Project Manager

Attachments – CD, As-Built Construction Drawings

Cc: BEH, File: 5807.410

```
6974        KK  D1021S
6975        KM   SUB-BASIN DIVERSION
6976        KM   SUB-BASIN 10-21
6977        KM   43% West & 57% South
6978        DT  D1021W
6979        DI        0  10000.
6980        DQ        0   4300.
            *
            *  ==================================================================
            *  REVISED BY DMJM --->   Reservoir Routing of the Diverted Hydrograph Portion
            *  ==================================================================
            *
            * *** Detain Southern Component of Sub-basin 10-21 ***
            *

6981        KK  D91det
6982        KM   Storage Route Southern Component of 10-21 prior to Combining with BH/GC
6983        KM      From:       Sub-basin 1021S
6984        KM      Outlet:     36" RCP into BH/GC Outfall Channel
6985        KM      Basin Type:  Off-Line Detention Basin
            *  KO      3
6986        RS        1     STOR
            *
            *      ***** Storage with BHOC Phase II - 60% Design Storage Volume Refinements
            *   SV      0    3.152    5.799    9.280   10.823   13.138   17.372   21.998   27.004   27
            *   SE1061.8     1064     1065     1066   1066.4     1067     1068     1069     1070   10
            *   SQ      0        0        0        0        0     30.3     50.0     63.8     75.2
            *
            *   **** BHOC Phase II - 90% Design Refinements to Storage Volumes ****
            *
            *   SV      0    0.195    0.987    3.337    3.608    6.123    9.763   11.370   13.781   18
            *   SV22.939   28.101   29.892
            *   SE1062.0   1062.5     1063     1064   1064.1     1065     1066   1066.4     1067
            *   SE  1069     1070     1071
            *
            * *** BHOC Phase II - with two grated inlets in basin in addition to 36" outlet
            *
            *   SV      0    0.195    0.987    3.337    3.608    5.089    6.123    9.763   11.370   13
            *   SV18.174   22.939   28.101   29.892   31.683
            *
            * *** BHOC Phase II - adjusted storage volumes due to final design refinements *
            *
```

1 HEC-1 INPUT PAGE178

```
LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

6987        SV        0    0.190    0.964    3.274    3.541    5.161    6.292    9.893   11.485   13.872
6988        SV   18.226   22.954   28.049   29.808   31.567
            *
6989        SE   1062.0   1062.5     1063     1064   1064.1  1064.63     1065     1066   1066.4     1067
6990        SE     1068     1069     1070     1071     1072
6991        SQ        0        0        0        0        0      5.4     12.2     19.8     22.1     55.3
6992        SQ     79.4     96.9    111.6    124.7      225
            *
```

BY INTERPOLATION;

FOR Q = 88 cfs

ELEV. = 1068.49

STORAGE = 20.549 AC-FT.

+	HYDROGRAPH AT	10-21	586.	12.58	160.	45.	15.	.98
+	DIVERSION TO	D1021R	410.	12.58	81.	21.	7.	.98
+	HYDROGRAPH AT	RET10	312.	13.50	84.	24.	8.	.98
+	HYDROGRAPH AT	S83PW	83.	13.25	39.	10.	3.	34.87
+	ROUTED TO	R1021W	77.	13.58	39.	10.	3.	34.87
+	3 COMBINED AT	C10-21	309.	13.83	144.	39.	13.	43.32
+	DIVERSION TO	D1021W	133.	13.83	62.	17.	6.	43.32
+	HYDROGRAPH AT	D1021S	176.	13.83	82.	22.	7.	43.32
+	ROUTED TO	D91det	88.	15.25	63.	20.	7.	43.32
+	HYDROGRAPH AT	D91GA	327.	13.17	145.	36.	12.	34.46
+	ROUTED TO	R91G	320.	13.33	145.	36.	12.	34.46
+	HYDROGRAPH AT	D1021W	133.	13.83	62.	17.	6.	43.32
+	2 COMBINED AT	C91D	421.	13.33	200.	51.	17.	43.32
+	DIVERSION TO	S91DW	180.	13.33	85.	21.	7.	43.32
+	HYDROGRAPH AT	S91DS	241.	13.33	115.	30.	10.	43.32
+	ROUTED TO	R91H	236.	13.50	114.	30.	10.	43.32
+	3 COMBINED AT	CBH5	3047.	13.67	1875.	572.	194.	57.17

Stage vs. Discharge
91st Avenue Detention Basin

Interpolated Rating Table	
Elev. (ft)	Q (cfs)
1061.80	#N/A
1063.00	#N/A
1063.94	#N/A
1064.63	#N/A
1065.00	#N/A
1066.00	#N/A
1066.40	0.0
1067.00	30.3
1068.00	50.0
1069.00	63.8
1070.00	75.2
1071.00	85.1

HY8 Rating Table	
Elev. (ft)	Q (cfs)
1066.40	0.0
1066.49	12.0
1066.76	24.0
1067.22	36.0
1067.86	48.0
1068.68	60.0
1069.69	72.0
1070.87	84.0
1072.24	96.0
1073.79	108.0

Note: Main outlet pipe only.

1 For main outlet pipe, 36" RCP with headwall (square edge)
2 For main outlet pipe, Constant tailwater of 1066.40
3 West Inlet Grate Elev. = 1064.29 TW=1063.94
4 East Inlet Grate Elev. = 1062.97 TW=1064.63

Combined Rating Table	
Elev. (ft)	Q (cfs)
1061.80	0.0
1063.00	0.0
1063.94	0.0
1064.63	5.4
1065.00	12.2
1066.00	19.8
1066.40	22.1
1067.00	55.3
1068.00	79.4
1069.00	96.9
1070.00	111.6
1071.00	124.7

Note: The above values include discharges from the main outlet pipe and whichever is lower between HY8 and Inlet Capacity values for each of both east and west Storm Drain Systems. Governing values are shaded.

Inlet Capacity Rating Table		
Elev. (ft)	$Q_W$cfs)	Q_E(cfs)
1061.80	N/A	N/A
1063.00	N/A	1.6
1063.94	N/A	9.1
1064.63	5.4	11.8
1065.00	7.7	13.1
1066.00	12.0	16.0
1066.40	13.4	17.0
1067.00	15.1	18.5
1068.00	17.7	20.6
1069.00	20.0	22.6
1070.00	22.0	24.4
1071.00	23.8	26.1

Note: The above values do not consider pipe tailwater effects.

HY8 Storm Drain Rating Table				Interpolated Rating Table		
West Drain		East Drain			West	East
Elev. (ft)	Q (cfs)	Elev. (ft)	Q (cfs)	Elev. (ft)	Q (cfs)	Q (cfs)
1063.94	0.0	1064.63	0.0	1061.80	#N/A	#N/A
1064.09	3.0	1064.78	3.0	1063.00	#N/A	#N/A
1064.56	6.0	1065.24	6.0	1063.94	0.0	#N/A
1065.33	9.0	1066.00	9.0	1064.63	6.3	0.0
1066.42	12.0	1067.08	12.0	1065.00	7.7	4.4
1067.81	15.0	1068.45	15.0	1066.00	10.8	9.0
1069.51	18.0	1070.14	18.0	1066.40	11.9	10.1
1071.52	21.0	1072.13	21.0	1067.00	13.3	11.8
1073.84	24.0	1074.43	24.0	1068.00	15.3	14.0
1076.47	27.0	1077.03	27.0	1069.00	17.1	16.0
1079.41	30.0	1079.94	30.0	1070.00	18.7	17.8
				1071.00	20.2	19.3

Stage vs. Storage
91st Avenue Detention Basin

100% SUBMITTAL
REVISED BASIN W/ MEANDERING PATH

91st Avenue Detention Basin (CAD Measured)

Elev. (ft)	Area (ac)	Δ d (ft)	Δ V_{meas} (ac-ft)	Σ V (ac-ft)
1062.0	0.000			
1062.5	1.137	0.5	0.190	0.190
1063.0	2.000	0.5	0.774	0.964
1064.0	2.635	1.0	2.310	3.274
1064.1	2.713	0.1	0.267	3.541
1065.0	3.413	0.9	2.751	6.292
1066.0	3.792	1.0	3.601	9.893
1067.0	4.169	1.0	3.979	13.872
1068.0	4.543	1.0	4.355	18.226
1069.0	4.915	1.0	4.728	22.954
1070.0	5.277	1.0	5.095	28.049
1071.0		1.0	1.759	29.808

Δ V_{conic} calculated using HEC-1 conic method for reservior methods.
Δ V_{meas} calculated by surface comparisions of contour lines using INROADS.

NATIONAL FLOOD INSURANCE PROGRAM
FEMA MAP COORDINATION CONTRACTOR

FLOOD CONTROL DISTRICT
RECEIVED
JUL 14 '03

CH & GM	FINANCE
PIO	LANDS
ADMIN	O & M
REG	P & PM
ENG	FILE
CONTRACTS	
PROJ	MWD

JUL 11 2003

Mr. Michael Duncan, P.E., C.F.M.
Senior Civil Engineer
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

IN REPLY REFER TO:
Case No.: 03-09-0640R
Communities: Cities of Phoenix and Glendale and Maricopa County, AZ
Community Nos.: 040051, 040045, and 040037

316-AD

Dear Mr. Duncan:

This is in regard to your April 10, 2003, request that the Federal Emergency Management Agency (FEMA) issue a Conditional Letter of Map Revision for the above-referenced communities. In a previous letter, you were informed that additional data might be required to complete our review of the request. The data required to complete our review, which must be submitted within 90 days of the date of this letter, are listed below.

1. Please provide as-built plans, certified by a registered professional engineer, of all constructed offsite detention basins.

2. Our detailed review revealed that the proposed conditions Phase II hydraulic model contains areas of high ground along the right bank (looking downstream) of Bethany Home Outfall Channel (BHOC). It appears that the areas of high ground along BHOC at Cross Sections 1415 through 1588, 9400 through 9600, and 20400 are acting as levees. Please provide evidence that the levees meet the requirements of Section 65.10 of the National Flood Insurance Program (NFIP) regulations. Alternatively, if a levee will not be in compliance with Section 65.10, please submit a hydraulic analysis and a revised certified topographic work map that support the boundary delineations of 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), based on failure of the levee.

3. The submitted proposed conditions HEC-1 hydrologic model indicated a significant flow increase at Cross Section 1415. It appears the high ground at Cross Sections 1415 through 1588, acting as a levee, as stated in Item 2 above, will not allow the increased flow to enter BHOC and therefore will cause ponding along the right bank. Please submit a hydraulic analysis and more detailed topographic information to show that ponding will not occur along the right bank between Cross Sections 1415 and 1588, or provide information to demonstrate that the flow will enter BHOC.

3601 Eisenhower Avenue, Alexandria, Virginia 22304-6425 PH: 703.960.8800 FX: 703.960.9125

Michael Baker Jr., Inc., under contract with the FEDERAL EMERGENCY MANAGEMENT AGENCY, is a Map Coordination Contractor for the National Flood Insurance Program

4. Our detailed review revealed water-surface elevations (WSELs) higher than the end points of the cross sections at Cross Sections 6600 through 7660 and 27810 through 28590 in the proposed conditions HEC-RAS hydraulic model for Grand Canal. The use of vertically extended cross sections might both overestimate the base flood WSELs and underestimate the width of the base floodplain. Please revise the submitted hydraulic analyses to include additional ground elevation data at the cross sections to eliminate all extended cross sections.

5. The submitted proposed conditions work maps show that the detention basin along Grand Canal at the intersection of 87th Avenue and Bethany Road will have a ponding elevation of 1068.49 feet, based on the inflow calculated from the HEC-1 hydrologic model. However, no backup stage-storage-discharge information was submitted to support this WSEL. Please submit sufficient analysis to demonstrate how the ponding elevation was calculated, or provide an explanation for this WSEL.

6. From the submitted information, it is unclear how the proposed boundary delineations of the SFHA designated Zone A along Grand Canal from Bethany Road to 75th Avenue were determined. The submitted hydraulic analysis did not model the Zone A flooding outside the basins, channels, or culverts. Please submit a hydraulic analysis and more detailed topographic information for these proposed Zone A boundary delineations on the work maps.

7. The submitted work map also does not provide essential information required to complete our detailed review of this request. Please submit a work map that includes topographic contour information used for the base floodplain boundary delineations and the locations and alignments of Cross Sections 12200 through 28590.

Please send the required data directly to us at the address shown at the bottom of the first page. For identification purposes, please include the case number referenced above on all correspondence.

If we do not receive the required data within 90 days, we will suspend our processing of your request. Any data submitted after 90 days will be treated as an original submittal and will be subject to all submittal/payment procedures, including the flat review and processing fee for requests of this type established by the current fee schedule. A copy of the notice summarizing the current fee schedule, which was published in the *Federal Register,* is enclosed for your information.

If you are unable to meet the 90-day deadline for submittal of required items, and would like us to continue processing your request, you must request an extension of the deadline. This request must be submitted to us in writing and must provide (1) the reason why the data cannot be submitted within the requested timeframe, and (2) a new date for the submittal of the data. FEMA receives a very large volume of requests and cannot maintain inactive requests for an indefinite period of time. Therefore, the fees will be forfeited for any request for which neither the requested data nor a written extension request is received within 90 days.

If you have general questions about your request, FEMA policy, or the NFIP, please call the FEMA Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627). If you have specific questions concerning your request, please call the Revisions Coordinator for your State, Pernille Buch-Pedersen, who may be reached at (703) 317-6224.

Sincerely,

Andrea L. Ryon

Andrea L. Ryon, P.E., Director
Engineering Division
Michael Baker Jr., Inc.

Enclosure

cc: Mr. Larry Broyles, P.E.
City Engineer
City of Glendale

Hasan Mushtaq, Ph.D., P.E., C.F.M.
Floodplain Manager
Street Transportation Department
City of Phoenix

Mr. Michael S. Ellegood, P.E.
Chief Engineer and General Manager
Flood Control District of Maricopa County

Ms. Shanna Yager
Flood Control District of Maricopa County

Ms. Lynn M. Thomas, P.E.
Branch Manager
Floodplain Management
Flood Control District of Maricopa County

Ms. Terri Miller
Executive Consultant
Mitigation Section
Arizona Division of Emergency Management

Federal Emergency Management Agency

Washington, D.C. 20472

FEE SCHEDULE FOR PROCESSING REQUESTS FOR MAP CHANGES

This notice contains the revised fee schedule for processing certain types of requests for changes to National Flood Insurance Program (NFIP) maps. The change in the fee schedule will allow FEMA to further reduce the expenses to the NFIP by more fully recovering the costs associated with processing conditional and final map change requests. The revised fee schedule for map changes is effective for all requests dated September 1, 2002, or later and supersedes the current fee schedule, which was established on June 1, 2000.

To develop the revised fee schedule for conditional and final map change requests, FEMA evaluated the actual costs of reviewing and processing requests for Conditional Letters of Map Amendment (CLOMAs), Conditional Letters of Map Revision – based on Fill (CLOMR-Fs), Conditional Letters of Map Revision (CLOMRs), Letters of Map Revision – based on Fill (LOMR-Fs), Letters of Map Revision (LOMRs), and Physical Map Revisions (PMRs).

Based on our review of actual cost data for Fiscal Years 2000 and 2001, FEMA has established the following review and processing fees, which are to be submitted with all requests submitted on or after September 1, 2002, that are not otherwise exempted under 44 CFR 72.5. Those fees below shown in bold format reflect a change in the fee established in June 1, 2000.

Fee Schedule for Requests for CLOMAs, CLOMR-Fs, and LOMR-Fs

Request for single-lot/single-structure CLOMA and CLOMR-F	**$500**
Request for single-lot/single-structure LOMR-F	**$425**
Request for single-lot/single-structure LOMR-F based on as-built information (CLOMR-F previously issued by us)	**$325**
Request for multiple-lot/multiple-structure CLOMA	$700
Request for multiple-lot/multiple-structure CLOMR-F and LOMR-F	$800
Request for multiple-lot/multiple-structure LOMR-F based on as-built information (CLOMR-F previously issued)	$700

Fee Schedule for Requests for CLOMRs

Request based on new hydrology, bridge, culvert, channel, or combination of any of these	**$4,000**
Request based on levee, berm, or other structural measure	**$4,500**

NATIONAL FLOOD INSURANCE PROGRAM

FEMA MAP COORDINATION CONTRACTOR

FLOOD CONTROL DISTRICT
RECEIVED
APR 28 '03
CH & GM | FINANCE
C & M
FILE
MWD

April 23, 2003

Mr. Michael Duncan, P.E., C.F.M.
Senior Civil Engineer
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

IN REPLY REFER TO:
Case No.: 03-09-0640R
Communities: Cities of Glendale and Phoenix and Maricopa County, AZ
Community Nos.: 040045, 040051, and 040037

316-ACK.FRQ

Dear Mr. Duncan:

This responds to your letter dated April 10, 2003, concerning a March 5, 2003, request that the Federal Emergency Management Agency (FEMA) issue a conditional revision to the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas. Pertinent information about the request is listed below.

Identifier:	Bethany Home Outfall Channel
Flooding Source:	Grand Canal
FIRM Panel(s) Affected:	04013C1620 G, 1640 E, and 2105 E

We have completed an inventory of the items that you submitted. We have received the data and the review and processing fee ($4,000) required to begin a detailed technical review of your request. If additional data are required, we will inform you within 60 days of the date of this letter.

When you write us about your request, please include the case number referenced above in your letter.

If you have general questions about your request, FEMA policy, or the National Flood Insurance Program, please call the FEMA Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627). If you have specific questions concerning your request, please call the Revisions Coordinator for your State, Pernille Buch-Pedersen, who may be reached at (703) 317-6224.

Sincerely,

Andrea L. Ryon

Andrea L. Ryon, P.E., Director
Engineering Division
Michael Baker Jr., Inc.

cc: Ms. Shanna Yager
Branch Manager
Floodplain Administrator
Flood Control District of Maricopa County

Ms. Terri Miller
Executive Consultant
Mitigation Section
Arizona Division of Emergency Management

3601 Eisenhower Avenue, Alexandria, Virginia 22304-6425 PH: 703.960.8800 FX: 703.960.9125

INTER-OFFICE MEMO

TO: Linda Hannan, Finance Branch

VIA: Tim Murphy, Flood Delineation Branch Manager

FROM: Mike Duncan, Flood Delineation Branch MD

DATE: 3-31-03

TOPIC: Check for FEMA

for Bethany Home Outfall Channel CLOMR

Please initiate a check for $ 4,000

payable to National Flood Insurance Program

for case no. 03-09-0640R

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

NATIONAL FLOOD INSURANCE PROGRAM

FEMA MAP COORDINATION CONTRACTOR

March 19, 2003

FLOOD CONTROL DISTRICT
RECEIVED
MAR 24 '03
FINANCE
ILANDS
ADM
P & PM
FILE
CONTRACTS
MWD

Mr. Michael Duncan, P.E., C.F.M.
Senior Civil Engineer
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

IN REPLY REFER TO:
Case No.: 03-09-0640R
Communities: Cities of Glendale and Phoenix, AZ and Maricopa County, AZ
Community Nos.: 040045, 040051, and 040037

316-FEE

Dear Mr. Duncan:

This responds to your request dated March 5, 2003, that the Federal Emergency Management Agency (FEMA) issue a conditional revision to the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas. Pertinent information about the request is listed below.

Identifier:	Bethany Home Outfall Channel
Flooding Source:	Grand Canal
FIRM Panel(s) Affected:	04013C1620 G, 1640 E, and 2105 E

FEMA has implemented a procedure to recover costs associated with reviewing and processing requests for modifications to published flood information and maps. A copy of the notice summarizing the current fee schedule, which was published in the *Federal Register*, is enclosed for your information. In accordance with this schedule, the fee for your request is $4,000 and must be submitted before we can begin processing your request. Payment of this fee must be made in the form of a check or money order, made payable in U.S. funds to the National Flood Insurance Program (NFIP), or a credit card payment. For identification purposes, the case number referenced above must be included on the check or money order.

If you choose to forward your payment using the U.S. Postal Service, please send it to the following address:

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

If you choose to forward your payment using an overnight service, please send it to the following address:

FEMA Fee-Charge System Administrator
c/o Dewberry & Davis
METS Division, Stop 19A
8401 Arlington Boulevard
Fairfax, VA 22031

Upon receipt of the requested payment, we will begin our technical review of your request. When you write to us about your request, please include the case number referenced above in your letter. Unless otherwise directed by you in writing, we will keep the submitted data in our files.

If you have general questions about your request, FEMA policy, or the NFIP, please call the FEMA Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627). If you have specific questions concerning your request, please call the Revisions Coordinator for your State, Pernille Buch-Pedersen, who may be reached at (703) 317-6224.

Sincerely,

Andrea L. Ryon

Andrea L. Ryon, P.E., Director
Engineering Division
Michael Baker Jr., Inc.

Enclosure

Federal Emergency Management Agency

Washington, D.C. 20472

FEE SCHEDULE FOR PROCESSING REQUESTS FOR MAP CHANGES

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Based on our review of actual cost data for Fiscal Years 2000 and 2001, FEMA has established the following review and processing fees, which are to be submitted with all requests submitted on or after September 1, 2002, that are not otherwise exempted under 44 CFR 72.5. Those fees below shown in bold format reflect a change in the fee established in June 1, 2000.

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Request for multiple-lot/multiple-structure LOMR-F based on as-built information (CLOMR-F previously issued)	$700

Fee Schedule for Requests for CLOMRs

Request based on new hydrology, bridge, culvert, channel, or combination of any of these	**$4,000**
Request based on levee, berm, or other structural measure	**$4,500**

FLOOD CONTROL DISTRICT
of
Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009-6399
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5897

BOARD OF DIRECTORS
Fulton Brock
Andrew Kunasek
Don Stapley
Mary Rose Garrido Wilcox
Max W. Wilson

March 5, 2003

Pernille Buch-Pedersen, Regional Manager
Michael Baker Jr. Inc.
3601 Eisenhower Avenue, Suite 600
Alexandria, Virginia 22304-6425

Dear Ms. Buch-Pedersen:

I have enclosed a CLOMR packet for a project called Bethany Home Outfall Channel. This CLOMR request encompasses multiple phases of the project, which are shown on the attached 11" x 17" exhibit. Phase 1, at the west of the project, has been constructed. Phase 2 is under construction. The future phase is for future construction. The second attached exhibit provides a capsule-view of the existing and proposed floodplains.

The major flooding feature/source of this project is stormwater ponding along the embankment of the Grand Canal. All of the related existing floodplain is Zone A. Three notebook-volumes are enclosed: two for the technical supporting data, and one for the hydrology-basis, entitled Maryvale Area Drainage Master Study, Hydrology, FCD # 93-29, February 1997.

I am submitting this on behalf of the Project Manager, C. Scott Vogel, P.E., who has signed the FEMA forms. If you have any questions, please contact me at 602-506-4732 or mwd@mail.maricopa.gov.

Sincerely,

Mike Duncan

Mike Duncan, P.E., C.F.M.
Senior Civil Engineer
Flood Delineation Branch

Enclosure

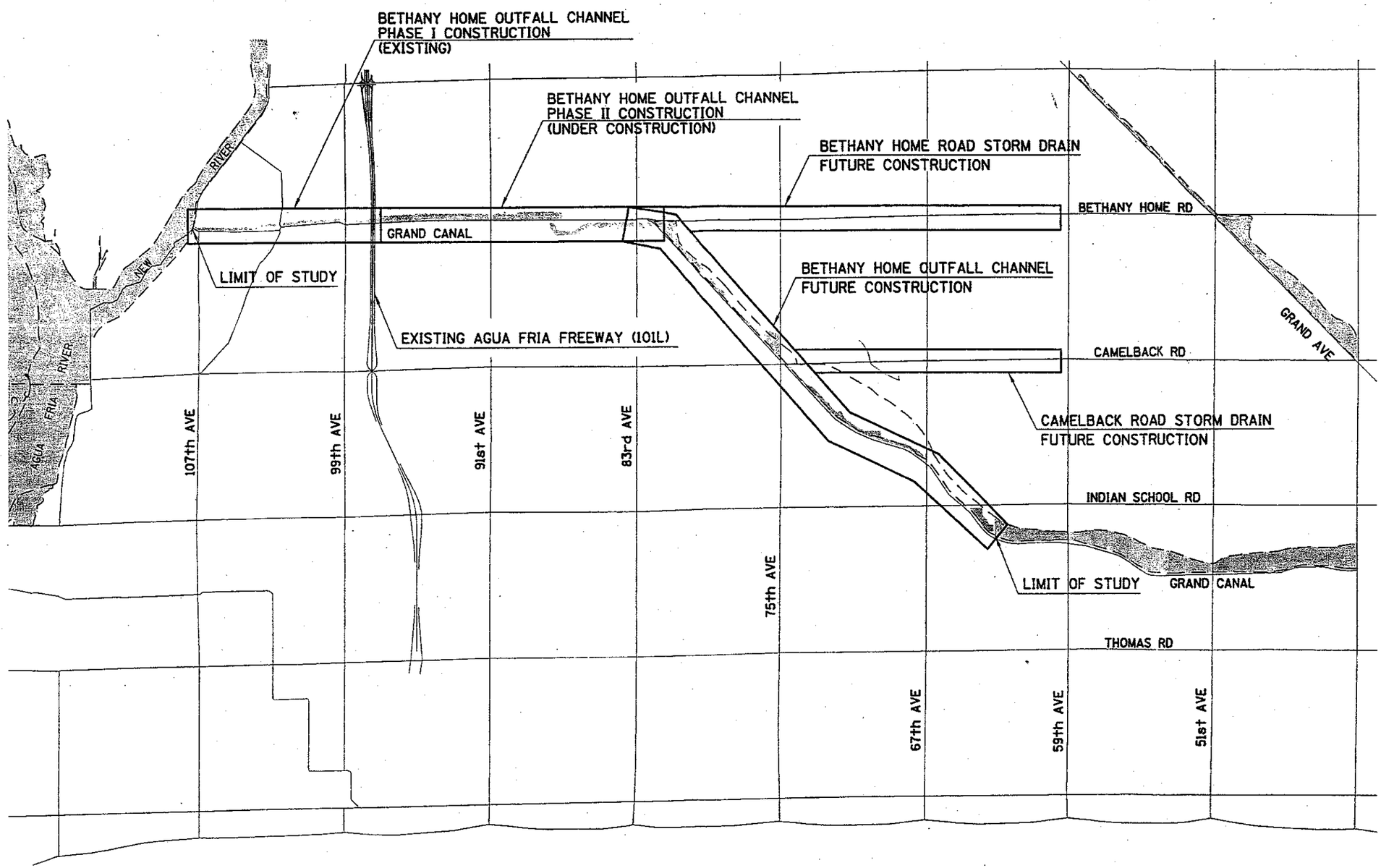
Copies to: Max Yuan, P.E., Project Engineer
Hazards Study Branch, Mitigation Directorate
Federal Emergency Management Agency
500 C Street SW
Washington, D.C. 20472-0001

Terri Miller, Executive Consultant
Mitigation Section
Arizona Division of Emergency Management
5636 E. McDowell Road
Phoenix, AZ 85008-3495

Dan Sherwood, P.E.
Engineering Department
City of Glendale
5850 W. Glendale Av., 3rd Floor
Glendale, AZ 85301-2599

Hasan Mushtaq, P.E.
Floodplain Manager
St. Trans. Dept., City of Phoenix
200 W. Washington St, 5th Floor
Phoenix, AZ 85003-1611

Jeffrey Minch, P.E.
DMJM+Harris
2777 E. Camelback Road, Suite 200
Phoenix, AZ 85016-4302



N

1000 0 1000 2000
Scale in Feet

LEGEND

EXISTING FLOODPLAIN

PROPOSED FLOODPLAIN

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BETHANY HOME OUTFALL CHANNEL

PCN NO. 620 03 32

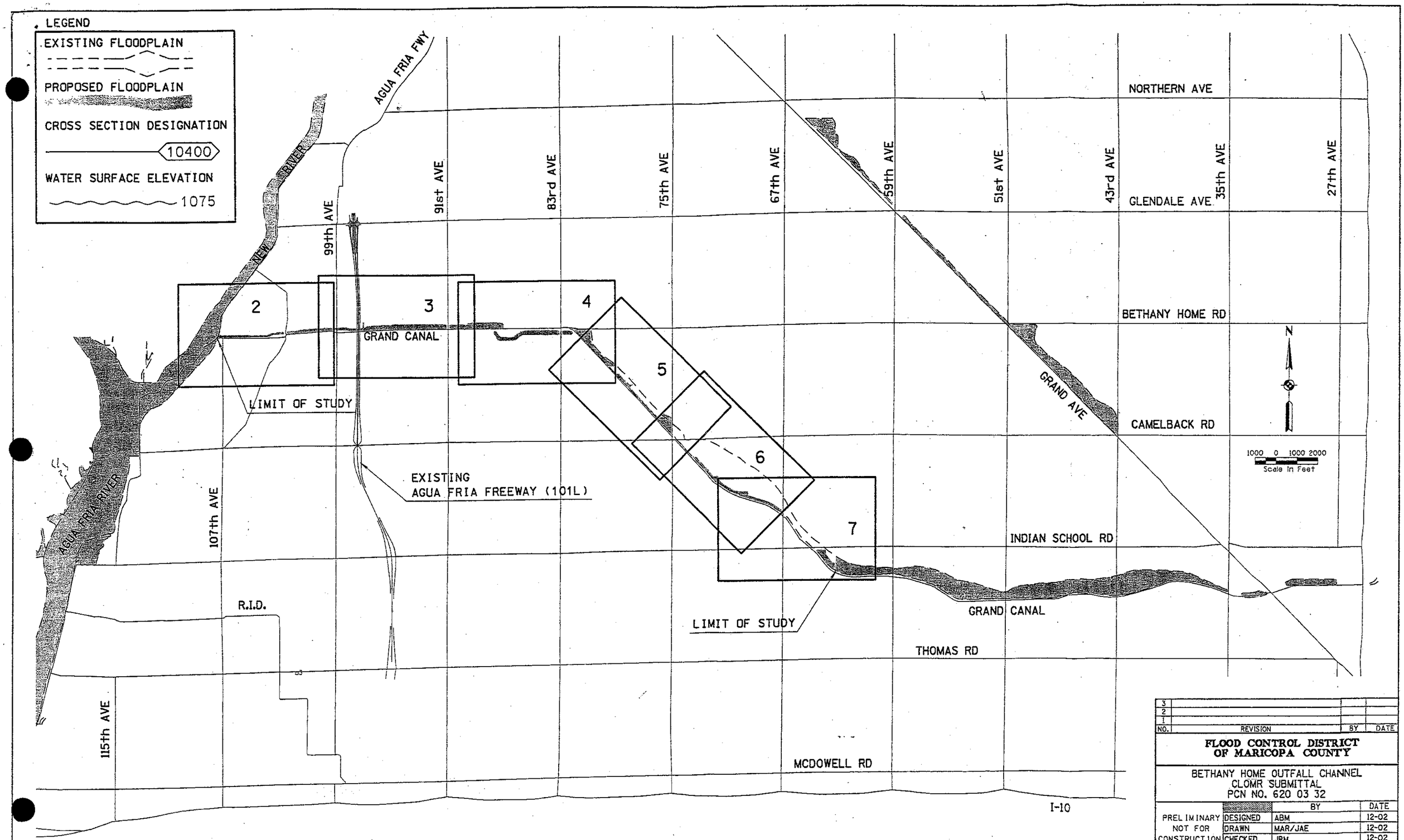
	BY	DATE
DESIGNED	DBL	12-02
DRAWN	CPG/JAE	12-02
CHECKED	JRM	12-02

DMJM HARRIS
2777 E. CAMELBACK ROAD SUITE 200
PHOENIX, AZ. 85016-4302 (602) 337-2777

DRAWING NO.

CONSTRUCTION PLANS

SHEET OF



NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BETHANY HOME OUTFALL CHANNEL
CLOMR SUBMITTAL
PCN NO. 620 03 32

		BY	DATE
PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING	DESIGNED	ABM	12-02
	DRAWN	MAR/JAE	12-02
	CHECKED	JRM	12-02

DMJM HARRIS
2777 E. CAMELBACK ROAD SUITE 200
PHOENIX, AZ. 85016-4302 (602) 337-2777

DRAWING NO. FLOOD ZONE MAPS SHEET 1 OF 7

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Registered Professional Engineer (Civil)
CERTIFICATE NO. 24999
JEFFREY R. MINCH
DATE SIGNED 1-24-03
ARIZONA, U.S.A.

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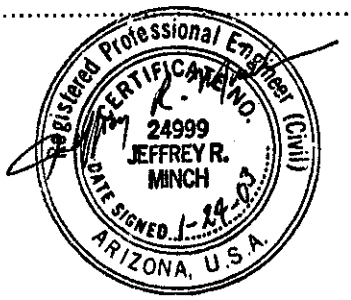

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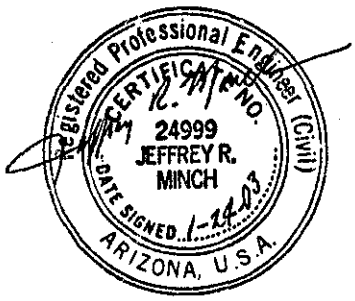

1.0 INTRODUCTION

The following Technical Data Notebook (TDN) was prepared for the Flood Control District of Maricopa County, Arizona (FCDMC) and is formatted to meet Arizona Department of Water Resources (ADWR) State Standard 1-97 and State Standard Attachment 1-97.

1.1 Purpose of Study

The purpose of this study is to provide documentation for the Federal Emergency Management Agency (FEMA) to issue a Conditional Letter of Map Revision (CLOMR) for the Bethany Home Outfall Channel (BHOC) project. The project is also referred to as the Bethany Home/Grand Canal Flood Control Project (BH/GC FCP). The documentation provided herein includes new hydrology, hydraulics and floodplain delineations.

1.1.1 Project Background

In February 1997, the FCDMC completed the Maryvale Area Drainage Master Study (ADMS). The purpose of the study was to identify and locate the flood prone areas within the study boundary. The study area was approximately 100 square miles in size and included portions of the cities of Peoria, Glendale, Avondale, Tolleson, Phoenix, and unincorporated Maricopa County, Arizona. The study limits encompassed an area from Interstate 10 (I-10) on the south to the Arizona Canal on the north, and from Interstate 17 (I-17) on the east to the Agua Fria and New Rivers on the west. One of the flood prone areas that was identified was along the north and east bank of the Grand Canal.

A second study, the Maryvale Area Floodplain Mitigation Study, was completed in November 1997 for the FCDMC. The purpose of this study was to identify and evaluate feasible mitigation options for each of the flood prone areas identified in the initial study. After identifying and evaluating the mitigation options, the most viable options were recommended for further evaluation. A drainage feature along the north and east side of the Grand Canal was identified as the option to be evaluated further for mitigating flooding adjacent to the Grand Canal. This drainage feature, which outlets into the New River at the Bethany Home Road alignment, was referred to as the Bethany Home Outfall Channel.

DMJM+HARRIS, under contract with the Arizona Department of Transportation (ADOT), developed the preliminary design for the Agua Fria Freeway (Loop 101) from Northern Avenue to I-10. During the preliminary plan development, it was identified that the freeway would have to be protected from off-site overland flows.

The design concept developed to protect the freeway was to intercept and route the 100-year off-site flows south to the Grand Canal alignment. The Bethany Home Outfall Channel (BHOC) Phase I was proposed to parallel the Grand Canal from approximately the 97th Avenue alignment west to the New River.

An Intergovernmental Agreement (IGA) was developed between ADOT and the FCDMC in 1998. This document defined that the State design and construct the BHOC, Phase I from the Loop 101 Freeway to the New River. The document further stated that the BHOC would be constructed at a capacity that will serve the freeway drainage as well as potential floodwaters from the surrounding region. The FCDMC funded the additional costs incurred by the State for right-of-way, design, construction, engineering and additional structures associated with enlarging the BHOC, to convey the additional flows. The BHOC, Phase I construction is complete from the Loop 101 west to the New River.

1.1.2 Project Purpose and Need

The Grand Canal is a large irrigation channel with banks that are raised several feet above adjacent ground in some locations. In general, there is no natural watercourse that defines the existing floodplain. During large storm events, water ponds along the north and east bank of the Grand Canal and floods adjacent properties. The Grand Canal also conveys a significant quantity of stormwater during major storms resulting in breaching of the canal banks and downstream flooding. This flooding was not a problem when the area was farmland, but as the area developed, it has resulted in the flooding of homes and businesses adjacent to the canal. Examples of typical flooding are provided on the following pages.

Several years ago, FEMA designated a floodplain containing approximately 598 structures along the north side of the Grand Canal between Camelback Road and 67th Avenue. Property owners who mortgage or refinance a home/business in this floodplain are required to pay flood insurance at a cost of $250 to $500 per year. The FCDMC and the City of Phoenix, Arizona have constructed the Sunset Detention Basin to help reduce flooding in the area of 64th Avenue and Indian School Road.

Several neighborhoods and the downtown area of Glendale, Arizona experience street and local flooding from nearly every storm event. The City of Glendale built retention basins to protect some of these areas and has designed a large diameter storm drain along Bethany Home Road in partnership with the FCDMC. The proposed BHOC project will provide an outlet to the New River for the city's storm drain system.

Photo 1 – August 17, 1963, 71st Avenue at the Grand Canal

Photo 2 – July 25, 1992, Campbell Avenue at 71st Avenue

Photo 3 – July 25, 1992, Stormwater Overtopping Grand Canal

Photo 4 – July 25, 1992, 75th Avenue, North of Camelback Road

In June of 1999, the FCDMC initiated the Bethany Home/Grand Canal Flood Control Project (BH/GC FCP) in cooperation with the Cities of Glendale and Phoenix to define and design the recommended solution based on public input. DMJM+HARRIS was retained by the FCDMC to perform the Pre-Design Study.

The BH/GC FCP Pre-Design Study developed alternatives and a recommended solution to minimize flooding adjacent to and north of the Grand Canal. The project limits were located between the Loop 101 Freeway, at approximately 97th Avenue and the Bethany Home Road alignment, to the Sunset Detention Basin at Indian School Road and 64th Avenue. In addition, storm drain construction was studied along Bethany Home Road, Missouri Avenue, and Camelback Road between the Grand Canal and 59th Avenue.

An efficient way to capture and move stormwater safely through and out of the area is the purpose of the BHOC project. Once the conveyance system is completed, storm drains are proposed to be constructed to minimize local flooding. The proposed project will collect and convey this stormwater using a combination of detention basins, channels and box culverts.

Upon completion of the Pre-Design Study, the FCDMC, the City of Phoenix and the City of Glendale have developed an IGA that defines all responsibilities and commitments regarding the cost sharing responsibilities, final design, construction and maintenance of the project. Both Cities have recently approved bonding capacity for a majority of the project improvements.

1.2 Authority for Study

Funding for this project was made possible through an IGA between the FCDMC and the Cities of Phoenix and Glendale. The Project Manager for the FCDMC is Mr. C. Scott Vogel, P.E. The contract number for the project is FCD 98-46. The DMJM+HARRIS Project Manager was Jeffrey R. Minch, P.E. The FCDMC is located at 2801 West Durango Street, Phoenix, Arizona 85009 (602) 506-1501.

1.3 Location of Study

The project is located in the West Valley of the Phoenix Metropolitan area. The contributing watershed to the project is mostly urbanized and includes portions of the Cities of Peoria, Glendale, Phoenix and Unincorporated Maricopa County.

The project is specifically located within or along Sections 8 - 17, and 24 of Township 2 North, Range 1 East and Sections 7, 18, 19 and 30 of Township 2 North, Range 2 East of the Gila and Salt River Baseline and Meridian. A Project Location Map is provided as Figure 1. A Vicinity Map is provided as Figure 2.

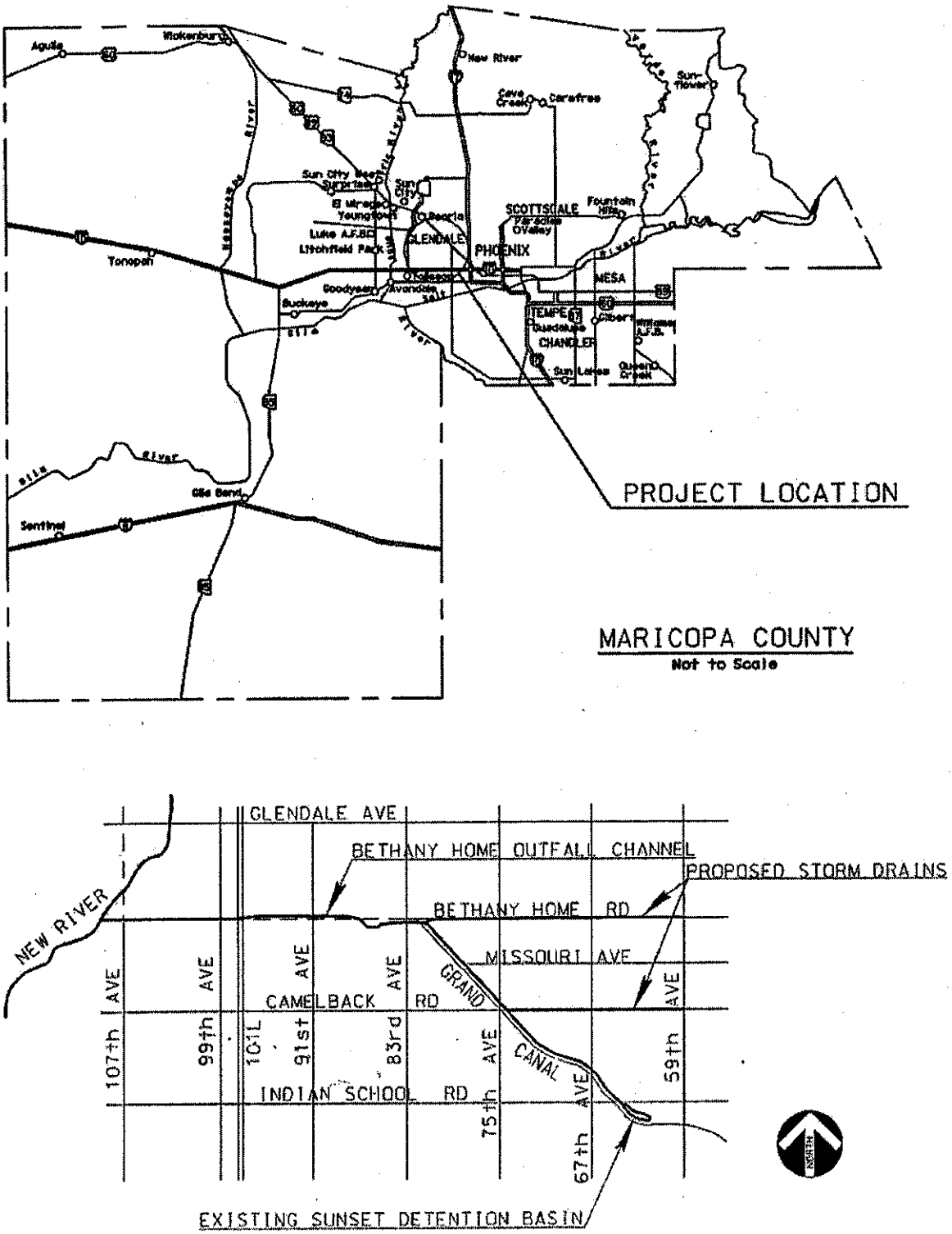

Figure 1. Location Map

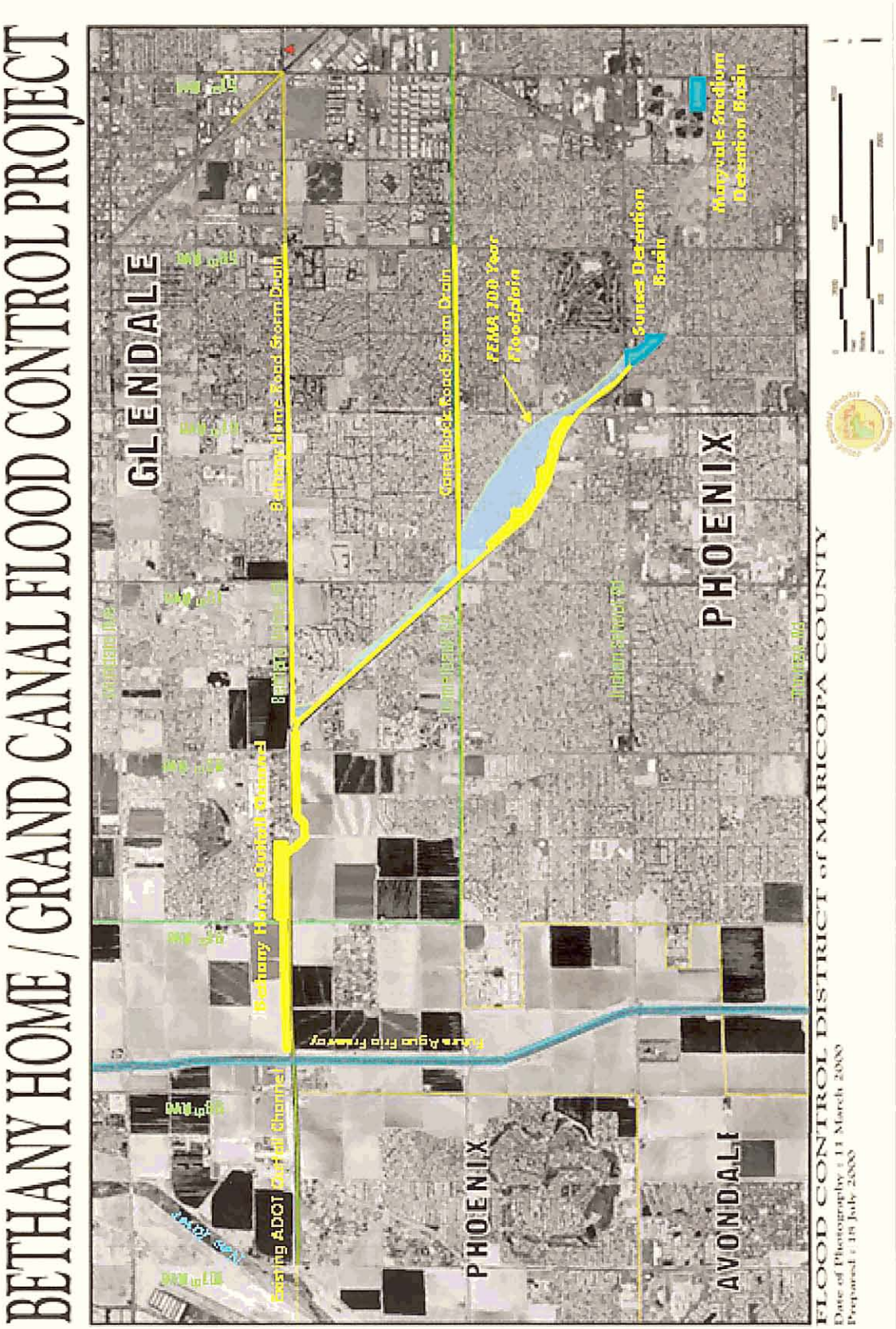

Figure 2. Vicinity Map

1.4 Methodology

The hydrology portion of this study utilized the U.S. Army Corps of Engineers HEC-1 Flood Hydrograph Package computer program to calculate the peak discharges for the 100-year, 24-hour storm events. The hydrology for this project was originally developed by the FCDMC for the Maryvale Area Drainage Master Study (Wood Patel, CH2M Hill, 1997). DMJM+HARRIS updated land use and retention volume diversions for these hydrologic models in 1999. DMJM+HARRIS also revised the hydrologic model to reflect the proposed project conditions.

The hydraulics portion of the study utilized the U.S. Army Corps of Engineers HEC-RAS River Analysis System computer program to determine the 100-year water-surface elevations for the proposed project.

1.5 Acknowledgements

The preparation of this CLOMR document for the Bethany Home Outfall Channel project could not have been completed without the input and review of many key individuals. We would like to thank the following individuals at the FCDMC: Mr. C. Scott Vogel, Mr. Tim Murphy and Mr. Mike Duncan. We would also like to thank Dan Sherwood with the City of Glendale and Hasan Mushtaq with the City of Phoenix. The DMJM+HARRIS project team who prepared this document consisted of: Jeff Minch, Alan Morrice, Linda Wagner and JoAnn Erickson.

1.6 Summary of Results

The floodplain delineation presented herein, for the proposed Bethany Home Outfall Channel project, would result in the removal of the regulatory FEMA 100-year floodplain from the existing homes and businesses. This study provides supporting documentation of a new 100-year floodplain approximately 5.8 miles in length along the Grand Canal and the Bethany Home Road alignment from 64th Avenue to the New River.

2.0 ADWR/FEMA Forms and Local Government/ADWR Abstracts

This section of the report is documented for submittal to FEMA.

2.1 General Information

Study Documentation Abstract for FEMA Submittals	Initial Study		Restudy		CLOMR	X	LOMR		Other	

2.1.1	Date Study Accepted	
2.1.2	Study Contractor Contact(s) Address Phone Internal Reference Number	DMJM+HARRIS, Inc. Jeffrey R. Minch, P.E. 2777 East Camelback Road Suite 200 Phoenix, AZ 85016-4302 (602) 337-2777 Project No. 6888
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	Arizona Department of Water Resources (602) 417-2400
2.1.6	Local Technical Reviewer Phone	Flood Control District of Maricopa County (602) 506-1501
2.1.7	Reach Description	Approximate floodplain delineation (Zone A – No base flood elevations determined) north and east of the Grand Canal from the New River to 63rd Avenue in Glendale, Phoenix, and Unincorporated Maricopa County, Arizona. FIRM Panel Numbers: 04013C1620G, 04013C1640E, and 04013C2105E
2.1.8	USGS Quad Sheet(s) with original photo date & latest photo revision date	USGS 7.5' Quadrangle Maps for the study area: EL MIRAGE, ARIZ, 1957 (photo revised 1982) GLENDALE, ARIZ, 1957 (photo revised 1982) FOWLER, ARIZ, 1957 (photo revised 1982)
2.1.9	Unique Conditions and Problems	Study in located in an urban watershed with no defined watercourse. Stormwater currently ponds adjacent to the Grand Canal. The proposed project will significantly reduce the regulatory floodplain.
2.1.10	Coordination of Q's Discharges (Agency, Date, Comments)	The hydrology was originally developed and approved by the FCDMC in February 1997 for the Maryvale Area Drainage Master Study, FCD Contract No. 93-29. In 1999, DMJM+HARRIS updated the hydrology for subsequent development retention and land uses.

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
0037	Maricopa County, Unincorporated Areas of	AZ	04013C	1620G	07/19/01

2. Flooding Source: Contributing watershed from Phoenix, Glendale, and unicorporated areas of Maricopa County.
3. Project Name/Identifier: Bethany Home Outfall Channel.
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/mit/tsd/frm_fees.htm 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: Mr. C. Scott Vogel, P.E. for	Company: Flood Control District Maricopa County	
Mailing Address: 2801 West Durango Street Phoenix, AZ 85009-6399	Daytime Telephone No.: (602) 506-4771	Fax No.: (602) 506-8561
	E-Mail Address: csv@mail.maricopa.gov	
Signature of Requester (required): Michael Duncan 602-506-4732		Date: 03-03-03

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: Mr. Michael S. Ellegood, P.E., Chief Engineer and General Manager		Telephone No.: (602) 506-1501
Community Name: Maricopa County	Community Official's Signature (required):	Date: 03/03/03

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: Jeffrey R. Minch	License No.: 24999	Expiration Date: 9/30/03
Company Name: DMJM+HARRIS	Telephone No.: (602) 337-2540	Fax No.: (602) 337-2620
Signature: Jeffrey R. Minch		Date: 1-23-03

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

Seal (Optional)

FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

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

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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
0045	Glendale, City of	AZ	04013C	1620G	07/19/01
040045	Glendale, City of	AZ	04013C	1640E	07/19/01

2. Flooding Source: Contributing watershed from Phoenix, Glendale, and unicorporated areas of Maricopa County.

3. Project Name/Identifier: Bethany Home Outfall Channel

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

-s 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/mit/tsd/frm_fees.htm 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: Mr. C. Scott Vogel, P.E. , for	Company: *Flood Control District Maricopa County*	
Mailing Address: 2801 West Durango Street Phoenix, AZ 85009-6399	Daytime Telephone No.: (602) 506-4771	Fax No.: (602) 506-8561
	E-Mail Address: csv@mail.maricopa.gov	
Signature of Requester (required): Michael Duncan 602-506-4732		Date: 03-03-03

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Community Official's Name and Title: Mr. Larry Broyles, P.E., City Engineer for		*Telephone No.:* (623) 930-3630
Community Name: City of Glendale	Community Official's Signature (required): David Ashorwood Senior Civil Engr	Date: 2-25-03

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: Jeffrey R. Minch	License No.: 24999	Expiration Date: 9/30/03
Company Name: DMJM+HARRIS	Telephone No.: (602) 337-2540	Fax No.: (602) 337-2620
Signature: Jeffrey R. Minch		Date: 1-23-03

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
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☐ 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

Seal (Optional)

FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

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

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0051	Phoenix, City of	AZ	04013C	1640E	07/19/01
040051	Phoenix, City of	AZ	04013C	2105E	07/19/01

2. *Flooding Source: Contributing watershed from Phoenix, Glendale, and unicorporated areas of Maricopa County.*

3. Project Name/Identifier: Bethany Home Outfall Channel

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)

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   ☐ Regulatory Floodway Revision ☐ Other (Attach Description)

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   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/mit/tsd/frm_fees.htm for Fee Amounts and Exemptions.

D. SIGNATURE

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Name: Mr. C. Scott Vogel, P.E. , for	Company: Flood Control District Maricopa County	
Mailing Address: 2801 West Durango Street Phoenix, AZ 85009-6399	Daytime Telephone No.: (602) 506-4771	Fax No.: (602) 506-8561
	E-Mail Address: csv@mail.maricopa.gov	
Signature of Requester (required): Michael Duncan 602-506-4732		Date: 03-03-03

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: Mr. Hasan Mushtaq, P.E., PhD, Floodplain Manager		Telephone No.: (602) 262-4026
Community Name: City of Phoenix	Community Official's Signature (required):	Date: 2/26/03

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: Jeffrey R. Minch	License No.: 24999	Expiration Date: 9/30/03
Company Name: DMJM+HARRIS	Telephone No.: (602) 337-2540	Fax No.: (602) 337-2620
Signature: Jeffrey R. Minch		Date: 1-23-03

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

Seal (Optional)

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

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

PAPERWORK REDUCTION ACT

Public reporting burden for this form is estimated to average 3 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: Contributing watershed from Phoenix, Glendale, and unicorporated areas of Maricopa County.
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 2) ☒ 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.)	FIS (cfs)	Revised (cfs)
Camelback Road	43.25	N/A	1145
83rd Avenue	50.96	N/A	2841
Confluence with New River	59.79	N/A	4517

3. Methodology for New Hydrologic Analysis (check all that apply)

☐ *Statistical Analysis of Gage Records* ☒ *Precipitation/Runoff Model* HEC-1 [TR-20, HEC-1, HEC-HMS etc.]
☐ 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. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

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	New River Confluence	7187 (Phase I)	N/A	
Upstream Limit	*63rd Avenue* (Sunset detention Basin)	28590 (Phase II)	N/A	

2. Hydraulic Method Used

Hydraulic Analysis HEC-RAS [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. *Pre-Submittal Review of Hydraulic Models*

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 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/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☒ Yes ☐ No

4. Models Submitted

Duplicate Effective Model*	Natural File Name:	Floodway File Name:
Corrected Effective Model*	Natural File Name:	Floodway File Name:
Existing or Pre-Project Conditions Model	Natural File Name:	Floodway File Name:
Revised or Post-Project Conditions Model	Natural File Name: BHOCBRW & BHOC100	Floodway File Name: N/A
Other - (attach description)	Natural File Name:	Floodway File Name:

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

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.).

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.

D. COMMON REGULATORY REQUIREMENTS

1. For CLOMR requests, do Base Flood Elevations (BFEs) increase? ☐ Yes ☒ No

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 BFEs established and would result in increases above 1.00 foot.

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 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.

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

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

PAPERWORK REDUCTION ACT

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Flooding Source: Contributing watershed from Phoenix, Glendale, and unicorporated areas of Maricopa County.
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: Bethany Home Outfall Channel - Phase I**

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

   Location of Structure: New River Confluence to 107th Avenue

   Downstream Limit/Cross Section: 7187 (Phase I)

   Upstream Limit/Cross Section: 7351 (Phase I)

2. **Name of Structure: 107th Avenue Box Culvert**

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

   Location of Structure: 107th Avenue

   Downstream Limit/Cross Section: 7351 (Phase I)

   Upstream Limit/Cross Section: 7399 (Phase I)

3. **Name of Structure: Bethany Home Outfall Channel - Phase I**

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

   Location of Structure: 107th Avenue to Grand Canal Crossing

   Downstream Limit/Cross Section: 7399 (Phase I)

   Upstream Limit/Cross Section: 10320 (Phase I)

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

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

PAPERWORK REDUCTION ACT

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Flooding Source: Contributing watershed from Phoenix, Glendale, and unicorporated areas of Maricopa County.
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: Bethany Home Outfall Channel - Phase I**

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

   Location of Structure: Grand Canal Crossing to 99th Avenue

   Downstream Limit/Cross Section: 10483 (Phase I)

   Upstream Limit/Cross Section: 12745 (Phase I)

2. **Name of Structure: 99th Avenue Bridge**

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

   Location of Structure: 99th Avenue

   Downstream Limit/Cross Section: 12732 (Phase I)

   Upstream Limit/Cross Section: 12856 (Phase I)

3. **Name of Structure: Bethany Home Outfall Channel - Phase I**

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

   Location of Structure: 99th Avenue to N-S Channel Confluence

   Downstream Limit/Cross Section: 12856 (Phase I)

   Upstream Limit/Cross Section: 13950 (Phase I)

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

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Flooding Source: Contributing watershed from Phoenix, Glendale, and unicorporated areas of Maricopa County.
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: Bethany Home Outfall Channel - Phase II**

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

   Location of Structure: N-S Channel Confluence to Irrigation Bridge

   Downstream Limit/Cross Section: 13950 (Phase I)

   Upstream Limit/Cross Section: 1516 (Phase II)

2. **Name of Structure: Irrigation Bridge**

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

   Location of Structure: Beginning of Phase II Construction

   Downstream Limit/Cross Section: 1516 (Phase II)

   Upstream Limit/Cross Section: 1603 (Phase II)

3. **Name of Structure: Bethany Home Outfall Channel - Phase II**

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

   Location of Structure: Irrigation Bridge to 91st Avenue

   Downstream Limit/Cross Section: 1603 (Phase II)

   Upstream Limit/Cross Section: 5482 (Phase II)

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

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Flooding Source: Contributing watershed from Phoenix, Glendale, and unicorporated areas of Maricopa County.
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: 91st Avenue Bridge**

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

   Location of Structure: 91st Avenue

   Downstream Limit/Cross Section: 5482 (Phase II)

   Upstream Limit/Cross Section: 5592 (Phase II)

2. **Name of Structure: Bethany Home Outfall Channel - Phase II**

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

   Location of Structure: 91st Avenue to Grand Canal

   Downstream Limit/Cross Section: 5592 (Phase II)

   Upstream Limit/Cross Section: 7676.4 (Phase II)

3. **Name of Structure: Grand Canal Culvert Crossing**

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

   Location of Structure: Grand Canal

   Downstream Limit/Cross Section: 7676.4 (Phase II)

   Upstream Limit/Cross Section: 7816.7 (Phase II)

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

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Flooding Source: Contributing watershed from Phoenix, Glendale, and unicorporated areas of Maricopa County.
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: Bethany Home Outfall Channel - Phase II**

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

   Location of Structure: Grand Canal to 83rd Avenue

   Downstream Limit/Cross Section: 7816.7 (Phase II)

   Upstream Limit/Cross Section: 11160 (Phase II)

2. **Name of Structure: 83rd Avenue Bridge**

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

   Location of Structure: 83rd Avenue

   Downstream Limit/Cross Section: 11160 (Phase II)

   Upstream Limit/Cross Section: 11266 (Phase II)

3. **Name of Structure: Bethany Home Outfall Channel - Phase II**

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

   Location of Structure: 83rd Avenue to Grand Canal

   Downstream Limit/Cross Section: 11266 (Phase II)

   Upstream Limit/Cross Section: 11755 (Phase II)

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

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Flooding Source: Contributing watershed from Phoenix, Glendale, and unicorporated areas of Maricopa County.
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: Grand Canal Culvert Crossing**

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

   Location of Structure: Grand Canal

   Downstream Limit/Cross Section: 11755 (Phase II)

   Upstream Limit/Cross Section: 11992 (Phase II)

2. **Name of Structure: Bethany Home Outfall Channel - Future Phase**

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

   Location of Structure: East of Canal and South of Bethany Home Road

   Downstream Limit/Cross Section: 11992 (Phase II)

   Upstream Limit/Cross Section: 12298 (Phase II)

3. **Name of Structure: Glendale Park Culvert**

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

   Location of Structure: South of Bethany Home Road to North of 75th Avenue and Camelback Road

   Downstream Limit/Cross Section: 12298 (Phase II)

   Upstream Limit/Cross Section: 18261 (Phase II)

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

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Flooding Source: Contributing watershed from Phoenix, Glendale, and unicorporated areas of Maricopa County.
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: Bethany Home Outfall Channel - Future Phase**

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

   Location of Structure: North of 75th Avenue and Camelback Road

   Downstream Limit/Cross Section: 18261 (Phase II)

   Upstream Limit/Cross Section: 18377 (Phase II)

2. **Name of Structure: 75th Avenue and Camelback Road Box Culvert**

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

   Location of Structure: East of Canal and South of Bethany Home Road

   Downstream Limit/Cross Section: 18377 (Phase II)

   Upstream Limit/Cross Section: 18860 (Phase II)

3. **Name of Structure: Maryvale Detention Basin**

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

   Location of Structure: Camelback Road to 67th Avenue

   Downstream Limit/Cross Section: 18860 (Phase II)

   Upstream Limit/Cross Section: 24960 (Phase II)

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

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Flooding Source: Contributing watershed from Phoenix, Glendale, and unicorporated areas of Maricopa County.
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: 67th Avenue through Indian School Road Box Culvert**

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

   Location of Structure: 67th Avenue to Sunset Detention Basin

   Downstream Limit/Cross Section: 24960 (Phase II)

   Upstream Limit/Cross Section: 27480 (Phase II)

2. **Name of Structure: Sunset Detention Basin**

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

   Location of Structure: Indian School Road to 63rd Avenue

   Downstream Limit/Cross Section: 27480 (Phase II)

   Upstream Limit/Cross Section: 28640 (Phase II)

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: Contributing watershed from Phoenix, Glendale, and unicorporated areas of Maricopa County.

Name of Structure: Bethany Home Outfall Channel - Phase I and II

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 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: Contributing watershed from Phoenix, Glendale, and unicorporated areas of Maricopa County.

Name of Structure:

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.

D. DAM

Flooding Source:

Name of Structure:

1. This request is for (check one): ☐ Existing dam ☐ New dam ☐ Modification of existing dam
2. The dam was designed by (check one): ☐ Federal agency ☐ State agency ☐ Local government agency

   ☐ Private organization Name of the agency or organization:
3. Does the project involve revised hydrology? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).
4. Does the submittal include debris/sediment yield analysis? ☐ Yes ☐ No

   If yes, then fill out Section F (Sediment Transport).
   If No, then attach your explanation for why debris/sediment analysis was not considered.
5. Does the Base Flood Elevation behind the dam or downstream of the dam change?

   ☐ Yes ☐ No If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

Stillwater Elevation Behind the Dam

FREQUENCY (% annual chance)	FIS	REVISED
10-year (10%)		
50-year (2%)		
100-year (1%)		
500-year (0.2%)		
Normal Pool Elevation		

6. Please attach a copy of the formal Operation and Maintenance Plan

E. LEVEE/FLOODWALL

1. System Elements

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	to
☐ 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:
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:
3. A profile of the BFE, closure opening outlet and inlet invert elevations, type and size of opening, and kind of closure. Sheet Numbers:
4. A layout detail for the embankment protection measures. Sheet Numbers:
5. *Location, layout, and size and shape of the levee* embankment features, foundation treatment, floodwall structure, closure structures, and pump stations. Sheet Numbers:

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

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.)

5. Embankment Protection

a. The maximum levee slope landside is:

b. The maximum levee slope floodside is:

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

Reach	Sideslope	Flow Depth	Velocity	Curve or Straight	Stone Riprap			Depth of Toedown
					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)

4. Embankment Protection (continued)

f. Is a bedding/filter analysis and design attached? ☐ Yes ☐ No

g. Describe the analysis used for other kinds of protection used (include copies of the design analysis):

Attach engineering analysis to support construction plans.

5. Embankment And Foundation Stability

a. Identify locations and describe the basis for selection of critical location for analysis:

☐ Overall height: Sta. ; height ft.

☐ Limiting foundation soil strength:

Sta. , depth to

strength ϕ = degrees, c = psf

slope: SS = (h) to (v)

(Repeat as needed on an added sheet for additional locations)

b. Specify the embankment stability analysis methodology used (e.g., circular arc, sliding block, infinite slope, etc.):

c. Summary of stability analysis results:

Case	Loading Conditions	Critical Safety Factor	Criteria (Min.)
I	End of construction		1.3
II	Sudden drawdown		1.0
III	Critical flood stage		1.4
IV	Steady seepage at flood stage		1.4
VI	Earthquake (Case I)		1.0

(Reference: USACE EM-1110-2-1913 Table 6-1)

d. Was a seepage analysis for the embankment performed? ☐ Yes ☐ No

If Yes, describe methodology used:

e. Was a seepage analysis for the foundation performed? ☐ Yes ☐ No

f. Were uplift pressures at the embankment landside toe checked? ☐ Yes ☐ No

g. Were seepage exit gradients checked for piping potential? ☐ Yes ☐ No

h. The duration of the base flood hydrograph against the embankment is hours.

Attach engineering analysis to support construction plans.

E. LEVEE/FLOODWALL (CONTINUED)

Floodwall And Foundation Stability

a. Describe analysis submittal based on Code (check one):

☐ UBC (1988) or ☐ Other (specify):

b. Stability analysis submitted provides for:

☐ Overturning ☐ Sliding If not, explain:

c. Loading included in the analyses were:

☐ 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.

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:

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

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

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)

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

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

    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

    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

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

F. SEDIMENT TRANSPORT

Flooding Source:

Name of Structure:

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:

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.

If a sediment analysis has not been performed, an explanation as to why sediment transport (including scour and deposition) will not affect the BFEs or structures must be provided.

3.0 Mapping and Survey Information

3.1 Field Survey Information

The initial field survey to set the ground control, establish Elevation Reference Marks (ERM's), and set panels for the aerial mapping was performed by Tetra Tech, Inc. [formerly Collins–Pina Engineering, Inc. (CPE)]. This survey also supplemented the aerial mapping with existing roadway cross-sections at 83rd and 91st Avenues. The original field surveys were completed and sealed by Mr. John R. Colling, R.L.S. in May 2000.

The initial survey was supplemented by AZTEC ENGINEERING (AZTEC) which included partial topographic surveys of the Grand Canal and as-built topography of the existing concrete lined channel the Loop 101. This survey also included ties to corners in Sections 10 and 15 of Township 2 North, Range 1 East. The AZTEC supplemental survey was completed and sealed by Mr. Norman L. Smith, R.L.S. in August 2001.

The supporting field survey notes are provided in Appendix C. The initial field survey notes by CPE and supporting exhibits are presented first in Appendix C. A reduced copy of the Results-of-Survey follows the initial field survey notes. The supplemental field survey notes by AZTEC then follows the Results-of-Survey drawings in Appendix C.

3.2 Mapping

Aerial strip mapping was developed for the BHOC corridor along the Grand Canal from the Loop 101 to approximately 63rd Avenue; Missouri Avenue from the Grand Canal to 59th Avenue; and Camelback Road from the Grand Canal to 59th Avenue.

The horizontal datum for the mapping is based on the North American Datum of of 1983 (NAD 83) State Plane Coordinate System, Arizona Central Zone, as published by the Arizona Department of Transportation. Coordinates for the horizontal control are ground coordinates based on a scale factor of 1.00016.

The vertical datum is based on the National Geodetic Vertical Datum of 1929 (NGVD 29) which is the same datum used by the Salt River Valley Water Users Association [Salt River Project (SRP)] for the Grand Canal and irrigation lateral system. The conversion factor from NGVD 29 to the North American Vertical Datum of 1988 (NAVD 88) is +1.9098.

The project is not located in an area of known ground subsidence.

The last overall vertical control survey upon which the referenced benchmarks are based is the initial CPE field survey completed in May of 2000. SRP has confirmed the project vertical NGVD 29 benchmarks.

Kenney Aerial Mapping, Inc. (KAM) was the mapping sub-consultant to CPE. KAM developed black and white aerial photography in stereo. They performed a photogrammetric stereo compilation to develop DTMIF (Digital Terrain Model Information Files). Mass points were digitized at high, low and intermediate positions in order to best depict the ground. Supplemental mass points were added in order to densify the point network.

Additionally, three-dimensional breaklines were used to supplement the Digital Terrain Model (DTM). One (1) foot contours were computer generated and interpolated using Intergraph Site Works software, then run through a contour smoothing software. Planimetric detail was digitized to produce the final mapping product. The above data was provided in MicroStation drawing file formatted to FCDMC specifications. Mass points and breakline data were provided on separate levels.

KAM and CPE delivered 76 sheets of 36"x42" sealed mylars as the final mapping product at 1"=20' scale. The final mapping products were sealed by Robert M. Williams, R.L.S. (KAM) and John R. Colling, R.L.S. (CPE). The final mapping product and electronic data was delivered to the FCDMC. The final survey and mapping product exceeds the minimum criteria defined in FEMA Document 37, Flood Insurance Study Guidelines and Specifications for Study Contractors, January 1995.

Detailed topographic mapping (i.e., 1"=200' with a contour interval of 1 or 2 feet) for the hydrology was prepared by Kenney Aerial Mapping, based on photography flown on March 28, 1994. This topographic mapping is the basis of the Maryvale Area Drainage Master Study – Hydrology, performed for the FCDMC by Wood/Patel Associates, Inc., and CH2M Hill. The FCDMC contract number for this project is FCD No. 93-29. This mapping has also been used to illustrate the limits of the existing FEMA floodplain adjacent to the Grand Canal in Section 5.2.

4.0 Hydrology

4.1 *Method Description*

The hydrologic models for this study were originally developed for the Maryvale Area Drainage Master Study (ADMS) – Hydrology, performed for the FCDMC by Wood/Patel Associates, Inc., and CH2M Hill. The FCDMC contract number for this project is FCD No. 93-29. The U.S. Army Corps of Engineers HEC-1 computer program (Version 4.1, June 1998) downloaded from the Corps' Hydraulic Engineering Center's web site was used for the hydrologic analysis of this project.

4.2 Parameter Estimation

4.2.1 Drainage Area Boundaries

The watershed area for the Maryvale ADMS encompasses approximately 100 square miles. Figure 3 illustrates the limits of the watershed studied for the Maryvale ADMS.

The proposed BHOC project is located approximately in the middle of this study watershed and parallels the north and east side of the Grand Canal from approximately 63rd Avenue to the New River. The total contributing area to the downstream end of the BHOC project is estimated to be approximately 59.79 square miles.

4.2.2 Watershed Work Maps

HEC-1 schematic exhibits for the watershed are provided in Appendix D. As part of this project, the land use and retention within the contributing watershed was updated and approved by the FCDMC in November 1999. The updated land use exhibit follows the HEC-1 schematics in Appendix D.

The supporting hydrologic analyses for the Maryvale ADMS can be provided by the FCDMC upon request. The hydrologic analysis for the Maryvale ADMS which defines the subbasin boundaries and concentration points; time-of-concentration; hydrograph routing paths; and soils boundaries are documented in a 4-inch notebook.

4.2.3 Gage Data

This section is not applicable to this study.

4.2.4 Statistical Parameters

This section is not applicable to this study.

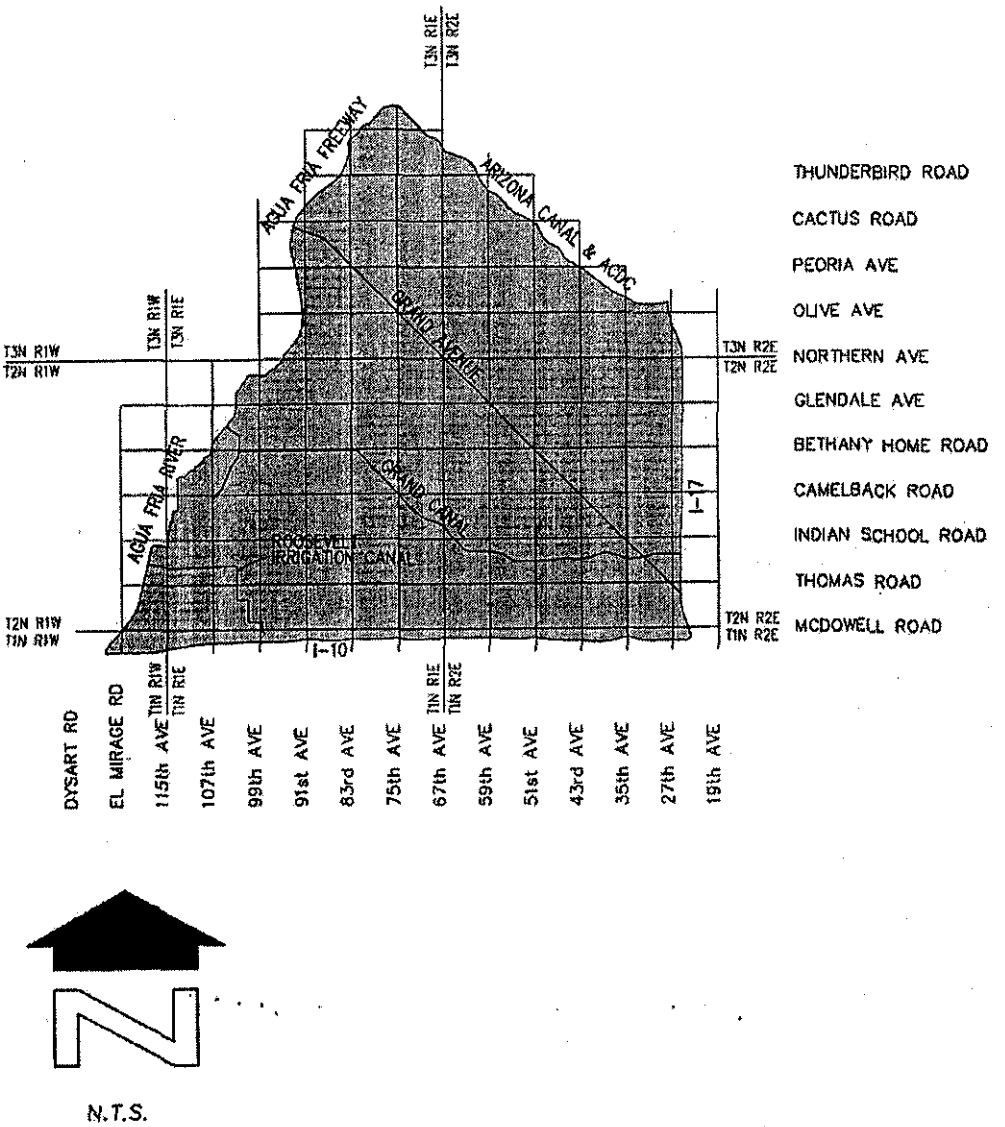


Figure 3. Maryvale ADMS Study Area

4.2.5 Precipitation

The Maryvale ADMS defined the adjusted point rainfall depths for the 10-year, 6-hour and the 100-year, 24-hour storm events for the study area. This study is based on the Maryvale ADMS precipitation depths which used the dimensionless storm patterns documented in the *Drainage Design Manual for Maricopa County: Volume I Hydrology* (FCDMC, 1995) for the 10-year, 6-hour rainfall distribution. The SCS Type II distribution was used for the 100-year, 24-hour rainfall distribution. The return period point precipitation values for the watershed are summarized in the Table below.

Table 1. Return Period Point Precipitation Values

Duration	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
5-Min	0.35	0.44	0.50	0.59	0.66	0.72	0.88
10-Min	0.52	0.66	0.76	0.90	1.00	1.11	1.36
15-Min	0.64	0.83	0.96	1.14	1.28	1.42	1.75
30-Min	0.84	1.11	1.29	1.54	1.73	1.93	2.38
1-Hr	1.03	1.37	1.59	1.92	2.16	2.41	2.98
2-Hr	1.10	1.47	1.73	2.08	2.36	2.63	3.27
3-Hr	1.14	1.55	1.82	2.20	2.49	2.78	3.45
6-Hr	1.23	1.68	1.99	2.41	2.73	3.06	3.81
12-Hr	1.30	1.82	2.16	2.64	3.01	3.37	4.22
24-Hr	1.37	1.95	2.34	2.87	3.28	3.69	4.63

The FCDMC has researched historical flooding within the study watershed and documented the following storm events:

Table 2. Historical Storm Event Precipitation and Durations

Date	Precipitation Depth (inches)	Duration
August 16 & 17, 1963	5.2	6 hours
September 13, 1966	2.2	1 day
September 4 – 6, 1970	1.7	1 day
September 3, 1990	2.3	3 hours
July 23 & 24, 1992	3.8	7 hours

Numerous photographs are available from the FCDMC documenting these flood events. In addition, the Corps of Engineers documented the rainfall depths and flooding limits as a result of the 1963 flood within the watershed.

4.2.6 Physical Parameters

The physical parameters used in the hydrologic modeling for the study watershed are based on the Maryvale ADMS. The details of the physical parameters are documented in the Maryvale Area Drainage Master Study (ADMS) – Hydrology report performed for the FCDMC. DMJM+HARRIS updated the physical parameters for the contributing watershed with the Pre-Design Study. Electronic files documenting this update are included with this study for use with the FCDMC's DDMS software.

4.3 Problems Encountered During the Study

No specific problems were encountered during the study.

4.4 Calibration

Calibration of the original hydrologic model is documented in the Maryvale Area Drainage Master Study (ADMS) – Hydrology report performed for the FCDMC.

4.5 Final Results

4.5.1 Hydrologic Analysis Results

Peak discharges were determined for the 10-year and 100-year return intervals using FCDMC methodology. The results of the hydrologic analyses are presented in Tables 3 and 4.

DMJM+HARRIS assumed the design discharges presented in Table 2 would be conveyed in storm drain systems along Bethany Home Road and Camelback Road based on the following hydrologic models. These design discharges will have to be confirmed during the final design of these facilities.

4.5.2 Verification of Results

No specific verification of results was performed with this study. The original hydrologic model developed for the watershed was compared with previous studies in the Maryvale ADMS.

The results of the hydrologic analysis performed for this study has been reviewed and approved by the FCDMC during the design of the BHOC from the Loop 101 to 83rd Avenue.

Table 3. Summary of 100-Year Design Peak Discharges at Selected Locations

Location	Concentration Point	Peak Discharge Rate (cfs)
New River Confluence	C8-21W	4517
97th Ave. to 91st Ave.	CBH97	3275
91st Ave. to Grand Canal	CBH5	3047
87th Ave. to 83rd Ave.	C@DC4	2841
83rd Avenue	C@DC4	2841
79th Avenue	C@DC3	1532
Maryvale Basin Outflow	GCDCo	1145
Maryvale Basin Inflow	C@DC2	1598
Indian School Road	RDC1B	344

Table 4. Summary of Assumed Storm Drain 10-Year Design Peak Discharges

Location	Concentration Point	Peak Discharge Rate (cfs)
Camelback Road Storm Drain System		
59th Avenue	CCB59	173
63rd Avenue	SCB3W	313
67th Avenue	CCB67	375
71st Avenue	SCB4W	498
75th Avenue	CCB75	498
Bethany Home Road Storm Drain System		
59th Avenue	CBH59	372
63rd Avenue	SHB4W	463
67th Avenue	CBH67	515
71st Avenue	SBH5W	643
75th Avenue	CHB75	714
79th Avenue	SBH6W	802
83rd Avenue	CHB83	834

5.0 Hydraulics

5.1 Method Description

The study area is located in Township 1 North, Range 1 and 2 East in Maricopa County Arizona. The approximate center of the study area, 75th Avenue and Camelback Road, is at Latitude 33°30.5" North and Longitude 112°13.2" West.

In general, there is no natural watercourse that defines the existing floodplain. During large storm events, water ponds along the north and east bank of the Grand Canal and floods adjacent properties. The proposed project will collect and convey this storm water using a combination of detention basins, channels, box culverts and storm drain systems.

The hydraulic analysis was prepared utilizing the U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-RAS River Analysis System. The computer program used for the hydraulic analyses is Version 3.0.1 dated March 2001.

The hydraulic analysis consists of two HEC-RAS projects. The first project was developed by BRW, Inc. as part of the design of the Agua Fria Freeway (101L) off-site drainage system. This project (BHOCBRW.PRJ) starts at the confluence of the BHOC and the New River and extends to the east side of the Agua Fria Freeway. The hydraulic analysis assumed 100-year design frequency for the BHOC and 10-year storm frequency for the New River. Therefore, the hydraulic analysis assumes a 10-year starting water-surface elevation in the New River. DMJM+HARRIS updated the flow rates in this analysis to be consistent with the updated hydrology for the BHOC project.

The second HEC-RAS project was developed by DMJM+HARRIS and begins where the first project ends on the east side of the Agua Fria Freeway (101L). The analysis extends to the eastern limit of the project which is the proposed outlet for the Sunset Detention Basin near 64th Avenue and Indian School Road. The downstream starting water-surface elevation for this HEC-RAS project (BHOC100.PRJ) was obtained from the upstream end of the first HEC-RAS project. The DMJM+HARRIS hydraulic analysis starts with station 14+04.5 which is equal to the BRW analysis station 139+50. The project invert elevation at this location is 1048.68 (DMJM+HARRIS) = 1048.21 (BRW) based on as-built surveys provided in Appendix C. Therefore, 0.47' was added to the BRW water-surface elevation for the starting water-surface elevation in the DMJM+HARRIS model.

5.2 Work Study Maps

The proposed floodplain maps were developed using detailed topographic mapping (i.e., 1"=200' with a contour interval of 1 or 2 feet) prepared by Kenney Aerial Mapping, based on photography flown on March 28, 1994. This mapping

was used to illustrate the existing and proposed floodplain limits since the detailed mapping for the construction of the project does not provide sufficient coverage to illustrate the existing FEMA floodplain.

The proposed floodplain limits were developed using detailed topographic mapping (i.e., 1"=20' with a contour interval of one foot) prepared by Kenney Aerial Mapping as documented in Section 3.2. The full size 11x17 work maps are at a scale of 1"=500' and are included on the following pages.

The work study maps follow basic FEMA format for the proposed floodplain delineation. The floodplain and floodway are one in the same for this project. Future encroachments on this facility will be evaluated on a case by case basis.

The construction plans for the project from the New River to east of 83rd Avenue are provided in Appendix E. The concept plans for the remainder of the facility including storm drains are also provided in Appendix E. Cross-section identifiers are based on the respective project construction centerline station. The thalweg is the profile grade line of the constructed conveyance system for each respective project. Water-surface elevations at each cross-section are not illustrated on the work maps since the proposed floodplain is contained within the constructed facility. The 100-year, 24-hour peak discharges are summarized in the final results section of this report.

5.3 Parameter Estimation

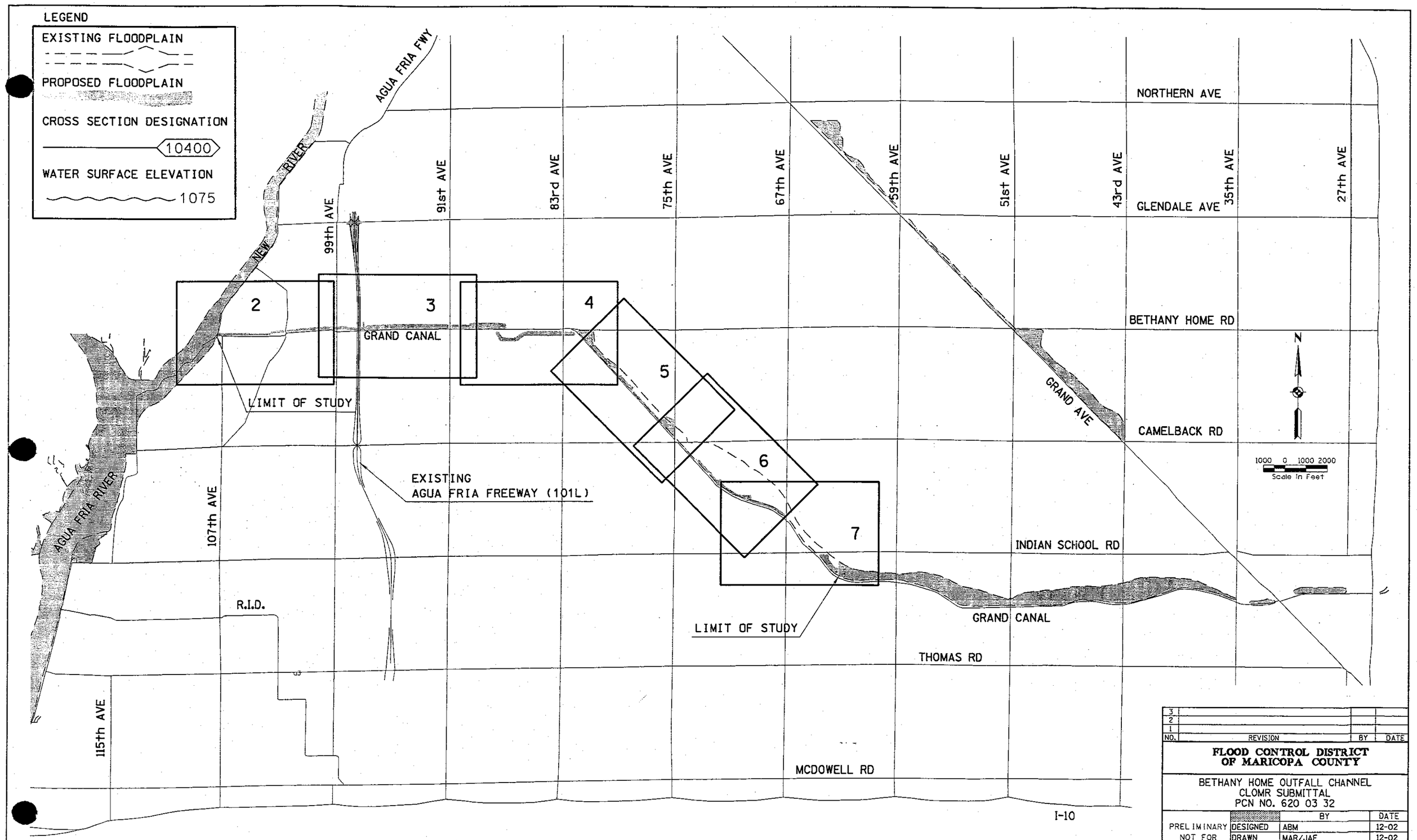
5.3.1 Roughness Coefficients

The procedure presented in the report titled "Estimated Manning's Roughness Coefficients for stream Channels and Flood Plains in Maricopa County, Arizona (USGS, 1991) was used for the estimation of Manning's "n" values. The procedure consists of selecting a base "n" value for the proposed channel and applying an adjustment factor to account for the roughness associated with channel irregularity, obstructions, vegetation and channel meandering.

The Manning's "n" values defined for the landscaped conveyance portion of the facility was divided into segments with similar characteristics. Appendix E provides supporting documentation for the definition of the Manning's "n" values for the hydraulic analysis.

5.3.2 Expansion and Contraction Coefficients

Normal expansion and contraction coefficients of 0.1 and 0.3 are used throughout the study limits. Vehicular bridge structures are proposed at 83rd and 91st Avenues. For the entrance and exit from bridges and box culverts, gradual vertical wall transitions or uniform trapezoidal sections are proposed and therefore, the loss coefficients were not modified.



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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BETHANY HOME OUTFALL CHANNEL
CLOMR SUBMITTAL
PCN NO. 620 03 32

		BY	DATE
PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING	DESIGNED	ABM	12-02
	DRAWN	MAR/JAE	12-02
	CHECKED	JRM	12-02

DMJM HARRIS
2777 E. CAMELBACK ROAD SUITE 200
PHOENIX, AZ. 85016-4302 (602) 337-2777

DRAWING NO. FLOOD ZONE MAPS SHEET 1 OF 7

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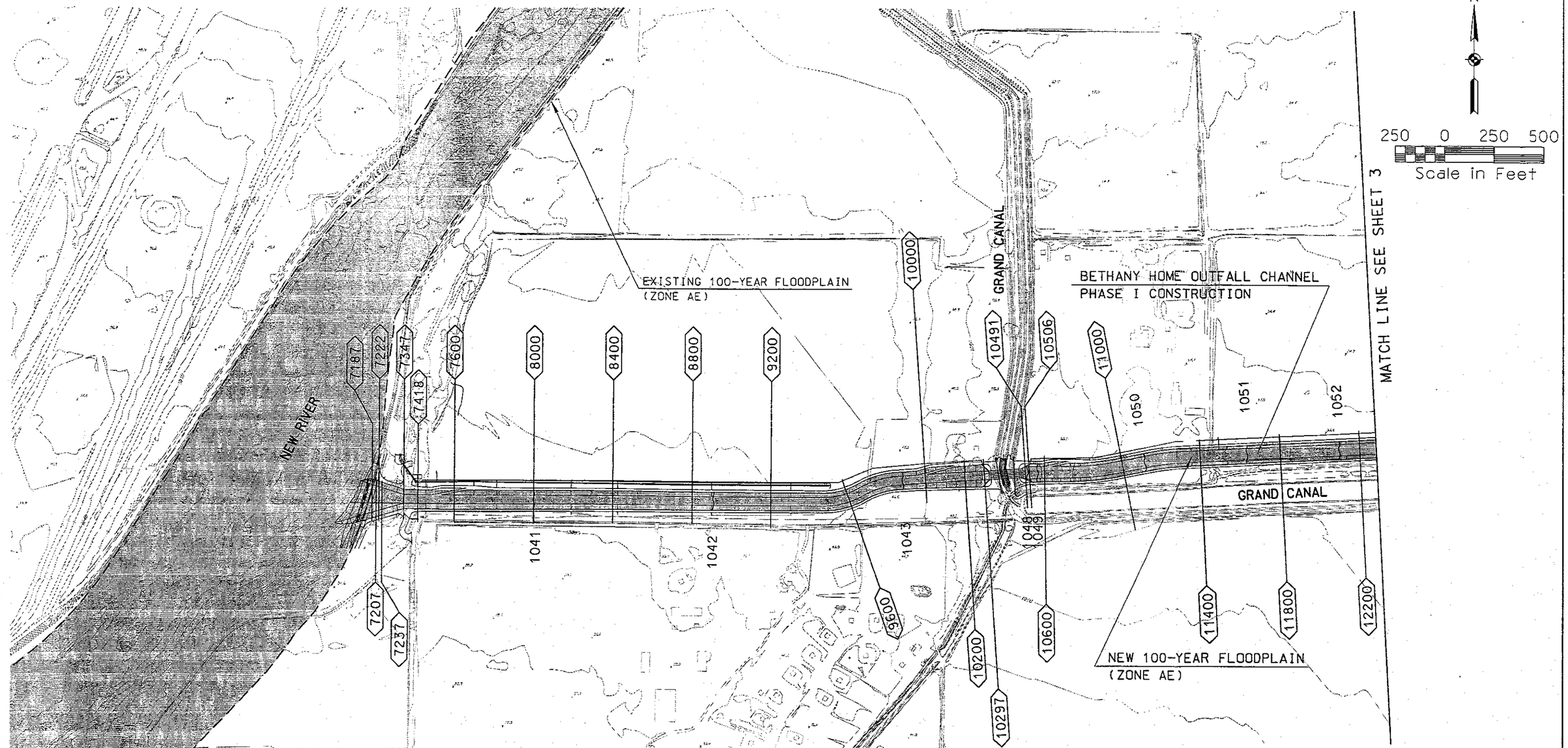

NOTE:

FOR MORE DETAILED TOPOGRAPHIC MAPPING, SEE THE CONSTRUCTION PLANS.

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BETHANY HOME OUTFALL CHANNEL
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DRAWING NO. FLOOD ZONE MAPS SHEET 2 OF 7

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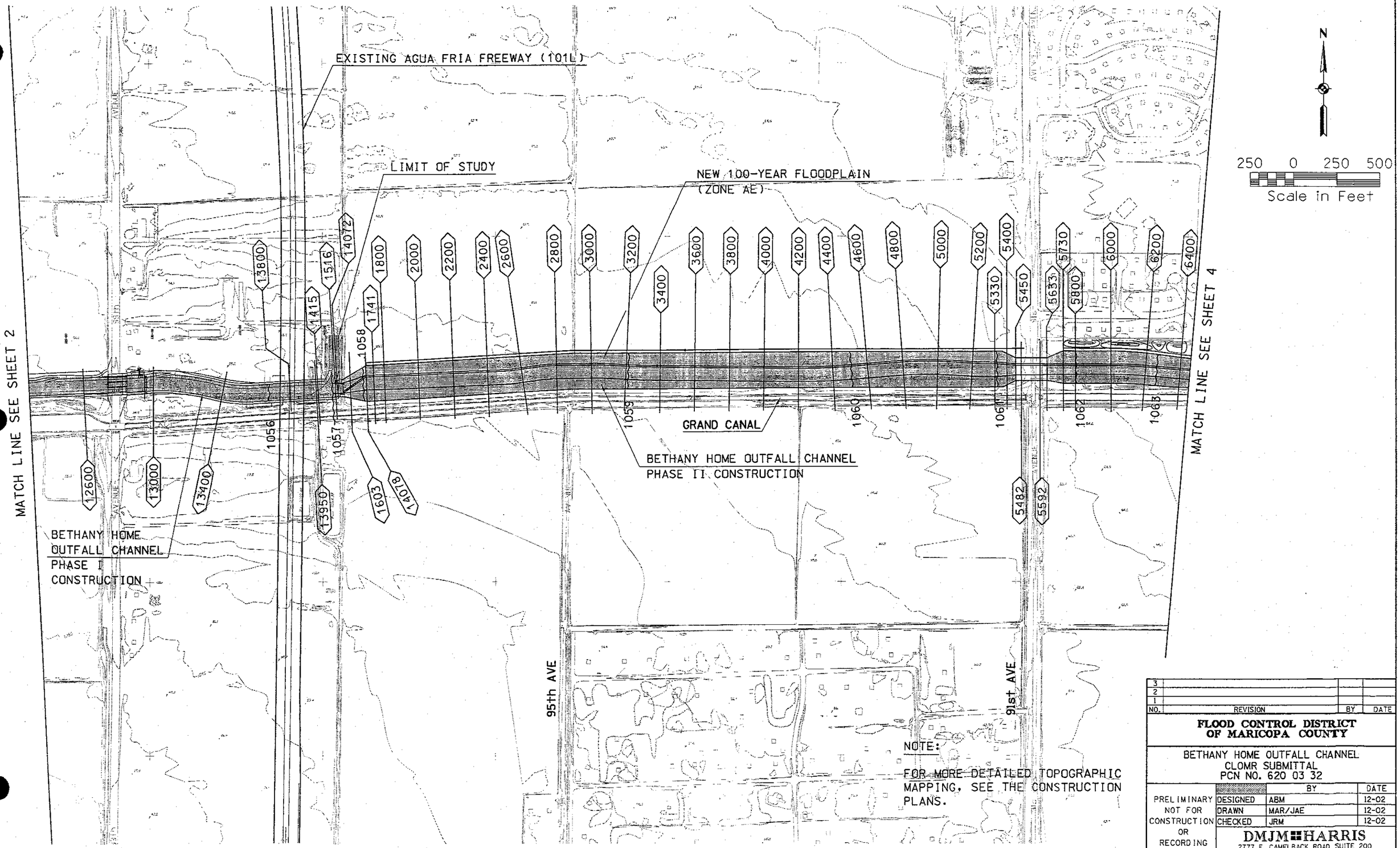

NOTE:

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

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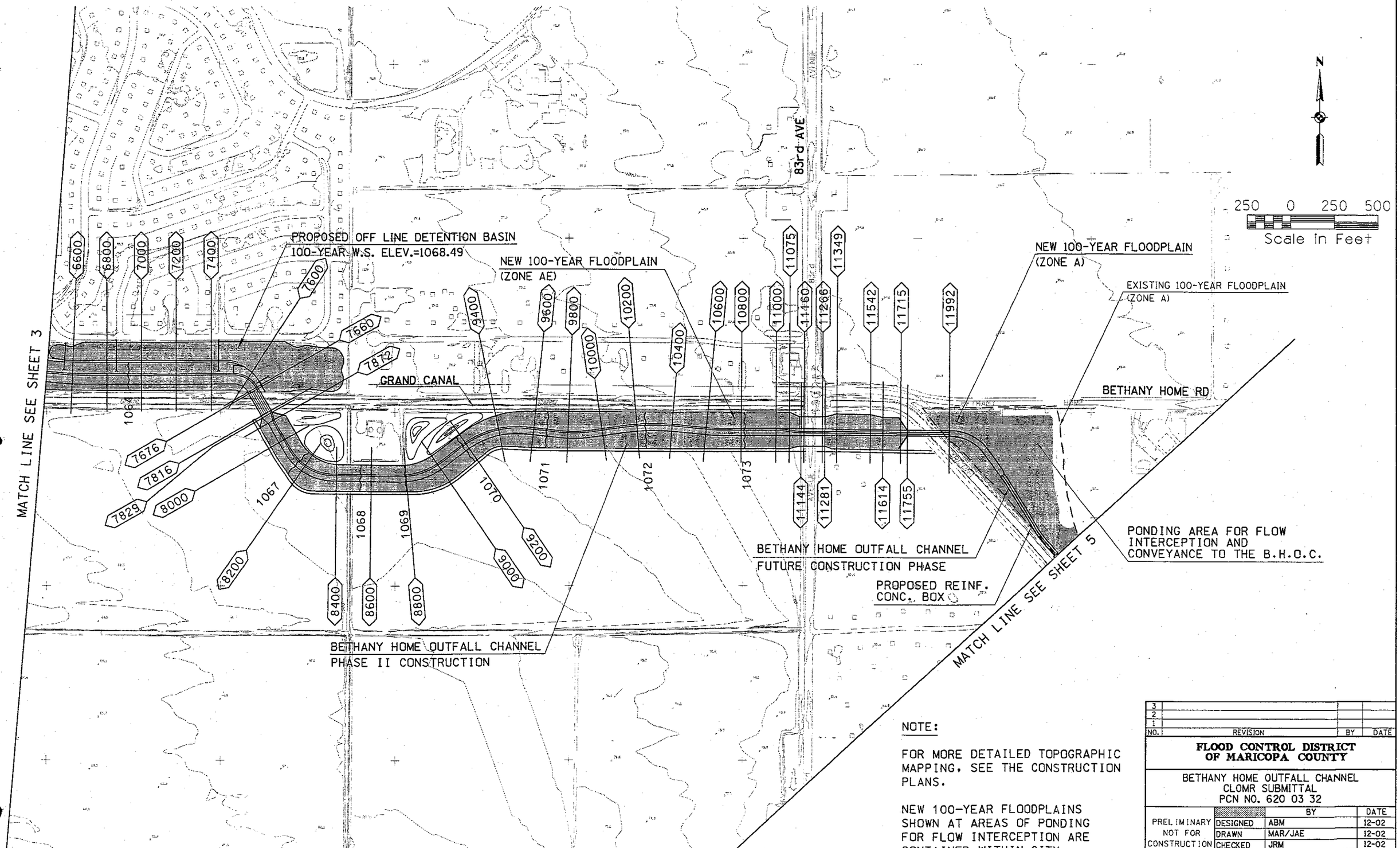

NOTE:

FOR MORE DETAILED TOPOGRAPHIC MAPPING, SEE THE CONSTRUCTION PLANS.

NEW 100-YEAR FLOODPLAINS SHOWN AT AREAS OF PONDING FOR FLOW INTERCEPTION ARE CONTAINED WITHIN CITY OWNED PARK PROPERTIES.

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BETHANY HOME OUTFALL CHANNEL
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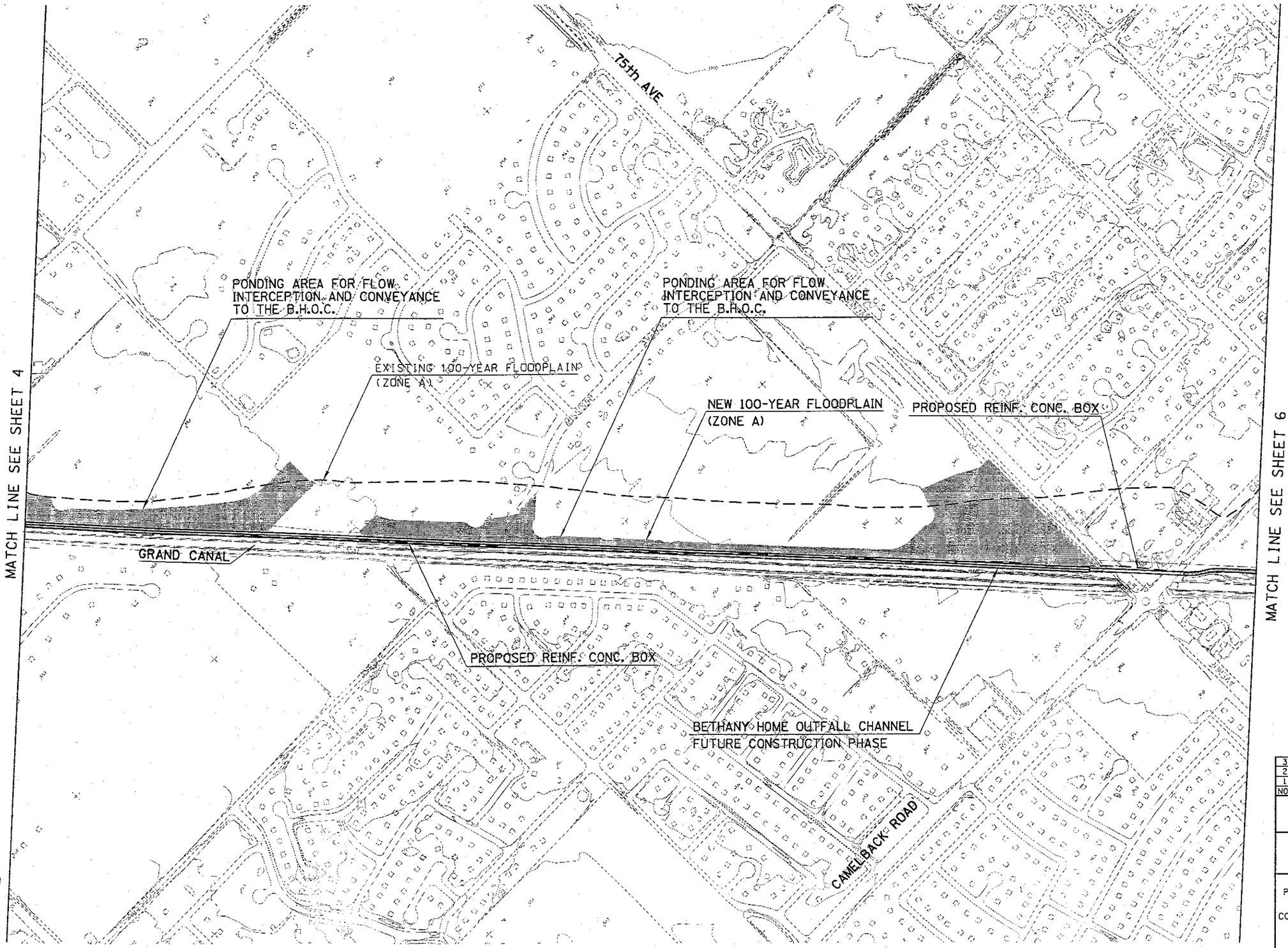

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Scale in Feet

NOTE:

FOR MORE DETAILED TOPOGRAPHIC MAPPING, SEE THE CONSTRUCTION PLANS.

NEW 100-YEAR FLOODPLAINS SHOWN AT AREAS OF PONDING FOR FLOW INTERCEPTION ARE CONTAINED WITHIN CITY OWNED PARK PROPERTIES.

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

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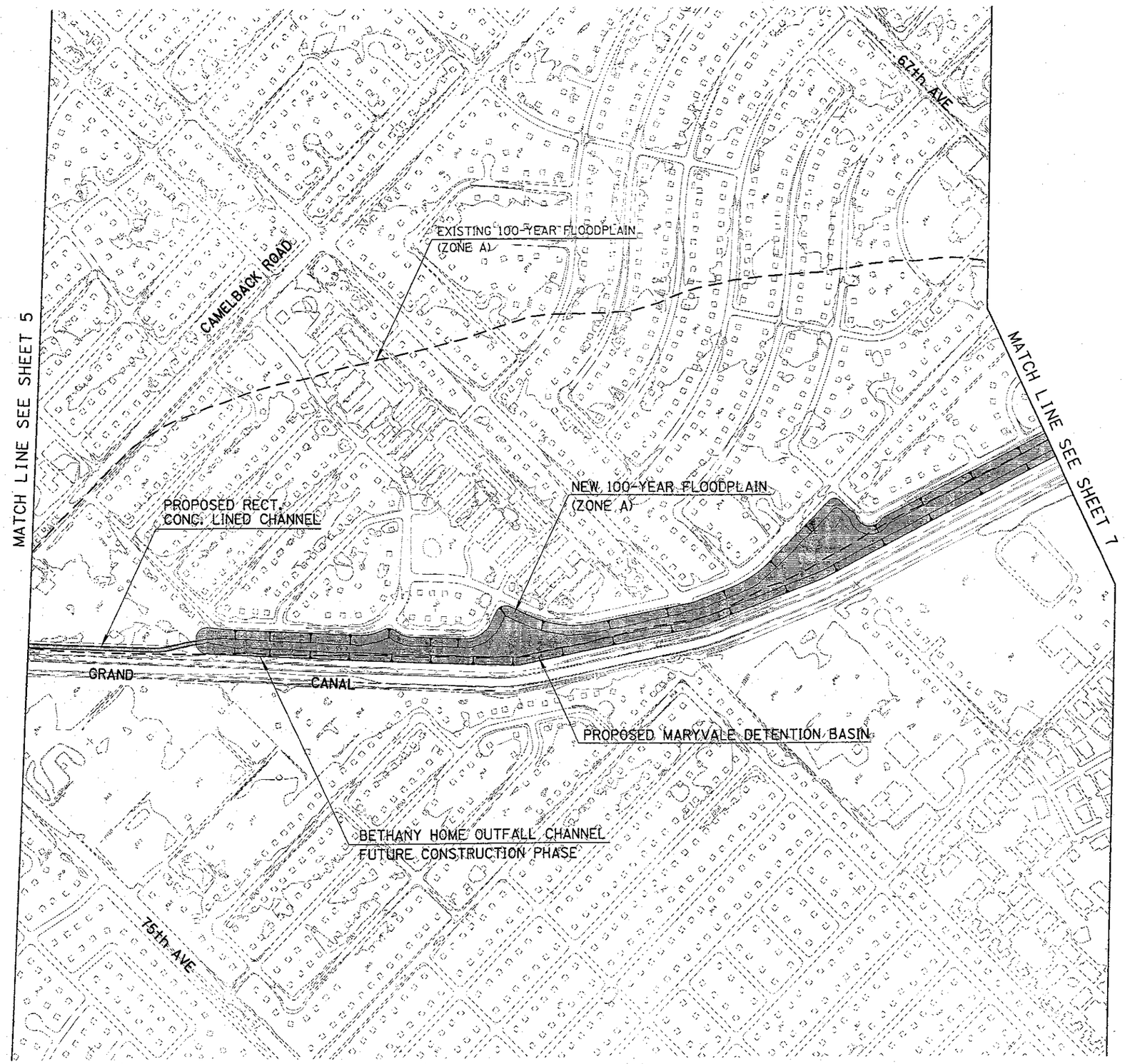

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NOTE:

FOR MORE DETAILED TOPOGRAPHIC MAPPING, SEE THE CONSTRUCTION PLANS.

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BETHANY HOME OUTFALL CHANNEL
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PCN NO. 620 03 32

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DMJM HARRIS
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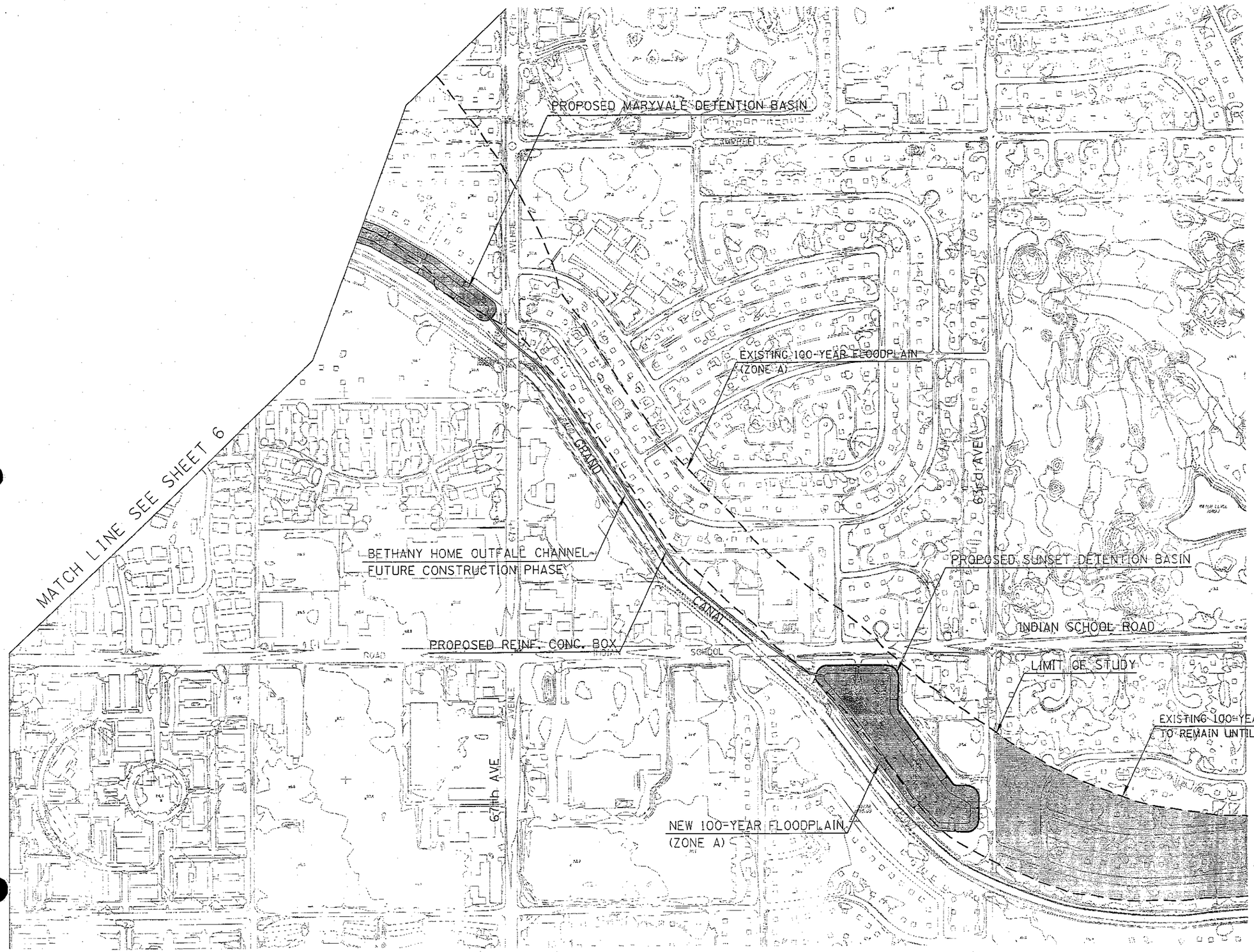
DRAWING NO.	FLOOD ZONE MAPS	SHEET 6 OF 7



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Scale in Feet

NOTE:

FOR MORE DETAILED TOPOGRAPHIC MAPPING, SEE THE CONSTRUCTION PLANS.

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

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DRAWING NO. | FLOOD ZONE MAPS | SHEET 7 OF 7

5.4 Cross-Section Description

Cross-sections for the study were located at 200 foot intervals on average. Additional cross-sections were added at bridges and changes in profile grade. Cross-sections were oriented perpendicular to the direction of flow.

Cross-sections were obtained through the use of project digital terrain modeling (DTM). The proposed project DTM was superimposed on the existing ground DTM which was used to define the HEC-RAS cross-sections. The cross-sections were generated in HEC-2 format using MicroStation InRoads (Version 7.0) software. The HEC-2 data files were then imported into the HEC-RAS computer program.

5.5 Modeling Considerations

5.5.1 Hydraulic Jump and Drop Analysis

A hydraulic jump is possible during a major flood event at the culvert under the Grand Canal at approximately the 82nd Avenue alignment. Drops in the channel profile are proposed upstream of the Grand Canal Wasteway box culvert, the 91st Avenue Bridge and the 87th Avenue alignment culvert under the Grand Canal.

The 82nd Avenue alignment culvert outlet was evaluated for a hydraulic jump and erosion potential. To force a hydraulic jump during large flood events, dumped rock riprap is proposed downstream of the culvert outlet. The details associated with defining the limits and sizing the riprap are provided in Appendix F.

The channel drop at the Grand Canal Wasteway box culvert is approximately 6.75 feet high and is constructed using reinforced concrete lining. The concrete box culvert is a five cell 8' x 7' under the wasteway and adjacent private irrigation canal. During low-flows the internal box culvert walls will dissipate the hydraulic jump associated with this drop. During the design flood event, the hydraulic jump will be submerged.

The channel drop at the 91st Avenue Bridge is approximately two feet high and implemented using reinforced concrete lining on a slope of less than five percent. The bridge piers should force a hydraulic jump within the concrete lined section of the channel.

The channel drop at the 87th Avenue alignment culvert under the Grand Canal is approximately 2.3 feet high and implemented using reinforced concrete lining. The entrance and exit to the six cell 10' x 5' proposed box culvert is protected by access barriers which will dissipate any potential hydraulic jump at the drop.

The proposed floodplain limits were not adjusted to account for hydraulic jumps and drops in the channel profile since the floodplain is mapped to the proposed project right-of-way limits.

5.5.2 Bridges and Culverts

The first phase of the BHOC project is constructed from the confluence with the New River to just east of the Agua Fria Freeway (101L). No as-built drawings are available at this time for the construction of this project. Record construction drawings are provided in Appendix E for reference. The following structures were constructed across the BHOC concrete lined channel with this project:

1. 107th Avenue: 3 span box culvert bridge
2. Grand Canal Wasteway: 5-8'x7' concrete box culvert
3. 99th Avenue: 3 span slab bridge

The second phase of the BHOC project is currently under construction from the Agua Fria Freeway (101L) to east of 83rd Avenue. Record construction drawings are provided in Appendix E for reference. The following structures are currently under construction:

1. 97th Avenue Alignment: SRP irrigation flume
2. 91st Avenue: 3 span slab bridge
3. Grand Canal at the 87th Avenue Alignment: 6-10'x5' box culvert
4. 83rd Avenue: 3 span slab bridge
5. Grand Canal at the 82nd Avenue Alignment: 3-10'x8' box culvert

Future phases of the BHOC project will construct additional box culvert conveyance facilities. The concept drawings for these future facilities are included in Appendix E for reference. The following structures are proposed for future construction:

1. Grand Canal Linear Park Box Culvert (East of the 82nd Avenue Alignment to approximately 75th Avenue and Camelback Road): 2-12'x8' box culvert.
2. 75th Avenue and Camelback Road: 2-8'x7' box culvert
3. 67th Avenue to the Sunset Detention Basin (Indian School Road and approximately 64th Avenue): 8'x7' box culvert

The bridge crossings were hydraulically analyzed using one or all of the following low-flow methods available in the HEC-RAS computer program:

- Energy (Standard Step)
- Momentum
- Yarnell (Class A only)

The highest energy solution is the one reported in the results section of this document.

5.5.3 Levees and Dikes

No levees or dikes are proposed as part of this project. However, at the channel confluence with the New River, the banks of the channel match into the existing New River levee system designed for the U.S. Army Corps of Engineers Standard Project Flood.

5.5.4 Islands and Flow Splits

There are no islands or flow splits associated with the design of this existing and proposed facility.

5.5.5 Ineffective Flow Areas

The proposed project cross-sections used in the HEC-RAS analysis incorporates the existing ground DTM adjacent to the project. In a few locations, the adjacent Grand Canal or detention basin was defined as ineffective using the levee option available in HEC-RAS. The ineffective levee approach facilitates proper hydraulic modeling and avoids divided flow solutions.

5.5.6 Supercritical Flow

No specific assumptions for supercritical flow were made in this study. The HEC-RAS hydraulic analysis was performed using a mixed flow regime. A more conservative subcritical flow regime assumption still illustrates that the proposed design flows would be contained within the project limits and public right-of-way.

5.6 Floodway Modeling

Floodway modeling was not performed as part of this study. Proposed encroachments into the floodplain will be evaluated on a case-by-case basis by the FCDMC, ADOT and the Cities of Phoenix and Glendale.

5.7 Problems Encountered During the Study

5.7.1 Special Problems and Solutions

No special problems were encountered during this study.

5.7.2 Model Warning and Error Messages

There are a number of warning messages generated by the HEC-RAS computer program for the hydraulic analysis of the project. These warnings do not affect the accuracy of the results and are intended to alert the user of any conditions outside of the expected norm.

DMJM+HARRIS executed FEMA's CHECK-RAS computer program (Version 1.1) on both hydraulic models (BHOCBRW and BHOC100) for each of the three reviews: NT, XS and Structures. Several comments

were generated that had little or no bearing on the hydraulic function of the design. Each of the comments or notations is addressed below.

Notations generated from the Manning's "n" Value and Transition Loss Coefficient Review (NT) included a comment that the channel "n" coefficient is less than 0.025. This is due to the use of concrete lined channels, as depicted on the plans, throughout the project. The program indicated that contraction and expansion loss coefficients of 0.3 and 0.5, respectively, should be used adjacent to all bridges. For the entrance and exit from bridges and box culverts, gradual vertical wall transitions or uniform trapezoidal sections are proposed and therefore, lower loss coefficients are warranted and were used in the analyses. Another comment pertained to the variance of "n" values between upstream and downstream bridge sections. Since the project is designed using uniform trapezoidal concrete channel lining which extends from the channel section through the bridges in a continuous fashion, it is considered appropriate that the "n" values remain consistent.

A few comments were also generated as part of the Cross-Section Location and Alignment Review (XS) of the hydraulic models. It was noted that levees were found in the modeling although no levees are proposed as part of this project. The use of these levee functions was simply to facilitate proper hydraulic modeling and to avoid any divided flow conditions where adjoining land had similar elevations as the conveyance facility. Typical locations where levees were used to define ineffective flow include along the Grand Canal and where off-line detention or retention basins are adjacent to the facility.

Execution of the Structures Check routine resulted in a few comments on the hydraulic models. These comments pertained to the road or weir stationing extending beyond the cross-section data and some minor inconsistencies in the elevations. These comments have no bearing on the accuracy of the hydraulic modeling since all the flow is contained within the channel section. The Structures Check routine was uncertain of the flow type at a few locations but it was found to be the result of the omission of the elevation in which weir flow would begin over the roadway. The project is designed with a minimum of one-foot of freeboard and as a result, roadway overtopping does not occur at any location along the project.

5.8 Calibration

There was no special calibration effort made as part of this study. There is no gage data or physical measurements to compare any results from the HEC-RAS analyses.

5.9 Final Results

5.9.1 Hydraulic Analysis Results

Tables 5 and 6 presented on the following pages provide a summary of the hydraulic analysis results for the BHOCBRW and BHOC100 HEC-RAS projects, respectively.

5.9.2 Verification of Results

There was not specific verification of results made as a part of this study. The flow depths are consistent with previously calculated normal depth analyses performed during the BHOC Pre-Design Study.

Table 5. Summary of Hydraulic Analysis Results (BHOCBRW.PRJ)

Cross – Section Identifier	Peak Discharge (cfs)	Water-Surface Elevation (ft)	Critical Water-Surface Elevation (ft)	Average Velocity (ft/s)	Top Width of Flow (ft)	Depth of Flow (ft)	Froude Number	Station Water-Surface Left (ft)	Station Water-Surface Right (ft)
7187 (A)	4517.00	1036.13	1036.63	11.73	155.89	4.47	1.32	21.06	176.94
7207	4517.00	1035.06	1036.36	16.90	134.06	3.31	2.11	31.88	165.94
7222	4517.00	1035.40	1036.67	16.72	126.40	3.50	2.02	35.71	162.12
7237	4517.00	1035.20	1036.68	18.24	121.64	3.39	2.25	38.22	159.86
7347 (B)	4517.00	1037.98	1038.80	15.29	65.54	5.83	1.27	66.35	131.89
7375	Bridge								
7418 (C)	4517.00	1040.26	1038.87	10.04	74.38	8.04	0.72	61.93	136.31
7600 (D)	4517.00	1040.50		9.93	74.64	8.10	0.71	61.80	136.44
8000 (E)	4517.00	1040.95		9.85	74.85	8.15	0.70	61.70	136.54
8400 (F)	4517.00	1041.41		9.76	75.06	8.20	0.69	61.59	136.65
8800 (G)	4517.00	1041.85		9.70	75.23	8.25	0.69	61.50	136.74
9200 (H)	4517.00	1042.28		9.65	75.36	8.28	0.68	61.44	136.80
9600 (I)	4517.00	1042.70		9.61	75.44	8.30	0.68	61.40	136.84
10000 (J)	4517.00	1043.11		9.60	75.49	8.31	0.68	61.38	136.86
10200 (K)	4517.00	1043.31		9.59	75.49	8.31	0.68	61.37	136.87
10297 (L)	4517.00	1043.41		9.60	75.47	8.31	0.68	61.38	136.86
10401.5	Culvert								
10490.7 (M)	4517.00	1047.61	1042.73	8.85	43.00	11.86	0.45	78.50	121.50
10505.6	4517.00	1047.97	1047.97	13.32	62.00	5.47	1.00	69.00	131.00
10600 (N)	4517.00	1049.25	1048.57	10.66	82.17	6.54	0.83	57.92	140.08
11000 (O)	4517.00	1049.75		11.47	80.69	6.17	0.91	58.66	139.34
11400 (P)	4517.00	1050.46	1050.32	11.88	80.01	6.00	0.96	58.99	139.01
11800 (Q)	4517.00	1051.31	1051.19	11.93	79.92	5.98	0.97	59.04	138.96
12200 (R)	4517.00	1052.17	1052.06	11.97	79.87	5.97	0.97	59.07	138.93
12600 (S)	4517.00	1052.38	1052.93	13.86	77.25	5.31	1.19	60.38	137.62
12784	Bridge								
13000 (T)	4517.00	1055.39	1053.42	8.48	87.31	7.83	0.60	55.35	142.65
13400 (U)	4517.00	1055.73		8.39	87.57	7.89	0.60	55.22	142.78
13800 (V)	4517.00	1056.07		8.30	87.82	7.96	0.59	55.09	142.91
13950	4517.00	1056.19		8.27	87.91	7.98	0.59	55.05	142.95

Table 6. Summary of Hydraulic Analysis Results (BHOC100.PRJ)

Cross – Section Identifier	Peak Discharge (cfs)	Water-Surface Elevation (ft)	Critical Water-Surface Elevation (ft)	Average Velocity (ft/s)	Top Width of Flow (ft)	Depth of Flow (ft)	Froude Number	Station Water-Surface Left (ft)	Station Water-Surface Right (ft)
1415 (W)	4517.00	1056.66	1054.13	7.24	101.11	7.98	0.51	69.59	170.70
1516	3275.00	1057.09	1053.68	5.66	90.87	8.22	0.40	126.46	217.32
1588	Bridge								
1603	3275.00	1057.82	1053.67	5.05	94.24	8.90	0.34	124.12	218.36
1741	3275.00	1058.09	1053.68	3.40	171.41	8.86	0.25	90.87	262.28
1800	3275.00	1058.09	1053.76	3.48	194.13	8.81	0.28	70.33	264.46
2000	3275.00	1058.22	1053.88	3.36	175.36	8.72	0.25	96.64	271.99
2200	3275.00	1058.32	1054.12	3.39	179.29	8.58	0.26	96.11	275.39
2400	3275.00	1058.43	1054.36	3.57	169.66	8.46	0.27	102.86	272.52
2600	3275.00	1058.56	1054.61	3.53	177.67	8.37	0.27	96.45	274.12
2800	3275.00	1058.68	1054.83	3.59	177.00	8.26	0.28	87.92	264.92
3000	3275.00	1058.81	1055.08	3.69	174.05	8.17	0.29	93.79	267.84
3200	3275.00	1058.94	1055.24	3.76	170.21	8.06	0.29	103.68	273.89
3400	3275.00	1059.09	1055.47	3.68	175.32	7.99	0.29	104.09	279.41
3600	3275.00	1059.22	1055.73	3.91	177.59	7.89	0.32	108.45	286.04
3800	3275.00	1059.37	1055.93	3.96	165.60	7.80	0.31	114.67	280.26
4000	3275.00	1059.51	1056.22	4.08	168.84	7.72	0.33	117.34	286.18
4200	3275.00	1059.69	1056.41	3.98	169.32	7.67	0.32	119.90	289.22
4400	3275.00	1059.85	1056.62	4.16	161.33	7.65	0.33	118.60	279.94
4600	3275.00	1060.03	1056.81	4.25	156.57	7.56	0.34	110.35	266.92
4800	3275.00	1060.24	1057.21	4.46	150.64	7.53	0.36	102.11	252.75
5000	3275.00	1060.48	1057.39	4.41	152.21	7.63	0.35	97.73	249.93
5200	3275.00	1060.71	1057.72	4.80	143.55	7.55	0.39	116.41	259.95
5330	3275.00	1060.93	1057.74	4.52	140.09	7.63	0.35	115.67	255.77
5400	3275.00	1060.98	1057.95	4.93	126.03	7.52	0.38	114.73	240.76
5450	3275.00	1060.91	1058.50	6.14	103.31	7.34	0.48	124.96	228.27
5482	3047.00	1061.09	1058.20	5.32	106.14	7.52	0.40	123.39	229.53
5591	Bridge								
5592	3047.00	1061.51	1058.40	5.18	106.25	7.53	0.39	123.09	229.34
5633	3047.00	1061.24	1060.11	7.34	106.13	5.75	0.65	119.43	225.56
5730	3047.00	1061.56	1060.21	6.70	118.80	5.79	0.60	123.61	242.41
5800	3047.00	1061.92	1060.21	5.87	131.38	6.09	0.52	114.90	246.28
6000	3047.00	1062.39	1060.42	5.61	129.90	6.40	0.48	112.62	242.52
6200	3047.00	1062.85	1060.52	4.97	144.15	6.70	0.42	103.83	247.98
6400	3047.00	1063.13	1060.72	5.10	134.17	6.82	0.43	109.30	243.47
6600	3047.00	1063.38	1061.06	5.66	112.93	6.94	0.46	120.28	233.21
6800	2841.00	1063.78	1061.03	5.03	113.70	7.15	0.40	120.31	234.01
7000	2841.00	1064.04	1061.20	4.98	113.42	7.24	0.39	119.82	233.24
7200	2841.00	1064.29	1061.35	4.88	114.58	7.39	0.38	119.36	233.94
7400	2841.00	1064.53	1061.53	4.81	115.32	7.42	0.37	118.94	234.26
7600	2841.00	1064.72	1061.75	5.11	104.11	7.45	0.39	120.09	224.19
7660	2841.00	1064.76	1061.85	5.45	94.04	7.47	0.41	124.86	218.90
7676.4	2841.00	1064.61		6.76	64.62	6.50	0.47	67.70	132.33
7815	Culvert								
7816.7	2841.00	1065.94	1061.96	5.57	64.61	7.89	0.35	67.70	132.32
7828.7	2841.00	1065.69		7.40	106.74	5.80	0.69	125.12	231.86
7872	2841.00	1065.80		7.32	107.22	5.84	0.68	124.90	232.11

Cross – Section Identifier	Peak Discharge (cfs)	Water-Surface Elevation (ft)	Critical Water-Surface Elevation (ft)	Average Velocity (ft/s)	Top Width of Flow (ft)	Depth of Flow (ft)	Froude Number	Station Water-Surface Left (ft)	Station Water-Surface Right (ft)
8000	2841.00	1066.48		6.25	125.20	6.32	0.58	120.31	245.51
8200	2841.00	1067.15		5.18	140.47	6.69	0.46	101.62	242.09
8400	2841.00	1067.46		6.16	122.64	6.70	0.56	110.42	233.06
8600	2841.00	1068.23		5.59	114.09	7.17	0.47	115.72	229.81
8800	2841.00	1069.01		5.18	115.22	7.65	0.42	114.29	229.50
9000	2841.00	1069.66		3.98	149.07	8.00	0.32	90.72	239.78
9200	2841.00	1070.03		4.24	139.77	8.03	0.34	94.15	233.92
9400	2841.00	1070.44	1067.14	4.29	134.92	8.17	0.34	106.13	241.04
9600	2841.00	1070.86	1067.34	3.96	146.19	8.29	0.32	102.64	248.83
9800	2841.00	1071.21	1067.68	4.05	141.03	8.34	0.32	117.41	258.44
10000	2841.00	1071.57	1067.99	4.00	141.44	8.40	0.32	108.16	249.60
10200	2841.00	1071.92	1068.31	4.02	139.94	8.45	0.32	93.76	233.70
10400	2841.00	1072.27	1068.64	4.06	137.39	8.50	0.32	95.14	232.52
10600	2841.00	1072.62	1068.96	4.11	133.60	8.55	0.32	108.07	241.66
10800	2841.00	1072.97	1069.39	4.17	134.45	8.59	0.33	109.50	243.95
11000	2841.00	1073.32	1069.68	4.43	119.28	8.64	0.34	118.63	237.91
11075	2841.00	1073.50	1069.69	4.13	127.09	8.71	0.31	114.72	241.81
11144	2841.00	1073.55	1070.15	5.03	101.42	8.66	0.38	124.66	226.07
11160	2841.00	1073.55	1070.17	5.08	100.91	8.63	0.38	125.14	226.05
11265	Bridge								
11266	2841.00	1073.74	1070.19	4.93	101.70	8.66	0.36	125.24	226.94
11281	2841.00	1073.74	1070.23	4.92	102.23	8.64	0.36	124.92	227.15
11349	2841.00	1073.88		4.31	122.22	8.69	0.33	113.73	235.95
11542	2841.00	1074.22		4.69	107.72	8.73	0.35	123.98	231.70
11614	2841.00	1074.36		4.88	101.71	8.76	0.36	123.19	224.90
11715	2841.00	1074.64	1070.89	4.78	102.48	8.89	0.35	120.49	222.97
11755	2841.00	1073.40		12.76	31.81	7.00	0.85	159.12	190.92
11991	Culvert								
11992	2841.00	1077.36	1073.07	8.44	31.85	10.58	0.46	159.07	190.93
12200	1532.00	1078.35		4.25	32.03	11.25	0.22	83.99	116.03
12284	1532.00	1078.35	1071.37	4.32	31.96	11.13	0.23	84.06	116.03
12298	1532.00	1079.21	1079.21	12.53	25.11	4.87	1.00	87.46	112.56
18260	Culvert								
18261	1532.00	1088.42	1085.13	7.48	25.12	8.15	0.46	87.45	112.57
18361	1532.00	1088.50		7.52	25.12	8.13	0.47	87.45	112.57
18377	1145.00	1088.33		8.58	16.80	7.95	0.54	91.61	108.42
18859	Culvert								
18860	1145.00	1090.73	1086.09	6.91	16.79	9.87	0.39	91.61	108.41
18918	974.00	1091.02		5.74	16.80	10.12	0.32	91.62	108.42
18920	974.00	1090.91		6.56	16.79	8.85	0.39	91.62	108.41
19000	974.00	1090.97		6.56	16.79	8.85	0.39	91.62	108.41
19200	974.00	1091.11		6.58	16.79	8.83	0.39	91.62	108.40
19400	974.00	1091.25		6.58	16.79	8.85	0.39	91.62	108.41
19600	974.00	1091.39		6.61	16.79	8.79	0.39	91.62	108.41
19800	974.00	1091.53		6.62	16.80	8.77	0.39	91.62	108.42
20000	974.00	1091.68		6.55	17.08	8.78	0.39	91.63	108.70
20051	974.00	1092.36		1.91	90.81	9.41	0.14	102.64	193.45
20200	974.00	1092.40		1.35	119.14	9.36	0.10	79.58	198.72
20400	830.00	1092.42		1.22	138.03	9.24	0.09	84.59	333.61

Cross – Section Identifier	Peak Discharge (cfs)	Water-Surface Elevation (ft)	Critical Water-Surface Elevation (ft)	Average Velocity (ft/s)	Top Width of Flow (ft)	Depth of Flow (ft)	Froude Number	Station Water-Surface Left (ft)	Station Water-Surface Right (ft)
20600	830.00	1092.44		1.21	118.20	9.14	0.09	78.81	197.01
20800	830.00	1092.46		1.20	118.97	9.01	0.09	83.03	202.00
21000	830.00	1092.47		1.24	112.74	8.88	0.09	87.63	200.37
21200	830.00	1092.49		1.28	109.24	8.76	0.09	92.35	201.59
21400	700.00	1092.51		0.47	224.19	8.61	0.03	86.22	310.41
21600	700.00	1092.52		0.58	177.10	8.50	0.04	91.52	268.62
21800	700.00	1092.52		1.13	107.96	8.34	0.08	94.00	201.96
22000	700.00	1092.52		1.28	99.49	8.18	0.10	98.22	197.71
22200	700.00	1092.53		1.21	104.00	8.03	0.09	99.70	203.71
22400	700.00	1092.54		1.19	106.30	7.88	0.09	100.77	207.07
22600	700.00	1092.55		1.17	108.00	7.75	0.09	100.76	208.77
22800	700.00	1092.57		0.67	170.52	7.57	0.05	93.57	264.09
23000	700.00	1092.58		0.43	250.62	7.41	0.03	90.87	341.49
23200	700.00	1092.58		1.06	129.03	7.27	0.08	103.17	232.20
23400	700.00	1092.57		1.29	105.26	7.07	0.10	102.59	207.85
23600	700.00	1092.58		1.35	102.89	6.90	0.11	102.22	205.12
23800	700.00	1092.59		1.40	101.41	6.74	0.11	100.21	201.62
24000	700.00	1092.61		1.39	102.71	6.61	0.11	98.54	201.25
24200	700.00	1092.63		1.47	99.98	6.43	0.12	105.48	205.46
24400	700.00	1092.64		1.50	99.11	6.29	0.12	98.39	197.50
24600	700.00	1092.66		1.57	96.95	6.15	0.13	107.16	204.11
24800	700.00	1092.68		1.61	96.70	6.00	0.13	103.07	199.76
24900	344.00	1092.72		0.84	92.48	5.98	0.07	111.52	204.00
24960	344.00	1091.96		8.44	8.04	5.08	0.66	95.99	104.03
27479	Culvert								
27480	344.00	1095.65	1092.74	6.29	8.21	6.75	0.43	95.98	104.19
27610	344.00	1096.32		0.23	213.84	10.32	0.02	21.67	235.51
27810	344.00	1096.33	1086.77	0.12	366.14	10.32	0.01	60.40	426.54
28010	344.00	1096.33	1086.97	0.18	254.81	10.33	0.01	54.82	309.63
28210	344.00	1096.33	1087.32	0.19	253.99	9.95	0.01	60.31	314.30
28410	344.00	1096.33	1087.81	0.20	256.34	9.33	0.01	70.47	326.81
28590	344.00	1096.33	1088.26	0.22	231.77	9.33	0.01	91.38	323.15

6.0 Erosion and Sediment Transport

6.1 Method Description

As presented in Appendix E, the project consists of concrete lined trapezoidal channels, reinforced concrete box culverts, irrigated bermuda grass and desert landscaping within the limits of the proposed floodplain. The erosion protection analysis was only performed for the landscaped portion of the project from the Agua Fria Freeway (101L) to approximately the 82nd Avenue alignment or the second phase of the project which is currently under construction. As illustrated on the construction plans, the longitudinal slope of the facility is approximately 0.1 percent.

Erosion protection for the proposed project is based on the permissible shear stress concepts presented in the report "Sizing Riprap for the Protection of Approach Embankments & Spur Dikes and Limiting the Depth of Scour at Bridge Piers & Abutments" (1989). The erosion protection was also checked using the permissible velocity concept documented in the "Drainage Design Manual for Maricopa County, Volume II, Hydraulics" (1996). The gradation and limits of construction for rock riprap are based on the Federal Highway Administration publication Hydraulic Engineering Circular No. 14, "Hydraulic Design of Energy Dissipators for Culverts and Channels" (1983). The articulated concrete block analysis was performed using a factor of safety method for overturning and sliding.

To control erosion associated with base flows (nuisance drainage) in the facility, a concrete low-flow channel will be constructed at the low point in the conveyance facility. The low-flow channel will be continuous along the entire length of the facility.

6.2 Parameter Estimation

As documented in the Geotechnical Investigation Report for the second construction phase of the project, the soils encountered in the vicinity of the proposed 83rd Avenue bridge, 91st Avenue bridge and the 6-10'x5' concrete box culvert (upper 15 to 20 feet) typically consist of finer grained medium plasticity clays. This soil type possesses sufficient cohesion to be classified as "erosion resistant" for the design hydraulic conditions anticipated in the vicinity of these structures.

Based on the longitudinal slope of the facility and the erosion characteristics of the soil, the permissible velocity of bermuda grass was assumed to be 6 feet per second (ft/s).

6.3 Modeling Considerations

Sediment transport modeling was not performed as a part of this study.

6.4 Problems Encountered During the Study

No specific problems were identified as part of this study.

6.5 Calibration

No specific calibration was performed as part of this study.

6.6 Final Results

The erosion control measures evaluated for use along the proposed facility included:

1. Enkamat Turf Reinforcement Matting (TRM),
2. Conlock I Articulated Concrete Blocks (ACB), and
3. Riprap Apron

The proposed condition HEC-RAS analysis was used to evaluate the type and application limit of the specific erosion control measure. The results are summarized in Table 7.

Table 7. Location of Erosion Control Measures

Structure	Type of Erosion Control Measure
83rd Avenue Bridge	Enkamat
91st Avenue Bridge	Enkamat
6-10'x5' RCBC	Enkamat
3-10'x8' RCBC	Riprap Apron
Spillways	Conlock I

The calculations supporting the selection of these erosion control measures are provided in Appendix F.

6.7 Verification of Results

No specific verification of the results was performed for this study.

7.0 Draft FIS Report Data

7.1 Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (cfs) 10-Year	50-Year	100-Year	500-Year
Bethany Home Outfall Channel					
New River Confluence	59.79	--[1]	--[1]	4,517	--[1]
97th Avenue	58.90	--[1]	--[1]	3,275	--[1]
91st Avenue	57.17	--[1]	--[1]	3,047	--[1]
83rd Avenue	50.96	--[1]	--[1]	2,841	--[1]
79th Avenue	50.96	--[1]	--[1]	1,532	--[1]
73rd Avenue	43.25	--[1]	--[1]	1,145	--[1]
Indian School Road	34.80	--[1]	--[1]	344	--[1]

--[1] – Not computed

7.2 Floodway Data

Preliminary Floodway Data tables are provided on the following pages. Floodway encroachments were not defined since the detailed design and construction of a significant portion of the project has yet to be completed.

7.3 Annotated Flood Insurance Rate Maps

Annotated flood insurance rate maps (FIRM) were not developed since the detailed design and construction of a significant portion of the project has yet to be completed. The work maps provided with this CLOMR provide more information at a better scale. The current FEMA FIRM's are provided electronically with this submittal in TIF format on the enclosed CD.

7.4 Flood Profiles

Flood profiles follow the Floodway Data tables for the Phase I construction of the Bethany Home Outfall Channel from the confluence with the New River to upstream of the Agua Fria Freeway (101L). Flood profiles for facilities upstream of the 101L will be provided upon completion of the construction.

FLOODING SOURCE		FLOODWAY [2]			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Bethany Home Outfall Channel								
A	0				1,039.6 [3]	1,036.1		
	20				1,039.6 [3]	1,035.1		
	35				1,039.6 [3]	1,035.4		
	50				1,039.6 [3]	1,035.2		
B	160				1,039.6 [3]	1,038.0		
C	231				1,040.3	1,040.3		
D	413				1,040.5	1,040.5		
E	813				1,041.0	1,041.0		
F	1,213				1,041.4	1,041.4		
G	1,613				1,041.9	1,041.9		
H	2,013				1,042.3	1,042.3		
I	2,413				1,042.7	1,042.7		
J	2,813				1,043.1	1,043.1		
K	3,013				1,043.3	1,043.3		
L	3,110				1,043.4	1,043.4		
M	3,303				1,047.6	1,047.6		
	3,317				1,048.0	1,048.0		
N	3,413				1,049.3	1,049.3		
O	3,813				1,049.8	1,049.8		
P	4,213				1,050.5	1,050.5		
Q	4,613				1,051.3	1,051.3		
R	5,013				1,052.2	1,052.2		
S	5,413				1,052.4	1,052.4		
T	5,813				1,055.4	1,055.4		

[1] In Feet Above The Confluence With The New River
[2] Floodway Water-Surface Elevations Not Computed For This Facility
[3] Water-Surface Elevation Interpolated Based On The Flood Insurance Rate Map At The New River Confluence

FEDERAL EMERGENCY MANAGEMENT AGENCY UNINCORPORATED MARICOPA COUNTY CITY OF GLENDALE, CITY OF PHOENIX (MARICOPA COUNTY, ARIZONA)	FLOODWAY DATA BETHANY HOME OUTFALL CHANNEL

FLOODING SOURCE		FLOODWAY [2]			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
U	6,213				1,055.7	1,055.7		
V	6,613				1,056.1	1,056.1		
W	6,763				1,056.7	1,056.7		
	6,863				1,057.1	1,057.1		
	6,950				1,057.8	1,057.8		
	7,088				1,058.1	1,058.1		
	7,147				1,058.1	1,058.1		
	7,347				1,058.2	1,058.2		
	7,547				1,058.3	1,058.3		
	7,747				1,058.4	1,058.4		
	7,947				1,058.6	1,058.6		
	8,147				1,058.7	1,058.7		
	8,347				1,058.8	1,058.8		
	8,547				1,058.9	1,058.9		
	8,747				1,059.1	1,059.1		
	8,947				1,059.2	1,059.2		
	9,147				1,059.4	1,059.4		
	9,347				1,059.5	1,059.5		
	9,547				1,059.7	1,059.7		
	9,747				1,059.9	1,059.9		
	9,947				1,060.0	1,060.0		
	10,147				1,060.2	1,060.2		
	10,347				1,060.5	1,060.5		
	10,547				1,060.7	1,060.7		
	10,677				1,060.9	1,060.9		
	10,747				1,061.0	1,061.0		
	10,797				1,061.0	1,060.9		

[1] In Feet Above The Confluence With The New River
[2] Floodway Water-Surface Elevations Not Computed For This Facility

FEDERAL EMERGENCY MANAGEMENT AGENCY UNINCORPORATED MARICOPA COUNTY CITY OF GLENDALE, CITY OF PHOENIX (MARICOPA COUNTY, ARIZONA)	FLOODWAY DATA BETHANY HOME OUTFALL CHANNEL

FLOODING SOURCE		FLOODWAY [2]			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
	10,829				1,061.1	1,061.1		
	10,939				1,061.5	1,061.5		
	10,980				1,061.5	1,061.2		
	11,076				1,061.6	1,061.6		
	11,146				1,061.9	1,061.9		
	11,346				1,062.4	1,062.4		
	11,546				1,062.9	1,062.9		
	11,746				1,063.1	1,063.1		
	11,946				1,063.4	1,063.4		
	12,146				1,063.8	1,063.8		
	12,346				1,064.0	1,064.0		
	12,546				1,064.3	1,064.3		
	12,746				1,064.5	1,064.5		
	12,946				1,064.7	1,064.7		
	13,006				1,064.8	1,064.8		
	13,022				1,064.8	1,064.6		
	13,162				1,065.9	1,065.9		
	13,174				1,065.9	1,065.7		
	13,218				1,065.9	1,065.8		
	13,346				1,066.5	1,066.5		
	13,546				1,067.2	1,067.2		
	13,746				1,067.5	1,067.5		
	13,946				1,068.2	1,068.2		
	14,146				1,069.0	1,069.0		
	14,346				1,069.7	1,069.7		
	14,546				1,070.0	1,070.0		
	14,746				1,070.4	1,070.4		

[1] In Feet Above The Confluence With The New River
[2] Floodway Water-Surface Elevations Not Computed For This Facility

FEDERAL EMERGENCY MANAGEMENT AGENCY UNINCORPORATED MARICOPA COUNTY CITY OF GLENDALE, CITY OF PHOENIX (MARICOPA COUNTY, ARIZONA)	FLOODWAY DATA BETHANY HOME OUTFALL CHANNEL

FLOODING SOURCE		FLOODWAY [2]			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
	14,946				1,070.9	1,070.9		
	15,146				1,071.2	1,071.2		
	15,346				1,071.6	1,071.6		
	15,546				1,071.9	1,071.9		
	15,746				1,072.3	1,072.3		
	15,946				1,072.6	1,072.6		
	16,146				1,073.0	1,073.0		
	16,346				1,073.3	1,073.3		
	16,421				1,073.5	1,073.5		
	16,490				1,073.6	1,073.6		
	16,506				1,073.6	1,073.6		
	16,612				1,073.7	1,073.7		
	16,627				1,073.7	1,073.7		
	16,695				1,073.9	1,073.9		
	16,888				1,074.2	1,074.2		
	16,960				1,074.4	1,074.4		
	17,061				1,074.6	1,074.6		
	17,101				1,074.6	1,073.4		
	17,339				1,077.4	1,077.4		
	17,547				1,078.4	1,078.4		
	17,631				1,078.4	1,078.4		
	17,645				1,079.2	1,079.2		
	23,609				1,088.4	1,088.4		
	23,709				1,088.5	1,088.5		
	23,726				1,088.5	1,088.3		
	24,210				1,090.7	1,090.7		
	24,268				1,091.0	1,091.0		

[1] In Feet Above The Confluence With The New River
[2] Floodway Water-Surface Elevations Not Computed For This Facility

FEDERAL EMERGENCY MANAGEMENT AGENCY UNINCORPORATED MARICOPA COUNTY CITY OF GLENDALE, CITY OF PHOENIX (MARICOPA COUNTY, ARIZONA)	FLOODWAY DATA BETHANY HOME OUTFALL CHANNEL

FLOODING SOURCE		FLOODWAY [2]			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
	24,270				1,091.0	1,090.9		
	24,350				1,091.0	1,091.0		
	24,550				1,091.1	1,091.1		
	24,750				1,091.3	1,091.3		
	24,950				1,091.4	1,091.4		
	25,150				1,091.5	1,091.5		
	25,350				1,091.7	1,091.7		
	25,401				1,092.4	1,092.4		
	25,550				1,092.4	1,092.4		
	25,750				1,092.4	1,092.4		
	25,950				1,092.4	1,092.4		
	26,150				1,092.5	1,092.5		
	26,350				1,092.5	1,092.5		
	26,550				1,092.5	1,092.5		
	26,750				1,092.5	1,092.5		
	26,950				1,092.5	1,092.5		
	27,150				1,092.5	1,092.5		
	27,350				1,092.5	1,092.5		
	27,550				1,092.5	1,092.5		
	27,750				1,092.5	1,092.5		
	27,950				1,092.6	1,092.6		
	28,150				1,092.6	1,092.6		
	28,350				1,092.6	1,092.6		
	28,550				1,092.6	1,092.6		
	28,750				1,092.6	1,092.6		
	28,950				1,092.6	1,092.6		
	29,150				1,092.6	1,092.6		

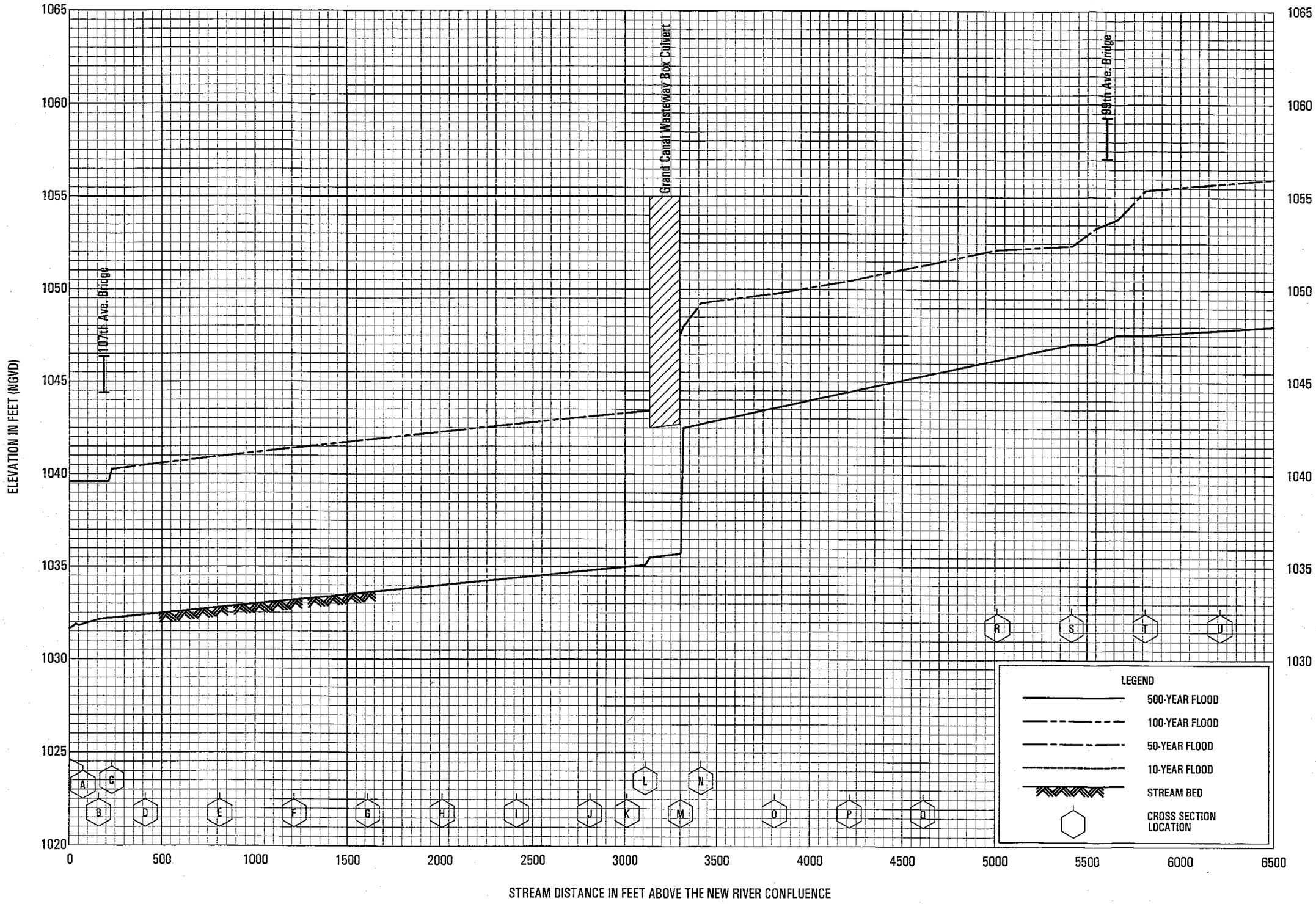
[1] In Feet Above The Confluence With The New River
[2] Floodway Water-Surface Elevations Not Computed For This Facility

FEDERAL EMERGENCY MANAGEMENT AGENCY UNINCORPORATED MARICOPA COUNTY CITY OF GLENDALE, CITY OF PHOENIX (MARICOPA COUNTY, ARIZONA)	FLOODWAY DATA BETHANY HOME OUTFALL CHANNEL

FLOODING SOURCE		FLOODWAY [2]			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
	29,350				1,092.6	1,092.6		
	29,550				1,092.6	1,092.6		
	29,750				1,092.6	1,092.6		
	29,950				1,092.7	1,092.7		
	30,150				1,092.7	1,092.7		
	30,250				1,092.7	1,092.7		
	30,310				1,092.7	1,092.0		
	32,831				1,095.7	1,095.7		
	32,961				1,096.3	1,096.3		
	33,161				1,096.3	1,096.3		
	33,361				1,096.3	1,096.3		
	33,561				1,096.3	1,096.3		
	33,761				1,096.3	1,096.3		
	33,941				1,096.3	1,096.3		

[1] In Feet Above The Confluence With The New River
[2] Floodway Water-Surface Elevations Not Computed For This Facility

FEDERAL EMERGENCY MANAGEMENT AGENCY UNINCORPORATED MARICOPA COUNTY CITY OF GLENDALE, CITY OF PHOENIX (MARICOPA COUNTY, ARIZONA)	FLOODWAY DATA BETHANY HOME OUTFALL CHANNEL



FLOOD PROFILES

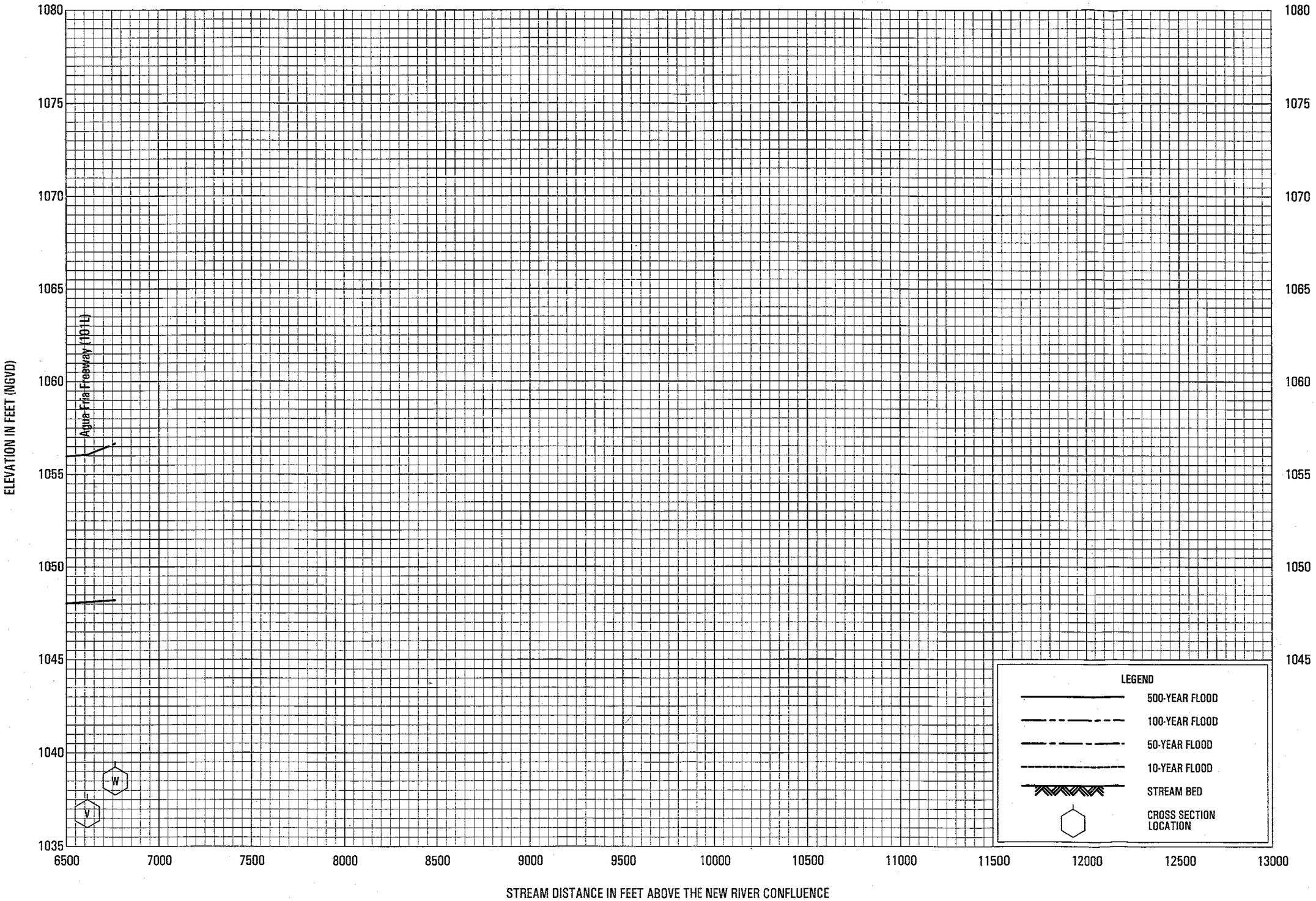
BETHANY HOME OUTFALL CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

UNINCORPORATED MARICOPA COUNTY, CITY OF GLENDALE, CITY OF PHOENIX

MARICOPA COUNTY, ARIZONA

01P



FLOOD PROFILES

BETHANY HOME OUTFALL CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

UNINCORPORATED MARICOPA COUNTY, CITY OF GLENDALE, CITY OF PHOENIX

MARICOPA COUNTY, ARIZONA

02P

APPENDIX A

REFERENCES

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Arizona Department of Water Resources, Flood Warning and Dam Safety Section, "Requirement for Floodplain and Floodway Delineation in Riverine Environments – State Standard 2-96," July 1996.

Arizona Department of Water Resources, Flood Warning and Dam Safety Section, "Requirement for Floodplain and Floodway Delineation in Riverine Environments – State Standard Attachment SSA2-96," July 1996.

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U. S. Department of Transportation, Federal Highway Administration, "Hydraulic Design of Highway Culverts," Hydraulic Design Series No. 5, September, 1985.

U. S. Department of Transportation, Federal Highway Administration, "Hydraulic Design of Energy Dissipators for Culverts and Channels," Hydraulic Engineering Circular No. 14, September 1983.

APPENDIX B

GENERAL DOCUMENTATION AND CORRESPONDENCE

Minch, Jeffrey

om: Scott Vogel - FCDX [csv@mail.maricopa.gov]
Sent: Tuesday, January 14, 2003 11:48 AM
To: Minch, Jeffrey
Subject: FW: BHOC CLOMR review comments

Comments on the CLOMR.

Thanks

-----Original Message-----
From: Michael Duncan - FCDX
Sent: Tuesday, January 14, 2003 8:31 AM
To: 'alan.morrice@dmjmharris.com'; 'jeffrey.minch@dmjmharris.com'
Cc: Scott Vogel - FCDX
Subject: BHOC CLOMR review comments

Here are my review comments:

<<BHOC CLOMR rev comm.doc>>

REVIEW COMMENTS

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

TO: *Jeffrey Minch, P.E.*
DMJM-Harris
602-337-2777

FROM: *Mike Duncan, P.E., Flood Delineation Branch*
phone 602-506-4732 FAX 602-506-4601

DATE: *1-14-03*

PROJECT: *Bethany Home Outfall Channel Phase II*

OBJECT OF REVIEW: *CLOMR Technical Data Notebooks*

1. Please add a note concerning the vertical datum at the Project Description of each RAS model, such as:

   VERTICAL DATUM OF THIS MODEL: NGVD 1929

   (Then new CD's with this change will be needed)

2. At Section 7.4, Page 60, add profile plot(s) for the existing-Phase-I portion of the study, in FEMA format (10 squares per inch and FEMA standard labels, symbols, and borders). Also, revise text of Section 7.4 accordingly.

3. At page 61, add a footnote to the first 5 water surface elevations, to indicate the source of the New River model elevations.

4. At back of Appendix E.1, add Bethany Home Road Storm Drain plans.

Minch, Jeffrey

From: Michael Duncan - FCDX [mwd@mail.maricopa.gov]
Sent: Tuesday, January 14, 2003 9:48 AM
To: Minch, Jeffrey; Morrice, Alan
Cc: Scott Vogel - FCDX
Subject: BHOC CLOMR -- one more reminder

In my review comments I failed to remind you of the missing Sheet 2 of Exhibit 1 of Appendix D, that we discovered during our meeting of 1-6-03.

B.1 – MEETING MINUTES

DMJM HARRIS

MEETING MINUTES

Date: March 28, 2002

To: File

From: Alan Morrice, Jeff Minch

Re: Bethany Home Outfall Channel, Phase II
Bethany Home/Grand Canal (BH/GC) Flood Control Project
Flood Control District of Maricopa County (FCD)
Contract No.: FCD 98-46
DMJM+HARRIS Project No. 6888

Subject: CLOMR Coordination Meeting March 20, 2002, 3:00 p.m.
Flood Control District of Maricopa County, New River Conference Room

Attendees: See attached list.

The following meeting minutes set forth our understanding of the discussions and decisions made at this meeting. If you have any questions, additions or comments please contact the author immediately at (602) 337-2777. If we do not hear from you within 10 days, we will assume that our understandings are the same. We are proceeding based upon the contents of these meeting minutes.

Action Items are identified in bold Italics.

I. Introductions

The meeting participants made self-introductions (see distribution list).

II. Meeting Purpose and Objectives

DMJM+HARRIS stated that in preparation of a Conditional Letter of Map Revision (CLOMR), several issues or questions have arisen that need clarification or direction before proceeding with the submittal.

III. Submittal Forms and Supporting Documentation

DMJM+HARRIS provided handouts that listed each CLOMR form to be submitted, the anticipated supporting documentation for each and various issues or items for discussion.

A. Form 1 – Revision Requestor and Community Official

It was agreed that three of page two would be submitted with signatures from the City of Phoenix (Husan Mushtaq – Floodplain Manager), City of Glendale (Larry Broyles – City Engineer) and for unincorporated areas of Maricopa County. It was not made clear at the meeting, whom would sign each form as the "requestor" from the FCDMC. ***DMJM+HARRIS will sign the P.E. certification for the requestor.***

The City of Phoenix (COP) and City of Glendale (COG) will each review letters of map revision on file and forward any pertinent information that is to be included with this submittal to DMJM+HARRIS.

Tim Murphy stated that he would provide DMJM+HARRIS with hard copies and scanned images of the most recent FIRM panels (7/19/01) for the BH/GC corridor. DMJM+HARRIS can acquire digitized floodplain maps, in Microstation format, from FCDMC's GIS staff (Marta Dent).

Mike Duncan mentioned that he would provide DMJM+HARRIS with an updated City/County boundary map electronically.

FEMA's submittal forms and to what degree they can be edited was discussed. Some of the forms in the past have had more flexibility than those presently available. ***The present forms should be utilized and supplemental sheets attached wherever necessary.*** FEMA's extension of the forms that are to be used for a CLOMR submittal was discussed. The forms use has been extended beyond March 31, 2002 and it can be used until an updated form is posted on their web site (but FEMA did not state when that might be).

Since requested by FEMA with Form 1, the maintenance responsibility of the proposed stormwater improvements was discussed to better understand how the second page of the form (one for each community) should be completed. The general intent is that the cities and ADOT would have maintenance responsibility for the facilities within each of their respective jurisdictions.

Regarding the fee to be paid, it was likely that a $3,100 would be required. It was stated that often FCDMC submits to FEMA without a fee and then FEMA responds and informs them of the fee due.

B. Form 2 – Credit Card Information

This form will not be used and therefore will not be filled out by DMJM+HARRIS.

C. Form 3 – Hydrologic Analysis

Regarding a letter(s) of approval of the hydrologic analysis, FCDMC stated that they would not provide such a letter unless it was required by FEMA. Therefore, per Form 3, DMJM+HARRIS will need to provide an explanation. It is FCDMC's understanding that, by submitting the information to FEMA for their consideration, they are in turn approving of the analyses. FCDMC stated that if a letter is required by FEMA as a condition of their approval, then they can provide such a letter.

With the exception of "ponding area calculations", which are discussed later, all items of documentation listed on the handout provided by DMJM+HARRIS were acknowledged as being appropriate and complete. The ADWR Technical Data Notebook State Standard format will be followed.

D. Riverine Hydraulic Analysis

The upstream and downstream limits of the new floodplain delineation to be submitted were discussed. ***At the New River, DMJM+HARRIS will project (level) the New River Base Flood Elevation (BFE) up the BH/GC FCP until it intersects the normal depth.*** This BH/GC channel reach length will be annotated in plan as being set by the New River water surface elevation.

Regarding the eastern limit of the CLOMR, discussion centered upon whether the limit of the study (new delineation) should terminate at 59th or 63rd Avenue. The 59th Avenue location appeared to be a more reasonable based upon the ponding areas shown in the Maryvale ADMP. The City of Glendale questioned the completeness and accuracy of the ADMP ponding area calculations. After some discussion of the group, ***the consensus was to label the "Limit of Study" at 63rd Avenue (Sunset Detention Basin).*** In the future, such as with the LOMR submittal, this issue will be reconsidered and documentation provided as necessary.

The issue of whether the CLOMR submittal should include all future phases of construction was discussed. The submittal should include the Bethany Home Road and Camelback Road storm drain systems to be consistent with the final hydrologic model. ***DMJM+HARRIS requested that the most recent set of the Bethany Home Road storm drain plans be provided*** so that it can be included in the submittal package.

Significant discussion occurred regarding whether the CLOMR should designate a new Zone A or Zone AE designation. DMJM+HARRIS explained how the additional level of effort (showing BFE's and cross-sections) and additional time delays (with the LOMR) for a detailed delineation was not warranted for this type of project. ***The consensus of the FCDMC was that they would like the reach of the project from the New River to 83rd Avenue to be presented as limited detail study (Zone AE 100-year only and without floodway) and the remainder of the BH/GC project as approximate (Zone A).*** Base flood elevations and cross-section locations will be shown on the work maps from the New River to 83rd Avenue.

Further discussion focused on specific areas of floodplain delineation. Areas that are contained within a box culvert will simply noted as such and a centerline shown. The reach between 83rd and 75th Avenues will have a floodplain delineation relatively consistent with the City park property boundary. The majority of this area will be annotated as being used for interception of 100-year runoff. Similarly, the area near 75th Avenue north of Camelback Road shall be annotated as having a "future storm drain system to intercept and convey the 100-year storm runoff to the BH/GC Flood Control Project".

E. Forms 5 - Riverine/Coastal Mapping

DMJM+HARRIS presented draft work maps that have been developed to date. The work maps illustrated the existing and proposed floodplains on the base topography from the Maryvale ADMS (scale: 1"=500') and will be used to relay pertinent annotations as well as other floodplain information. This will improve clarity and substitute for annotated FIRMs (1"=1000') wherever practical. As discussed at the meeting, ponding areas as shown in the Maryvale ADMP, will not

be shown. New floodplains will be shown in plan view from top of bank to top of bank for simplicity and conservatism. As discussed earlier, from New River to 83rd Avenue, the work maps will include base flood elevations and cross-section locations. A floodway analysis is not necessary to be performed. Flood frequencies other than the 100-year will not be shown.

F. *Form 6 – Channelization and Form 7 – Bridge/Culvert*

These forms will be completed and submitted with the package. No specific discussions, other than mentioned above, occurred at the meeting relative to these forms.

IV. Miscellaneous Issues and Items of Discussion

Since there has been some differences in the project title used for various purposes over time, DMJM+HARRIS requested clarification as to what title should be used for the CLOMR submittal. After some discussion, the group consensus was to use "Bethany Home/Grand Canal Flood Control Project". Also, within an introductory paragraph or transmittal letter, reference will be made and clarification provided relative to the other name that has been often used, i.e. Bethany Home Outfall Channel.

If you have any corrections or additions to the minutes of this meeting, please contact Jeff Minch or Alan Morrice at (602) 337-2777.

Cc: Attendees,

Files 6888 – 200.2, 200.3, 200.4, 400.12, 600.1

bethany home / grand canal
flood control project

Attendees of the March 20, 2002 meeting:

AGENCY/COMPANY	NAME	PHONE/FAX	E-MAIL
FDCMC	Scott Vogel	602-506-4771 / 602-506-8561	csv@mail.maricopa.gov
FDCMC	Tim Murphy	602-506-1501	tmm@mail.maricopa.gov
FDCMC	Mike Duncan	602-506-1501	mwd@mail.maricopa.gov
City of Phoenix	Hasan Mushtaq	602-262-4026 / 602-2627322	hasan.mushtaq@phoenix.gov
City of Glendale	Dan Sherwood	623-930-3634 / 623-915-2689	dsherwood@ci.glendale.az.us
DMJM+HARRIS	Jeff Minch	602-337-2540 / 602-337-2620	jeff.minch@dmjmharris.com
DMJM+HARRIS	Alan Morrice	602-337-2533 / 602-337-2620	alan.morrice@dmjmharris.com

B.2 – CONTRACT DOCUMENTS

Filename: BHOC Reach A SOW 2-2-01

EXHIBIT "A"

SCOPE OF WORK

for

Design of Reach A of the Bethany Home Outfall Channel – Phase II

Contract No.: FCD 98-46

Supplement for Phase 2, Final Design

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A PROJECT DESCRIPTION

1.0 GENERAL DESCRIPTION

Phase 2 of the contract includes final design, the preparation of construction plans, special provisions and the engineer's estimate for Reach A of the Bethany Home Outfall Channel (BHOC) – Phase II, and analysis and documentation of the entire BHOC corridor.

The basis for the design will be the Maryvale Area Drainage Master Plan (ADMP), completed in November 1997 and the pre-design study completed as Phase 1 of this contract. The Phase 1 pre-design study, completed in September 2000, further defined the project features, alignment, costs and schedule. The District, City of Glendale and City of Phoenix determined the Preferred Alternative from the pre-design study results.

In addition to the Preferred Alternative from the pre-design study, the project will include the following features:

a. Pedestrian bridges over the Grand Canal at 83rd Avenue and 87th Avenue.
b. Pedestrian undercrossing at 83rd Avenue.

2.0 PURPOSE

The purpose of Phase 2 of the contract is to prepare final design plans, special provisions and engineer's estimates for the construction of Reach A of the BHOC (97th Avenue to east of the Grand Canal undercrossing east of 83rd Avenue, hereinafter referred to as the Final Design Project Limits). **Tasks within this scope of work associated with the pedestrian bridges shall be considered optional tasks, included in the work to be done only after authorization from the District.** In addition, investigation and documentation will be required for the remainder of the BHOC corridor, to ensure compatibility of Reach A with the remainder of the BHOC.

3.0 LOCATION

The project is located within the Cities of Glendale and Phoenix, extending along the Grand Canal from approximately 64th Avenue to ADOT's Agua Fria Freeway outfall channel located along the Bethany Home Road Alignment, at approximately 97th Avenue.

4.0 AGENCIES

The District will be the lead agency. The project will involve special coordination with the City of Glendale (GLENDALE), the City of Phoenix (PHOENIX), the Salt River Project (SRP), and possibly others.

5.0 CONTRACT TIME

The Phase 2 portion of the contract shall be completed within 58 weeks from the Notice to Proceed date.

6.0 REFERENCE MATERIAL

The report titled "Maryvale Area Drainage Master Study, Floodplain Mitigation Study" shall be used as a reference tool, in addition to the backup information prepared for the report and the Phase 1 pre-design study.

B SCHEDULE

1.0 KICK OFF MEETING ..... 2 weeks from NTP

2.0 PRE-DESIGN PHASE (Complete)

3.0 DESIGN PHASE

3.1 30% Design Submittal ..... 20 weeks from NTP
3.2 30% Design Review Meeting ..... 24 weeks from NTP
3.3 Value Engineering Meeting ..... 25 weeks from NTP
3.4 60% Design Submittal ..... 30 weeks from NTP
3.5 60% Design Review Meeting ..... 34 weeks from NTP
3.6 Constructability Analysis Meeting ..... 35 weeks from NTP
3.7 90% Design Submittal ..... 41 weeks from NTP
3.8 90% Design Review Meeting ..... 45 weeks from NTP
3.9 100% Submittal ..... 52 weeks from NTP
3.10 Final Review Meeting ..... 56 weeks from NTP

4.0 FINAL DELIVERABLES ..... 58 weeks from NTP

C CONSULTANT SERVICES

Except as otherwise amended in this scope of work, completion of this consultant service contract shall be in accordance with the Flood Control District of Maricopa County's "Consultant Guidelines," dated August 1, 2000.

1.0 GENERAL PROVISIONS

2.0 SCHEDULE AND PROJECT COORDINATION

3.0 SURVEY, PHOTOGRAMMETRY, AND MAPPING

3.1 SUPERVISORY QUALIFICATION REQUIREMENTS.

Replace this section with the following:

Topographic mapping (1" = 200' with a contour interval of 1 or 2 feet), based on photography flown in March 1994, is available for the Consultant to use. Also available is survey performed by Stanley Consultants for the design of Bethany Home Road.

In addition, aerial photogrammetry and control survey of the Outfall Channel was performed in the Pre-Design (along the Grand Canal from 97th Avenue to 64th Avenue),

with the exception of field survey required to supplement aerial mapping of the Outfall Channel near the Grand Canal undercrossing east of 83rd Avenue and portions within PHOENIX (Camelback Road to 64th Avenue).

The Consultant shall complete the field survey required to supplement the aerial mapping of the portions of the Outfall Channel near the Grand Canal undercrossing east of 83rd Avenue.

The Consultant shall conduct all additional field surveys and prepare all additional mapping necessary to complete the project. All survey work shall be supervised by a registered land surveyor.

3.6.1 FOR INCLUSION INTO GIS

Delete this section.

4.0 DATA DELIVERY STANDARDS

Replace the first sentence with:

The Consultant shall use CAD FORMAT for data deliverables.

4.1 GIS FORMAT

Delete this section.

4.2 CAD FORMAT

4.2.1 Delete the first paragraph and replace with:

Consultant shall follow the CADD standards and shall deliver digital data in MicroStation Version 5.07 or newer per the following specs book: "Data Delivery Specifications: Computer Aided Drafting & Design REV 1.0 January 2000" Flood Control District of Maricopa County, latest edition.

5.0 PUBLIC INVOLVEMENT

Replace Section 5.0 PUBLIC INVOLVEMENT with the following:

5.1 PUBLIC INVOLVEMENT PLAN

A public involvement plan has been prepared as part of the pre-design study.

5.2 PUBLIC MEETINGS

One public meeting during final design will be included in the base contract.

The Consultant shall be responsible for providing the exhibits for the public meetings, which shall include the final exhibits from the Pre-Design public meetings along with

exhibits identifying the current project schedule. Materials prepared for other project scope task items (design plans, landscape aesthetic information) may also be necessary to provide information at public meetings. The Consultant shall also provide 100 copies of an 8.5" X 11" project fact sheet, and refreshments for the public meetings.

The consultant shall ensure that the public meetings do not conflict with other council meetings, board meetings, or community interest meetings.

The public meeting shall be advertised in local newspaper public notices and in the project newsletters.

5.3 NEWSLETTERS

The Consultant shall prepare a newsletter that is updated and distributed two (2) times throughout the design. The newsletters shall be approximately 11" X 17" and shall contain general project information, project progress to date and information regarding upcoming project events. The newsletters shall be similar to those prepared for the pre-design. The consultant shall also reproduce and distribute the newsletter (door-to-door) to approximately 10,000 properties. The consultant shall maintain and update the current mailing list for the project, and shall mail the newsletters to those on the mailing list.

5.4 OPTIONAL TASKS

The Consultant shall include optional tasks for public involvement in the fee proposal that includes the following:

a. An additional 4 public or small group meetings (i.e., Village Planning Board, Neighborhood and Homeowners Associations, City Councils).
b. The preparation, reproduction and distribution of three (3) additional newsletters.

6.0 RIGHTS-OF-WAY AND EASEMENTS

6.1 Add to this section the following: The District will acquire rights-of-entry for site investigations including geotechnical investigations.

6.3 Delete this section.

6.4 Replace this section with the following: The Consultant shall identify and dimension the rights-of-way and easements required for the project features on the 30% plans, and tie the rights-of-way into existing monumentation. The project rights-of-way that have been identified by the District for acquisition shall also be indicated on the project plans. If dimensioning and tying the rights-of-way on the plans is not possible due to space limitations, the Consultant shall provide this information on a separate plan or exhibit.

6.5 Add to this section the following: The Consultant shall identify any temporary construction easements required to complete the project, and dimension these limits on the 30% plans, with ties to existing monumentation.

6.6 Delete this section.

7.0 ENVIRONMENTAL REQUIREMENTS

Sections 7.1, 7.2, 7.3, 7.4 and 7.6 – Delete these sections and replace with the following: If Hazardous Waste Sites, Archaeological Resources, Ecological Resources, Jurisdiction Delineations and/or Title VI Environmental information or documentation is required for the Project, the District shall perform this work. The Consultant may be required to provide information regarding the Project, that would be otherwise be generated in the pre-design and design of the Project, to assist in the performance of this work.

The Consultant shall perform the work required in Section 7.5, Environmental Permits and Approvals, which is authorized with the Notice to Proceed.

8.0 GEOTECHNICAL INVESTIGATION

Add to this section the following:

The Consultant shall conduct geotechnical investigations for the final design within the Final Design Project Limits.

8.1 FIELD INVESTIGATION

Add to this section the following:

The Consultant will obtain the necessary permits for subsurface investigations from the Arizona Department of Water Resources (ADWR). The borings will be located within the proximity to the Grand Canal that construction excavation is anticipated, to determine the potential impact of seepage on construction.

The Consultant will drill test borings to depths of 15 to 80 feet for investigation of outfall channel and bridge structure elements along the Final Design Project Limits corridor. The number and depths of anticipated borings are as follows:

Design Segment	No. of Borings	Depth (feet)	Total (feet)
1	7	15 to 80	235
2	6	15 to 20	100
3	4	20 to 80	200
TOTAL	17		535

Standard penetration testing (SPT's) and open-end (undisturbed) ring samples will be collected within the borings at intervals of 5 feet or less. The samples will be kept for laboratory analysis. The Consultant's field engineer will prepare logs of the soils encountered.

Should seepage from the Grand Canal, or soft conditions indicating seepage, be encountered, slotted 2-inch diameter PVC pipe will be installed within the borings and the groundwater levels, if present will be monitored a sufficient period of time (one to two weeks) to determine a stabilized groundwater level.

8.2 LAB TESTS

Add to this section the following:

Laboratory testing of samples collected from the representative areas will be performed for moisture content, grain-size analysis, plasticity index, density of rings, direct shear, consolidation, moisture-density, pH and resistivity.

8.3 ANALYSIS

Add to this section the following:

Engineering Analysis of the data collected in the field will be made in combination with review of all existing information.

8.4 REPORT

Add to this section the following:

A Geotechnical Investigation Report will be prepared by the Consultant, which addresses the channel and bridge elements for the project. The report will be provided with the 30% submittal. Some or all of the information in the geotechnical report may be used as an appendix in the SGCs. The report will include, as a minimum the following:

- Logs of the test borings and site plans that indicate the test locations.
- Results of laboratory testing.
- Geologic description of the materials encountered within the test borings.
- Discussion of the recommended foundation support alternatives for channel sections, boxes and bridge structures. Recommended foundation design bearing pressures for box culvert and bridge structures.
- Estimated settlements of foundations supported on various materials.
- Estimated lateral earth pressures for the design of rectangular concrete lined channels.
- Site grading recommendations.
- Recommended cut and fill slopes for both temporary and permanent excavations and embankments.
- Estimated earthwork factors.
- Discussion of anticipated excavation conditions, including the influence of seepage, if present, from the Grand Canal.
- Recommendations for bedding and backfill of pipes.

9.0 HYDROLOGY

Delete this section, and replace with the following: The Consultant shall use the hydrologic model developed for the pre-design study.

Modifications to the recommended alternative hydrologic model may be required to reflect the design changes and ensure the proposed Camelback Road and 75th Avenue crossing maintains the concept design high water-surface elevation in the Maryvale Detention Basin.

Modifications to the hydrology may also be necessary to comply with the requirements of Section 11.0, Floodplain Delineation Studies.

10.0 HYDRAULICS

Add to this section the following:

Hydraulics calculations shall be prepared and submitted for the entire Outfall Channel, from 64th Avenue (including the Sunset Detention Basin, to 97th Avenue).

Delete Section 10.4.

11.0 FLOODPLAIN DELINEATION STUDIES

Delete this section, and replace with the following:

The Consultant shall generate the CLOMR technical data notebook for the recommended alternative from the pre-design study. The outfall channel invert grade and cross sections shall be verified using HEC-RAS or HEC-2 and the pre-design study plan and profile sheets modified as necessary and used for the CLOMR submittal. The CLOMR package will include, but not be limited to the existing hydrology, refined per this scope of work, the hydraulic verification (including cross-section identification), new floodway/floodplain delineation (on the pre-design plan sheets) and FEMA forms and miscellaneous information.

The delineated floodplain for the areas east of Reach A will be confined to the facility for the CLOMR effort, which will be verified by a future final design contract.

The District will take the lead to submit the CLOMR information to FEMA.

The Consultant shall make corrections to the CLOMR technical data notebook, hydrology, and hydraulic models as deemed necessary by FEMA.

The technical data notebook shall be updated and submitted at the end of the design contract to reflect modifications made during design.

12.0 PLANNING STUDIES

Delete this section.

13.0 PRE-DESIGN STUDY

Delete this section and replace with the following:

The pre-design study way completed in September 2000. The Consultant shall utilize the information developed for the pre-design study for the final design effort.

14.0 FINAL DESIGN AND CONSTRUCTION DOCUMENTS

14.1 DESIGN ACTIVITIES

14.1.1 TRAFFIC

14.1.1.1 Delete this section and replace with the following:

The Consultant shall identify requirements for public and private access within and across the project limits and review traffic control requirements that will be imposed by the jurisdictional authority. These requirements shall be included by the Consultant in the special provisions Section 401-1. The consultant shall ensure that the requirements can be met by the contractors using reasonable traffic control and detours measures.

The traffic control requirements will be provided to the public at the public meeting, but the traffic control plan will not be presented.

14.1.1.2 Add the following section: Traffic Control Optional Tasks

The Consultant shall include optional tasks for traffic control in the fee proposal that includes the following:

a. An optional task shall be included for preparation of conceptual traffic control plans for 91st and 83rd Avenues, which will be presented to the local agencies. All local guidelines and requirements will be incorporated into the plans. The concept will be developed to a level of detail to ensure that traffic control can feasibly be accomplished by the contractor given the traffic control requirements, to develop an accurate estimate of traffic control costs, and to delineate any temporary construction easements that may be needed for traffic control.

b. An optional task shall be included for the preparation of plans for permanent pavement marking. The plans shall be at a scale of 1-inch to 40 feet for all public roadways that are reconstructed within the final design project limits. Plans will be developed to the standards and specifications of the responsible local agency. Local agency standards will be referenced and not reproduced in the construction documents.

14.1.2 LANDSCAPE AESTHETIC AND RECREATION MULTIPLE-USES

Replace this section with the following:

The Landscape Aesthetic and Recreation Multi-Use activities identified in this section shall be performed for the entire Outfall Channel, from 64th Avenue (including the Sunset Basin), to 97th Avenue, and the City of Glendale park sites at the northwest corner of 75th Avenue and Camelback Road and at the south east corner of 83rd Avenue and Bethany Home Road.

14.1.2.1 Project Aesthetics Advisory Committee (PAAC)

The District will form a Project Aesthetics Advisory Committee (PAAC) to recommend aesthetic features for the project. The District shall assemble the PAAC per the District's Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects. The PAAC will recommend and review proposed aesthetics in accordance with current District and project partner guidelines, budget, function, public perception, natural environment and cultural environment and will include review of the Concept Plans and subsequent Construction Plans. The group will identify issues and review design standards, budgets, assist with the development of any required public art program, CPTED requirements (Crime Prevention Through Environmental Design), recreation, maintenance and ADA requirements.

The PAAC will be composed of the District's Project Manager, Landscape Planner and public involvement coordinator; cooperative agency project managers, parks staff and planners; neighborhood representatives; and the Consultant's Project Manager, Landscape Architect; and others as necessary. The Consultant's participation on the PAAC shall end at the commencement of construction unless otherwise authorized as additional services by the District.

Five (5) PAAC meetings shall be scheduled by the Consultant. The District shall have the responsibility for obtaining agreement and consensus on the aesthetic treatments.

The Consultant will meet with representatives of the District and each City to generate the program of project improvements, amenities and aesthetics that are over and above normal District landscape design treatments.

14.1.2.2 Landscape Aesthetics and Multi-Use Needs Assessment and Goals and Objectives

a. Meet with department staff from the Cities of Glendale, Phoenix and FCD to determine the program needs, goals and objectives of the corridor segments and sub-segments as it relates to landscaping aesthetics, irrigation, maintenance, recreation and multi-use opportunities.
b. Review the Landscape Design Concept perspective sketches previously prepared in the Pre-Design Study with department staff from the Cities of Glendale, Phoenix and FCD to refine and document the desired future visual character and condition for the corridor.

c. Review Needs Assessment & Goals and Objectives with PAAC.
d. Incorporate final needs assessment information in the design report submitted at the 30% stage.

Deliverables:
Needs Assessment, Goals and Objectives Narrative Report

14.1.2.3 Site Analysis

a. Assemble relevant data, plans, maps and records of the corridor area including its (1 to 2 miles) contextual environment.
b. Prepare a project and context base map incorporating current survey base information.
c. Review the site data previously assembled in the Pre-Design Study, evaluate for completeness and current conditions, and identify needed information.
d. Visit the site and contextual area, record observations of the new and undocumented physical environment and photo-document (digital photographs) these observations. Provide the following information for each photo: photo number, location (approximate project station) and direction that photo was taken, and the name of the feature or area in the photo.
e. The site analysis documentation will include the following elements from the pre-design study and research conducted in this scope of work:
   - Land Use & Future Land Use
   - Zoning
   - Vehicular Circulation, Traffic Control, Adjacent Parking
   - Trail Systems – Pedestrian, Bicycle, Equestrian and Arterial Crossings
   - Recreational Facilities – Public & Private
   - Utilities – Above & Below Ground
   - Topography – Elevation & Significant Features
   - Existing Vegetation
   - Drainage – Entering the Corridor
f. Prepare an updated assessment of Opportunities and Constraints for landscape aesthetics and recreation multiple-uses.
g. Review the site analysis with the PAAC.
h. Incorporate

Deliverables:
Site analysis exhibit at a scale of 1" = 200' (5 sheets)
Site Analysis Report containing the following:
- Purpose and scope of the analysis
- Process and Methodology
- Narrative summary description of the site analysis observations and interpretations of opportunities and constraints within the project corridor.
- Photos of the project area.
- Document sources of information used in the site analysis.
- Definition of terms.
- Field notes.

14.1.2.4 Visual Assessment

a. Using the Site Analysis base plans, identify logical points of visual quality observations along the project corridor. Included will be major arterial street crossings, ¼ mile points between them, changes of land use and perceived character, and at points of community cultural interest or impact.
b. Visit the site and identify and record the existing landscape and cultural characteristics of the corridor at each viewpoint, including landscape character and composition, scenic quality, existing visual conditions, types of views, and prominent focal point features visible within a minimum distance of 10 miles from the project corridor.
c. Photograph (digital format) the corridor and the area around each viewpoint. Provide the following information for each photo: photo number, location (approximate project station) and direction that photo was taken, and the name of the feature or area in the photo.
d. Prepare the view point inventory and provide a description of the information identified in b above at each location.
e. Describe and interpret the visual quality evaluation at each viewpoint, including opportunities for: 1) preservation and enhancement of views; 2) preservation or retention of highly scenic features; and 3) improvement of existing visual conditions.
f. Prepare recommendations of landscape treatment options for the corridor including preservation of important scenic features (natural/cultural), enhancement of existing views, buffering/mitigation of existing conditions and appropriate landscape themes to achieve the desired visual character for the corridor.
g. Identify logical places for off-site views to the corridor occurring at project crossings, dead-end streets or cul-de-sacs, local street frontages, etc., and identify treatment options for those areas.
h. Identify views and prominent focal point features (existing and future natural and cultural features) visible from within the project corridor and identify treatment options for those areas.
i. Review the Visual Assessment with the PAAC.
j. Incorporate final visual assessment information in the design report submitted at the 30% stage.

Deliverables:
Visual Analysis Report with:

- Purpose and Scope of the Visual Assessment
- Process & Methodology
- Visual Analysis Exhibit depicting Landscape Character Units and Subunits, Scenic Quality, Visual Conditions, Visual Sensitivity, views and focal point features and areas of corridor (combined exhibit at 200 scale, 5 sheets)
- Summary narrative description of Visual Character, Scenic Quality, Visual Conditions, Visual Dominance, Visual Expectation & Visual Sensitivity within each character unit and subunit.
- Photographs of the project corridor.
- Conclusions and Recommendations on Visual Design Preservation and Enhancements
- Sources of information used in the report

- Definition of terms used in the report
- Field Notes

14.1.2.5Landscape and Aesthetics Alternatives

a. Utilizing the Site Analysis, Visual Analysis, Needs Assessment and Goals and Objectives, prepare concept design alternatives of the corridor, it's segments and subsegments and key project landscape and aesthetics elements.
b. Alternatives for the corridor will include the overall landscape theme and spatial composition desired as an end result. Alternatives for the features will include but not be limited to vegetative treatment, special paving treatments, walls, safety railings, concrete surface treatments (color, texture and imprinting), entry and rest nodes, aesthetic treatment for drainage structures, site lighting, site furniture, pedestrian bridges, graphics and signage.
c. Review the Landscape Aesthetics and Recreation Multi-Use Alternatives with the PAAC.
d. Incorporate the final landscape aesthetics and recreation multi-use alternatives information in the design report submitted at the 30% stage.

Deliverables:
Develop concept design alternatives for the overall corridor, and a maximum of 2 alternative concepts for the following project elements:

- Landscape of project entries, nodal areas, connection points and transition areas
- Wall and vertical channel treatments
- Inlet and outlet structures
- Bridge abutment, supports and spans and undercrossings
- Fences and railings
- Hardscape elements at nodes, entries, transition areas and areas requiring hard lined erosion protection.
- Grading Concepts

14.1.2.6 Landscape and Aesthetics Design Guidelines

a. Develop Landscape and Aesthetic design guidelines (graphic and narrative), including the plant palette, grading and drainage, and architectural style, size/scale, colors, forms and textures for treating various elements and corridor segments within the corridor to achieve the desired character from the selected alternative.
b. Review project goals and objectives with PAAC.
c. Incorporate final landscape and aesthetic design guidelines in the design report submitted at the 30% stage.

Deliverables:
Landscape and aesthetics design guidelines report that defines the parameters of the various design elements of the landscape and aesthetic treatments within and along the corridor. This report will include narrative and graphic descriptions to guide the final design of the following project elements:

- Landscape Theme and plant palette descriptions

- Aesthetic treatments (color, form & texture) of vertical elements including walls, abutments, drainage structures and fencing
- Aesthetic treatments (color, materials & texture) of the horizontal elements including trails, pedestrian/vehicular paths, nodal areas and entry features
- Lighting type and character
- Recreation architectural elements including form, color and materials

14.1.2.7Corridor Master Plan

a. Utilize the site analysis, visual analysis, needs assessment to determine the location of the major project elements as it relates to landscaping, irrigation aesthetics, recreation and multi-use opportunities.
b. Establish a landscape "theme' for the project corridor in segments or for the entire length of the project.

Deliverables:
Corridor Master Plan in narrative and graphic format that incorporates the selected landscape, aesthetics and multi-use alternatives and design guidelines at a scale of 1" = 200' (5 sheets)

14.1.2.8 OPTIONAL TASKS

The Consultant shall include optional tasks for Landscape Aesthetics & Recreation Multiple-Uses:

The following services are to be provided for the entire proposed linear park from 75th Avenue to the Aqua Fria Freeway, including the park areas northwest of the 75th Avenue and Camelback Road intersection, and southeast of the 83rd Avenue and Bethany Home Road intersection. The consultant shall provide the following services working in close cooperation with City of Glendale Parks and Recreation Staff:
1. Meet with COG P&R Staff to ascertain priorities.
2. Provide public notification for and conduct two public meetings to gather citizen input for recreational amenities. The public notification shall be in the form of an 8½" X 11" flyer delivered door-to-door to all addresses that are within a 3 mile radius of the project area and are within the City of Glendale.
3. Develop a rendered site plan of the proposed park elements from staff and public input.
4. Provide public notification for and conduct a third public meeting to explain conceptual site plan.
5. Present conceptual site plan to Parks and Recreation Commission for endorsement and approval to present to City Council.
6. Present endorsed conceptual plan to City Council at workshop for information purposes.

The following services are to be provided for the proposed linear park from east of the 83rd Avenue Grand Canal underchute to the Aqua Fria Freeway, and for the park areas northwest of the 75th Avenue and Camelback Road intersection, and southeast of the 83rd Avenue and Bethany Home Road intersection. The linear park areas from 75th Avenue to 83rd Avenue which will be disturbed by the future outfall channel construction do not require construction documents. The consultant shall provide the

following services working in close cooperation with City of Glendale Parks and Recreation Staff:
7. From endorsed conceptual site plan prepare preliminary construction documents.
8. From approved preliminary construction documents prepare final construction documents.

14.1.3 UTILITIES

14.1.3.2 Add the following to this section:

The Consultant shall prepare an optional task for potholing all of the utilities for the Final Design Project Limits, and shall submit the proposed pothole plan for approval by the District prior to completing the potholes. The approved potholing shall be paid for out of the pothole optional task item.

14.1.3.6 Add the following to this section:

Meetings shall be held as required to coordinate utility relocations for the project, and organized by the Consultant. Utility coordination meetings shall be held following each submittal (as a minimum) and as required to effectively coordinate the utility relocations.

14.1.3.7 Replace this section with the following:

The Consultant shall provide for the preferred alternative design calculations, plans, and specifications for the relocation of the municipal utilities, including:
a. Water lines.
b. Sewer lines.

14.1.5 STRUCTURAL DESIGN

The Consultant shall prepare final construction documents for the following structural elements of the project:

14.1.5.1 Structural Design Elements

- 91st Avenue drop structure
- 91st Avenue bridge and transitions
- Box culvert under the Grand Canal west of the 87th Avenue alignment
- Grand Canal pedestrian bridge at the 87th Avenue alignment box culvert crossing (Optional Item)
- Drop structure at 87th Avenue Alignment
- 83rd Avenue bridge
- 83rd Avenue drop structure
- Grand Canal pedestrian bridge at the box culvert under the Grand Canal east of 83rd Avenue (Optional Item)

14.1.5.2 Structural Detailing Elements

- 91st Avenue detention basin side weir
- Rectangular concrete channel between 83rd Avenue and the Grand Canal
- Box culvert under the Grand Canal east of 83rd Avenue
- Structural transition details for the Bethany Home Road Storm Drain confluence and rectangular concrete channel east of the Grand Canal
- Pipe handrail details for headwalls
- Concrete channel lining details
- Maintenance access ramp details

All box culverts shall be designed using ADOT Standard Construction drawings and supplemented with structural detailing elements as required. The Consultant shall prepare a structures selection report to define recommended bridge types and a standard approach to common structural elements (i.e. bridges, drop structures, trail underpasses). The structures selection report will be provided with the 30% submittal for review prior to development of any design documents.

14.2 MEETINGS

14.3 FINAL DESIGN AND CONSTRUCTION DOCUMENTS

14.3.2 Design Data Report

14.3.2.1 Add to this section the following:

l. Results and criteria for landscaping and aesthetics developed from the PAAC meetings.

14.4 30% SUBMITTAL

Add to this section the following:

Submit two (2) copies each of the submittal items to GLENDALE and PHOENIX for review.

14.4.2.3 Replace this section with the following:

Include the approximate size and configuration of project features, including landscaping, aesthetic and recreation features. This shall include one conceptual design plan with diagrammatic graphics of land uses (active/passive recreation), circulation, buffers/screening, aesthetic treatment ideas, etc.

14.4.2.4 Add to this section the following:

The rights-of-way and easements required shall be dimensioned and tied to monumentation to allow District staff to prepare legal descriptions for the project. Rights-of-Way acquired by the District shall be identified on the project plans.

14.4.2.5 Add to this section the following:

All required potholing shall be complete and the pothole information shown on the plans.

14.4.2.7 Replace this section with the following:

Submit six (6) sets to the District for review (three (3) at 11" X 17" and three (3) full size).

Add to this section the following:

14.4.9 STRUCTURES SELECTION REPORT

Submit two (2) copies for the District for review.

Add to this section the following:

14.4.10 LANDSCAPE, AESTHETICS AND RECREATION

For the 30% submittal, the consultant shall develop the landscape, aesthetics and recreation information to the "conceptual design phase," which includes the following:

14.4.10.1 The Consultant shall prepare landscape, aesthetics and recreation elements base plans including project boundaries, easements, topography, infrastructure and proposed flood control improvements.

14.4.10.2 The District/Consultant shall conduct a pre-design meeting to review all initial work and discuss site development possibilities including recreation elements, site amenities, site aesthetics, landscape treatments and basic irrigation system planning. This includes definition of cost/maintenance sharing issues.

14.4.10.3 The Consultant shall develop and prepare design guidelines and master plan per Section 14.1.2.7.

14.4.10.4 The Consultant shall prepare a construction cost estimate for the concept plan. The costs will be segregated into District, City of Glendale and City of Phoenix responsibilities.

14.4.10.5 The Consultant shall meet with the District and the PAAC to review and resolve comments.

Submit two (2) copies for the District for review.

14.5 60% SUBMITTAL

Add to this section the following:

Submit two (2) copies each of the submittal items to GLENDALE and PHOENIX for review.

14.5.2 Plans

14.5.2.2 Replace this section with the following:

Submit six (6) sets to the District for review (three (3) at 11" X 17" and three (3) full size).

Add to this section the following:

14.5.9 LANDSCAPE, AESTHETICS AND RECREATION

For the 60% submittal, the consultant shall develop the landscape, aesthetics and recreation information to the "design development phase," which includes the following:

14.5.9.1 The Consultant shall advance the concept plans (with approved public comment) to the design development level of completion The plans will include:

- General notes/legend
- Engineering design coordination
- Detailed site and recreation layout plans
- Hardscape, recreation and aesthetics details (excluding artist's work)
- Landscape plans and details
- Irrigation plans and details
- Coordination of landscape power, lighting and details

14.5.9.2 The Consultant shall prepare a construction cost estimate for the concept plan. The costs will be segregated into District, City of Glendale and City of Phoenix responsibilities.

14.5.9.3 The Consultant shall meet with the District and the PAAC to review and resolve comments.

14.6 90% SUBMITTAL

Add to this section the following:

Submit two (2) copies each of the submittal items to GLENDALE and PHOENIX for review.

14.6.2.2 Replace this section with the following:

Submit six (6) sets to the District for review (three (3) at 11" X 17" and three (3) full size).

Add to this section the following:

14.6.9 LANDSCAPE, AESTHETICS AND RECREATION

For the 90% submittal, the consultant shall develop the landscape, aesthetics and recreation information to the "final design phase," which includes the following:

14.6.9.1 The Consultant shall meet with the District and the PAAC to review and resolve comments.

14.7 99% SUBMITTAL

Add to this section the following:

Submit two (2) copies each of the submittal items to GLENDALE and PHOENIX for review as required.

14.8 FINAL (100%) SUBMITTAL

Add to this section the following:

Submit two (2) copies each of the submittal items (except originals) to GLENDALE and PHOENIX.

15.0 QUALITY ASSURANCE/QUALITY CONTROL

16.0 MAINTENANCE PLAN

A section is to be included in the design report that summarizes criteria used in design that will need to be ensured in the operation and maintenance effort (vegetation limits, cleaning of grates, etc.)

17.0 CADD/DRAFTING STANDARDS

18.0 DIGITAL ORTHOPHOTOS

Delete this section.

19.0 DESIGN REFERENCES, SPECIFICATIONS AND STANDARDS

Add to this section the following:

City of Glendale and/or City of Phoenix standards shall be used as appropriate.

APPENDIX C

SURVEY FIELD NOTES

C.1 – SURVEY FIELD NOTES FOR AERIAL MAPPING CONTROL

BETHANY HOME OUTFALL CHANNEL

FCDMC CONTRACT NO. 98-46

AERIAL MAPPING
SURVEY CONTROL
UTILITIES

Prepared By:
Collins/Piña Consulting Engineers, Inc.
40 East Virginia Ave., Suite 200
Phoenix, AZ 85004
(602) 264-7505
(602) 264-0568 fax
CP#4144

Collins/Piña
Consulting Engineers, Inc.

Bethany Home Outfall Project Controls
August 20, 1999

Horizontal and Vertical Data (GRID)

1 Bethany Home Road and 75th Avenue, C/P Iron Rod 66 feet East of the Northeast corner of Section 14-T2N-R1E, Elevation = 1102.68 feet, X=607,453.0570, Y=918,160.3102

113 Camelback Road and 75th Avenue, Brass Cap in Hand Hole, Elevation = 1095.26 feet, X=607,386.8479, Y=912,856.8747

111 Camelback Road and 67th Avenue, Brass Cap in Hand Hole, Elevation = 1107.78 feet, X=612,678.6706, Y=912,974.5043

110 Camelback Road and 63rd Avenue, Brass Cap Flush, Elevation = 1114.01 feet, X=615,148.7107, Y=913,005.5601

109 Camelback Road and 59th Avenue, Brass Cap in Hand Hole, Elevation = 1120.87 feet, X=617,800.4127, Y=913,038.7559

12 Grand Canal and 63rd Avenue, C/P Iron Rod, Elevation = 1098.13 feet, X=615,122.3122, Y=906,452.9689

10 Grand Canal bridge at 67th Avenue, Cut Cross in bridge sidewalk on East side of 67th Avenue, Elevation = 1099.39 feet, X=612,688.1518, Y=909,178.6198

107 Missouri Avenue and 63rd Avenue, Brass Cap Flush, Elevation = 1120.44 feet, X=615,161.31, Y=915,643.20

106 Missouri Avenue and 67th Avenue, Brass Cap in Hand Hole, Elevation = 1115.44 feet, X=612,696.0587, Y=915,610.8754

108 Missouri Avenue and 59th Avenue, Stone in Hand Hole, Elevation = 1127.75 feet, X=617,820.9190, Y=915,678.3764

104 Missouri Avenue and 75th Avenue, Brass Cap in Hand Hole, Elevation = 1098.46 feet, X=607,391.97120, Y=915,491.2852

4 Missouri Avenue and 79th Avenue, Brass Cap in Hand Hole, Elevation = 1091.01, X=605,046.0701, Y=915,597.9529

29 East of Bethany Home Road and 99th Avenue, C/P Iron Rod, Elevation = 1059.19 feet, X=591,635.2397, Y=917,921.0185

3 East of Bethany Home Road and 83rd Avenue, C/P Iron Rod, Elevation = 1089.09 feet, X=602,744.5224, Y=918,076.7215

30 Missouri Avenue and 95th Avenue, C/P Iron Rod, Elevation = 1056.37 feet, X=594,185.4678, Y=917,064.2386

27 Grand Canal, 52' East of the Northwest corner of Section 16-T2N-R1E, Elevation = 1068.07 feet, X=596,930.7736, Y=918,094.5370

114 Camelback Road and 79th Avenue, Brass Cap and Hand Hole, Elevation = 1084.48 feet, X=604,767.2769, Y=912,828.8726

8 Grand Canal, C/P Iron Rod at the Center of Section 24-T2N-R1E, Elevation = 1097.99 feet, X=610,066.5345, Y=910,339.2925

32 87th Avenue, C/P Iron Rod on dirt road 1,200 feet South of North ¼ corner of Section 15-T2N-R1E, Elevation = 1071.09 feet, X=599,506.3539, Y=917,437.0046

Vertical Data ONLY

Maryland Avenue and 91st Avenue, Brass Cap in Hand Hole, Elevation = 1072.39 feet

Maryland Avenue and 83rd Avenue, Brass Cap in Hand Hole, Elevation = 1088.72 feet

Osborn Road and 67th Avenue, Brass Cap in Hand Hole, Elevation = 1084.26 feet

Sells Drive and 75th Avenue, Brass Cap in Hand Hole, Elevation = 1087.08 feet

Report Nodes (Ground)

Node ID	Northing	Easting	Elevation	Description
1	918308.35197	607549.11654	-0.57944	CP 1/2 IR
2	918251.95860	604883.06540	-0.72537	N 1/4 COR SE
3	918224.76325	602840.58189	1089.08610	CP 1/2 IR
4	915745.99471	605142.12963	1091.01220	CP 1/2 IR
5	914164.84930	606600.58307	1092.92060	CP 1/2 IR
6	912964.01588	607603.75357	1096.18440	CP 1/2 IR
7	911401.36064	609041.02621	1096.80990	CP 1/2 IR
8	910487.33431	610162.59395	1097.98920	CP 1/2 IR
9	909870.51627	611926.44725	1099.06870	CP 1/2 IR
10	909326.66156	612784.21131	1099.39490	CP 1/2 IR
11	907806.53780	614009.39650	1098.77510	CP 1/2 IR
12	906601.01080	615218.37150	1098.12820	CP 1/2 IR
13	907926.65880	615233.98550	0.14263	X ON CONCRET
14	918456.39400	607645.13500	1101.95500	IRON ROD
15	911653.73745	615258.21753	0.42770	X ON CONCRET
16	913107.28211	615214.72649	1113.12960	X ON CONCRET
17	913255.58662	617853.65703	1121.08480	X ON CONCRET
18	914554.00370	617943.24806	1124.75300	X ON CONCRET
19	915795.02815	617856.54449	1128.37630	X ON CONCRET
20	915766.59311	615358.84826	1120.76370	X ON CONCRET
21	915778.33865	612710.45075	1114.60250	CP 1/2 IR
22	915665.25393	609671.13229	1105.40960	PK IN A/C
23	915678.47968	607449.96157	1098.63500	X IN CONCRET
24	913158.84815	612693.10351	1107.93230	X ON CONCRET
25	913100.16930	610051.73374	1100.68420	X ON CONCRET
26	918220.32501	599625.92882	1073.66190	CP 1/2 IR
27	918242.57883	597026.83308	-0.28904	CP 1/2 IR
28	918208.56792	594235.57939	1059.65170	CP 1/2 IR
29	918069.06026	591731.29924	1059.18560	CP 1/2 IR
30	917212.28041	594281.52734	1056.37000	CP 1/2 IR
31	918242.57878	597026.84950	0.32492	CP 1/2 IR
32	917585.04638	599602.41344	1071.08640	CP 1/2 IR
33	918224.76325	602840.58189	0.69350	CP 1/2 IR
34	918308.34980	607549.12245	1.38614	CP 1
35	918251.95860	604883.06540	1.53206	CP 2
36	912964.01590	607603.75360	0.86824	X ON CONCRET
37	918155.33080	591686.44550	-0.72537	North Cnal R
38	918156.62508	591713.00398	-0.72537	North Canal
38	918156.62508	591713.00398	-0.72537	Node Descrip
39	918303.64180	594328.25450	-0.72537	North Canal
40	918320.79280	596864.16650	-0.72537	North Canal
41	918321.35173	596975.77159	-0.72537	North Canal
42	918307.00780	596975.75450	-0.72537	North Canal
43	918297.81558	599620.19753	-0.72537	North Canal
44	918304.21080	599620.21850	-0.72537	North Canal
45	918296.67080	602274.19850	-0.72537	North Canal

Report Nodes (Ground)

Node ID	Northing	Easting	Elevation	Description
46	918286.16180	602274.21250	-0.72537	North Canal
47	918287.12280	602608.06150	-0.72537	North Canal
48	918273.34580	602766.34350	-0.72537	North Canal
49	918235.92680	602874.71850	-0.72537	North Canal
50	916047.83380	604874.82150	-0.72537	North Canal
51	915618.60380	605272.18850	-0.72537	North Canal
52	915618.71180	605283.77750	-0.72537	North Canal
53	913213.16680	607482.50250	-0.72537	Northeast Ca
54	913009.81380	607705.94550	-0.72537	Northeast Ca
55	912075.34880	608563.15050	-0.72537	Northeast Ca
56	911397.70462	609184.76818	-0.72537	Northeast Ca
57	911041.26680	609514.69750	-0.72537	Northeast Ca
58	910649.24080	610115.44050	-0.72537	Northeast Ca
59	910571.45780	610234.63650	-0.72537	Northeast Ca
60	910444.23380	610524.02650	-0.72537	Northeast Ca
61	910324.13780	610797.20150	-0.72537	Northeast Ca
62	909946.75754	612018.68371	-0.72537	Northeast Ca
63	909786.85980	612296.78250	-0.72537	Northeast Ca
64	909437.01098	612749.90081	-0.72537	Northeast Ca
65	909262.17480	612748.68850	-0.72537	Southwest Ca
66	909506.01880	612432.98350	-0.72537	Southwest Ca
67	909842.81180	611849.01250	-0.72537	Southwest Ca
68	910184.25780	610744.93650	-0.72537	Southwest Ca
69	910415.18280	610219.83050	-0.72537	Southwest Ca
70	910438.67059	610183.64721	-0.72537	Southwest Ca
71	910483.55280	610114.50550	-0.72537	Southwest Ca
72	910529.76980	610064.77650	-0.72537	Southwest Ca
73	910954.07795	609409.21679	-0.72537	Southwest Ca
74	911332.32280	609061.77450	-0.72537	Southwest Ca
75	913005.87580	607526.58850	-0.72537	Southwest Ca
76	913057.89680	607482.80450	-0.72537	Southwest Ca
77	914855.29778	605839.93718	-0.72537	Southwest Ca
78	915621.83328	605139.30547	-0.72537	Southwest Ca
79	915625.35460	605132.90866	-0.72537	Southwest Ca
80	915893.48480	604874.24450	-0.72537	Southwest Ca
81	915968.31980	604802.05350	-0.72537	Southwest Ca
82	916746.32180	604096.92750	-0.72537	Southwest Ca
83	917228.33308	603660.06628	-0.72537	Southwest Ca
84	917997.85463	602962.62619	-0.72537	Southwest Ca
85	918181.34280	602764.12750	-0.72537	Southwest Ca
86	918187.26880	602274.24350	-0.72537	South Canal
87	918194.56080	602274.28950	-0.72537	South Canal
88	918202.14380	599605.12350	-0.72537	South Canal
89	918206.77180	599605.14050	-0.72537	South Canal
90	918216.30680	596975.80850	-0.72537	South Canal
91	918212.47380	596975.82150	-0.72537	South Canal

Report Nodes (Ground)

Node ID	Northing	Easting	Elevation	Description
93	918187.09278	594329.18320	-0.72537	South Canal
94	918199.18180	594255.94750	-0.72537	South Canal
95	918124.39640	593008.60774	-0.72537	South Canal
96	918046.26480	591686.57450	-0.72537	South Canal
97	907850.37180	614101.07950	-0.72537	Northeast Ca
98	907666.46780	614317.70350	-0.72537	Northeast Ca
99	907553.17080	614416.12950	-0.72537	Northeast Ca
100	918272.59987	607493.34379	-0.58554	NE COR SEC 1
101	918231.17110	602274.28991	1083.76000	NW COR SEC 1
102	918250.30811	596975.68883	-0.28899	NE COR SEC 1
103	918084.32698	591686.36702	1060.38000	NW COR SEC 1
104	915639.32699	607488.03149	1098.46000	E 1/4 COR SE
105	907047.33580	614792.26250	-0.72537	Northeast Ca
106	915758.91716	612792.11817	1115.44000	E 1/4 COR SE
107	906907.50998	614935.94502	0.00000	Northeast Ca
108	915826.41841	617916.97805	1127.75000	E 1/4 COR SE
109	913186.79788	617896.47167	1120.87000	SE COR SEC 1
110	913153.60206	615244.76970	1114.00600	S 1/4 COR SE
111	913122.54626	612774.72963	1107.79000	SE COR SEC 1
112	913063.01606	610129.06634	1.47040	S 1/4 COR SE
113	913004.91673	607482.90694	0.46594	SW COR SEC 1
114	912976.91455	604863.33594	0.61972	S 1/4 COR SE
115	909125.80541	610106.84337	0.63917	1/16 SEC 24
116	909153.24816	612747.93338	0.69453	1/16 SEC 24
117	910476.38553	612757.13739	0.72103	W 1/4 COR SE
118	910628.96379	612758.16394	0.72871	E 1/4 COR SE
119	907830.62198	612739.08402	0.80500	SW COR SEC 1
120	907866.47198	615211.25202	0.80200	S 1/4 COR SE
121	905229.69429	615210.35709	0.87052	C 1/4 SEC 30
122	913231.80110	607433.27915	0.44746	TRI-STATION
123	906907.57498	614895.82502	0.00000	Northeast Ca
124	906783.77598	615031.88202	0.00000	Northeast Ca
125	906691.41198	615210.85302	0.00000	Northeast Ca
126	906569.72198	615210.81202	0.00000	Southwest Ca
127	906681.69798	615010.80102	0.00000	Southwest Ca
128	908019.20998	615856.87602	0.00000	RP Southwest
129	907055.44898	614601.50902	0.00000	Southwest Ca
130	907447.51798	614300.51302	0.00000	Southwest Ca
131	906639.20498	613247.62802	0.00000	RP Southwest
132	907623.17798	614138.54602	0.00000	Southwest Ca
133	907783.32298	613961.67402	0.00000	Southwest Ca
134	907847.34998	613892.66102	0.00000	Southwest Ca
135	909406.22198	612749.68702	0.00000	NORTH CANAL
136	909350.22098	612814.45302	0.00000	NORTH CANAL
137	909379.83985	612814.65808	0.00000	nORTH cANAL
138	909320.77243	612881.37862	0.00000	nORTH cANAL

Report Nodes (Ground)

Node ID	Northing	Easting	Elevation	Description
139	909228.61798	612962.31402	0.00000	nORTH cANAL
140	908370.27272	613522.44405	0.00000	North Canal
141	908352.85998	613537.37802	0.00000	North Canal
142	908352.44294	613508.43627	0.00000	North Canal
143	908213.16998	613627.89902	0.00000	North Canal
144	907991.49773	613899.78510	0.00000	North Canal
145	907849.72298	614056.24602	0.00000	North Canal
146	907847.73904	613919.51960	0.00000	South Canal
147	907911.63998	613843.20702	0.00000	South Canal
148	908199.70198	613499.19402	0.00000	South Canal
149	908732.53698	613145.21202	0.00000	South Canal
150	909146.31998	612897.09702	0.00000	South Canal
151	909262.19098	612781.68902	0.00000	South Canal
152	909295.03828	612748.97243	0.00000	South Canal
200	916017.78851	605050.42954	1089.99084	BASE PT
205	912414.73190	608234.02848	1094.56379	4OD NAIL
300	912344.49681	608296.29837	1094.62994	AP
301	917808.59191	593000.59035	1057.37492	AP
302	917920.60261	595310.16254	1059.63059	AP
303	918748.29180	593003.64769	1061.07825	AP
304	918289.07709	594385.65835	1060.19487	AP
305	918639.51063	595046.90595	1061.32843	AP
306	918297.39436	595862.16658	1062.30754	AP
307	917862.71306	597012.93775	1065.30903	AP
308	917827.59882	599618.36331	1072.02785	AP
309	918203.18016	600347.29164	1076.03397	AP
310	918742.05911	596975.33806	1067.09262	AP
311	918624.27030	599194.05457	1071.74580	AP
312	918362.35825	598350.58001	1062.75827	AP
313	918309.86872	599558.34683	1071.88520	AP
314	918611.84970	600695.07026	1077.29914	AP
315	918230.86226	602273.98354	1083.82660	AP
316	917573.61791	602911.32713	1082.79315	AP
317	916721.32328	603881.83421	1087.04784	AP
318	914822.69805	605700.12450	1089.09782	AP
319	913191.33222	606756.76489	1090.19759	AP
320	918297.44852	602764.70511	1086.08947	AP
321	917057.23192	603967.18874	1087.94908	AP
322	917570.83750	603760.60654	1088.49507	AP
323	916683.56464	604609.73360	1088.97494	AP
325	915005.27210	605962.38210	1090.85799	AP
326	915486.37682	607119.93607	1095.47440	AP
327	915959.79096	607293.66766	1099.98464	AP
328	913879.69243	606891.09317	1090.45216	AP
329	915841.87474	605277.61107	1090.14230	AP
330	912865.55359	607771.97353	1097.56254	AP

Report Nodes (Ground)

Node ID	Northing	Easting	Elevation	Description
331	911045.66048	609502.78271	1093.01900	AP
332	910017.33555	611792.68281	1093.76732	AP
333	908864.91957	613186.21971	1097.75966	AP
334	907202.31798	614645.67302	1097.27000	AP
335	907047.45998	615210.28602	1097.93600	AP
336	908231.40140	614421.29872	1098.63478	AP
337	908553.62971	613633.83636	1097.49167	AP
338	909446.39808	612998.24236	1096.36786	AP TOP HH LI
339	910129.52382	611906.11741	1094.56952	AP
340	910601.33658	610842.41175	1094.03576	AP
341	911619.78260	609259.85787	1093.65851	AP
342	911196.65928	609035.32596	1092.24133	AP
343	910003.68413	610861.10291	1092.70613	AP
344	909151.36453	612546.20158	1093.79875	AP
345	907539.39598	612842.79002	1091.29200	AP
346	907717.93498	613892.43002	1096.44400	AP
347	907138.18598	614373.27202	1094.99500	AP
348	913028.21415	608530.95005	1098.16930	AP
349	913066.24707	610284.17669	1101.46518	AP
350	913110.03411	612227.17254	1106.37010	AP
351	913145.96118	614634.82477	1112.39675	AP
352	913170.24310	616570.96482	1117.79926	AP
353	912863.17538	617894.23836	1119.48755	AP
354	912625.22229	615608.70864	1112.37397	AP
355	912831.57100	613488.31998	1107.40134	AP
356	912542.44003	611457.63718	1102.14398	AP
357	912758.62091	609487.10773	1096.88215	AP
358	913500.24835	607583.20615	1093.97080	AP
359	913316.70957	609394.86463	1100.24547	AP
360	913392.67815	611328.32792	1104.43546	AP
361	913442.81899	613411.92303	1109.41789	AP
362	913422.63038	615534.53534	1114.43801	AP
363	913503.03459	617901.42820	1122.20533	AP
364	917884.17378	601209.60239	1076.64893	AP
365	918239.49975	603346.50060	1087.14714	AP
366	915663.98769	607970.12208	1100.38372	AP
367	915702.31902	610279.55587	1107.55382	AP
368	915747.05813	612264.11894	1112.75512	AP
369	915784.42835	614742.65528	1119.46648	AP
370	915791.27951	615257.35490	1120.42675	AP
371	915814.86445	617058.57335	1125.55321	AP
372	915388.74335	617913.42483	1127.48333	AP
373	915349.50287	615948.80144	1121.10922	AP
374	915408.40186	613372.67351	1114.28466	AP
375	915445.76867	611469.47848	1110.53697	AP
376	915429.57102	609413.27654	1104.41609	AP

Node ID	Northing	Easting	Elevation	Description
377	915226.60538	608812.71659	1102.64288	AP
378	915950.25146	609079.61493	1104.88435	AP
379	916116.26669	611033.73596	1109.72139	AP
380	916019.46342	613920.00729	1118.28803	AP
381	916327.00832	615506.87718	1122.41659	AP
382	916258.30281	617918.61823	1130.27919	AP
400	913255.63639	617853.68441	1121.14343	CP 17
401	915795.06247	617856.50451	1128.37572	CP 19
402	905229.70993	615210.51909	1091.42910	PT 121
500	918336.95800	602756.10809	1085.82275	TRI STATION
501	918336.95601	602756.11062	1085.82041	TRI STATION
502	918336.96740	602756.10866	1085.80574	TRI STATION
503	913231.69365	607433.24888	1096.29556	TRI STA BACK
504	913231.68587	607433.24907	1096.32896	TRI STA BACK
505	913231.68856	607433.24471	1096.31632	TRI STA BACK
5300	918235.71223	602874.46458	-2.85625	1 1/4IRONPI
5301	918320.36725	596975.52099	1068.01896	SET PK 5012
5302	918286.95914	602607.96030	-4.85376	FD 1/2RE BEN
5303	918180.60058	602764.36382	-1.32774	FD ANGLIRON
5304	917997.48192	602962.08240	-3.62792	FD 1/2RE BEN
5305	918187.04968	602273.67310	-5.05644	FD CPS 86
5306	918194.31913	602273.69190	-5.05187	FD PK 87
5307	918320.30818	596975.56052	0.00000	CALC 5012
5308	918212.48838	596975.75742	0.00000	NEW VALUE 50
5309	918319.63558	596863.82252	0.00000	CALC 5013
5310	918213.85387	596977.09678	1067.98194	CALC 5012
5311	918319.67163	596863.74916	1064.79914	CALC 5013
5312	918307.29318	596975.58432	0.00000	CALC 5005
5313	918216.59318	596975.59712	0.00000	DOT
5314	918216.59318	596975.59712	0.00000	CALC 5007
5315	918216.66053	596975.73317	1068.07183	SET PK 5007
5316	918307.23744	596975.62759	1068.15237	SET PK 5005
5317	918212.50999	596975.79490	1068.05985	SET PK 5022
5318	918292.76926	602273.43051	1083.84209	FD PK
5319	918312.79046	602273.96460	1083.86987	BC BETHANY
5320	918194.11128	602273.57536	1083.91853	FD PK
5321	918186.87411	602273.65338	1084.10148	FD COTTON SP
5322	918286.91379	602607.92652	1084.09713	FD 1/2REB 47
5323	918272.95382	602766.02175	1084.79772	FD 1/2REB 48
5324	918235.75057	602874.47650	1086.13739	FD 3/4IR 49
5325	918181.33717	602764.11721	1085.93031	SET 1/2REB 8
5326	917997.58649	602962.15398	1085.37724	FD 1/2REB 84
5327	917031.29938	603954.19868	1088.66123	W/P
5328	917227.99007	603659.75820	1085.80079	FD SRP ALUM
5329	916746.28360	604096.94696	1088.37669	SET 1/2REB 8
5330	916482.58360	604461.34402	1089.29105	SET NAIL W/P

(Ground)

Node ID	Northing	Easting	Elevation	Description
5331	916044.45774	604866.27769	1089.63412	SET NAIL W/P
5332	916047.23603	604874.88252	1089.68699	FD SRP ACF 5
5333	915968.25467	604802.11716	1089.44032	FD SRP ACF 8
5334	915893.26387	604874.35823	1089.92746	FD IR 80
5335	915625.16138	605132.95138	1089.78434	FD 1/2REB 79
5336	915621.53901	605139.01399	1089.90035	FD SRP ACF 7
5337	915618.81166	605283.68088	1091.13564	SET 1/2REB 5
5338	915618.63013	605272.15536	1091.53753	SET 1/2REB 5
5339	914855.27088	605839.97879	1092.22006	SET 1/2 IR 7
5340	913005.96428	607526.42633	1095.62080	FD PK 75
5341	913009.82067	607706.04971	1096.12812	SET PK 54
5342	913057.93237	607482.76076	1096.17724	SET PK 76
5343	913213.21768	607482.47724	1096.58628	SET PK 54
5344	911397.70785	609184.76502	1093.34410	SET 1/2 IR 5
5345	911041.22444	609514.88720	1091.69933	FD 3/4 IP 57
5346	912110.33905	608388.93371	1097.82667	SET NAIL W/P
5347	911332.11200	609061.85413	1094.18789	FD SRP ACF 7
5348	910954.26107	609409.41939	1093.19787	FD SRP ACF 7
5349	912075.36709	608563.04670	1095.74687	SET 1/2 IR 5
5350	910415.06278	610219.92529	1094.31233	FD SRP ACF 6
5351	910438.63376	610183.66327	1094.45231	SET 1/2 IR 7
5352	910483.55027	610114.47324	1093.92154	SET 1/2 IR 7
5353	910529.74988	610064.82116	1094.12796	FD 1/2 IR 72
5354	910438.30542	610114.35783	1091.94538	FD 1IN IR CE
5355	910571.42491	610234.60932	1093.30626	SET 1/2 IR 5
5356	910649.21398	610115.41756	1093.70201	SET 1/2 IR 5
5357	910241.25208	610734.60280	1097.61332	SET NAIL W/P
5358	909636.64462	612326.29706	1098.52448	SET NAIL W/P
5359	909787.04564	612296.92907	1094.00085	FD SRP ACF 6
5360	909946.79214	612018.72462	1093.81483	SET 1/2 IR 6
5361	910184.24496	610744.93997	1093.71489	SET 1/2 IR 6
5362	910324.08032	610797.15683	1093.25862	SET 1/2 IR 6
5363	909405.88768	612749.82608	1099.02917	FD CPS
5364	909295.06067	612749.00823	1098.94833	FD CPS
5365	909262.17119	612748.68579	1098.84868	SET PK 65
5366	909436.92162	612749.92994	1098.92613	SET PK 64
5367	907847.36794	613892.61424	1098.71421	FD BCF 134
5368	907850.39308	614101.12313	1098.46927	FD CPS 97
5369	907850.02593	614079.99296	1098.51816	FD CPS
5370	907847.77764	613919.78658	1098.76633	FD CPS
5371	907783.12641	613961.61267	1097.51579	FD SRP ACF 1
5372	907623.22202	614138.61746	1095.22285	FD SRP ACF 1
5373	907659.08398	614311.29256	1095.39678	FD SRP ACF 9
5374	907545.78258	614409.64656	1095.68865	FD SRP ACF 9
5375	907180.83469	614636.88892	1098.32416	SET NAIL W/P
5376	907047.31114	614792.29124	1096.36621	FD SRP ACF 1

(Ground)

Node ID	Northing	Easting	Elevation	Description
5377	906907.58243	614935.30791	1096.55293	FD 1IN REB 1
5378	906907.57207	614895.82692	1097.84522	FD 1/2 IR 12
5379	907447.26494	614300.60516	1096.01000	FD SRP ACF 1
5380	907055.52821	614601.49607	1095.93000	FD SRP ACF 1
5381	906720.18822	614988.05303	1097.44651	SET NAIL W/P
5382	906569.76548	615210.90557	1095.39673	FD SRP ACF 1
5383	906783.87292	615031.81456	1098.66949	FD 3/4 IR 12
5384	906691.39278	615211.01018	1098.88378	FD SRP ACF 1
5385	908387.45280	613479.78725	1098.88010	SET NAIL W/P
5386	908332.64438	613520.41558	1098.72948	SET NAIL W/P
5387	909350.17762	612814.39865	1097.94734	SET 1/2 IR 1
5388	909380.08443	612814.79942	1096.56089	FD 1 1/2 IP
5389	909325.14627	612877.79140	1096.65855	FD SRP ACR 1
5390	909232.70045	612957.97837	1096.60748	FD SRP ACR 1
5391	909146.06341	612897.25595	1098.10734	FD SRP ACR 1
5392	908732.71466	613145.39505	1096.43019	FD SRP ACR 1
5393	908352.91152	613537.42100	1097.12274	SET 1/2 IR 1
5394	908357.11326	613525.61110	1097.01539	FD SRP ACR 1
5395	908374.70330	613518.67640	1092.50278	FD SRP ACR 1
5396	907911.60764	613843.48648	1097.69031	FD 1/2 IR 14
5397	908202.63894	613497.83276	1095.77947	FD 1/2 IR TR
5398	908199.72125	613499.19705	1095.37734	SET CHIS X 1
5399	908003.61587	613910.47502	1096.93812	FD SRP ACF 1
5400	918084.32698	591686.36702	0.00000	temp point
5401	917936.28500	591590.30800	0.00000	temp point

SALT RIVER PROJECT / SURVEYS DEPARTMENT

PROJECT SYLLABUS FOR THE

NEW X-CUT AND GRAND CANAL PHASE

OF THE ELEVATION NETWORK SURVEYS

This report is a portion of a total scheme to establish a network of elevation benchmarks every 1/2 mile along the transmission canals in Maricopa County which are maintained by the Salt River Project. The scope includes verifying prior topographical surveys (called "spur ties") and re-surveying the reaches where a consistent elevation equation could not be realized or where new construction had rendered the prior surveys obsolete. Ultimately, this project will enable accurate hydrometric modeling and analysis of the entire canal system.

The sea level datum was based on elevations developed and supplied by the Arizona Department of Transportation (ADOT), Highway Division, Photogrammetry and Mapping Services, in a June 17, 1981 report entitled: "1981 NGS Level Line Apache Junction to I-10 at Miller Road. ADOT Preliminary Adjustment". The values given conform to the National Geodetic Vertical Datum of 1929 (NGVD 29).

All level circuits were surveyed with a set of matched invar rods which were observed by either a WILD model NA2 or NA2000 precise leveling instrument. All equipment and procedures conform to Second Order, Class Two (2nd/II) leveling performance standards as set forth by the Federal Geodetic Control Committee (FGCC).

The vertical control for this phase of the network established benchmarks along the canals in four inter-locking surveys:

1) Benchmarks from the <u>Land Subsidence Monitoring Program</u> completed during 1990 established control at the headgates of the New X-Cut Canal. During December of 1993, a circuit was run from the headgates, South along the New X-Cut Canal, continued West from the headwaters of the Grand Canal, deviated from the canal heading North along 16th Street, and closed at benchmarks near the intersection of 16th Street and Colter. The closing benchmarks were also a part of the 1990 control.

Field note observations for the New X-cut portion were recorded in a PARAVANT model electronic data collector by a software program called PCLEVEL.EXE, in a data file named GRAND.SRL. Field note observations for the Grand Canal portion were recorded in the data module supplied with the WILD NA2000 leveling instrument and the data files were later compiled into a computer file named GRAND.FBK. Printout copies of these files (GRAND.SRL and GRAND.FBK) are in the BM Field Notes section of this report.

X-CUT AND GRAND CANALS ELEVATION NETWORK

PROJECT SYLLABUS CONTINUED

2) The next circuit was continued West along the Grand Canal from the 16th Street Bridge to 43rd Avenue. This portion was also kept in the NA2000 module and compiled into GRAND.FBK.

3) During August of 1992, a level circuit was initiated to link the Arizona Canal elevation network with the Grand Canal. This circuit began at the bridge over the Arizona Canal from benchmarks documented in the 1991 Subsidence Report. The circuit ran East along the Arizona Canal to 43rd Avenue, South along 43rd Avenue to the Grand Canal, West along the Grand to 59th Avenue, North along 59th Avenue, and tied at benchmarks near at Olive Avenue which were also established in the 1991 surveys. The observations for this portion were recorded in field book 645 pages 32 through 80 and book 646 pages 1 through 39.

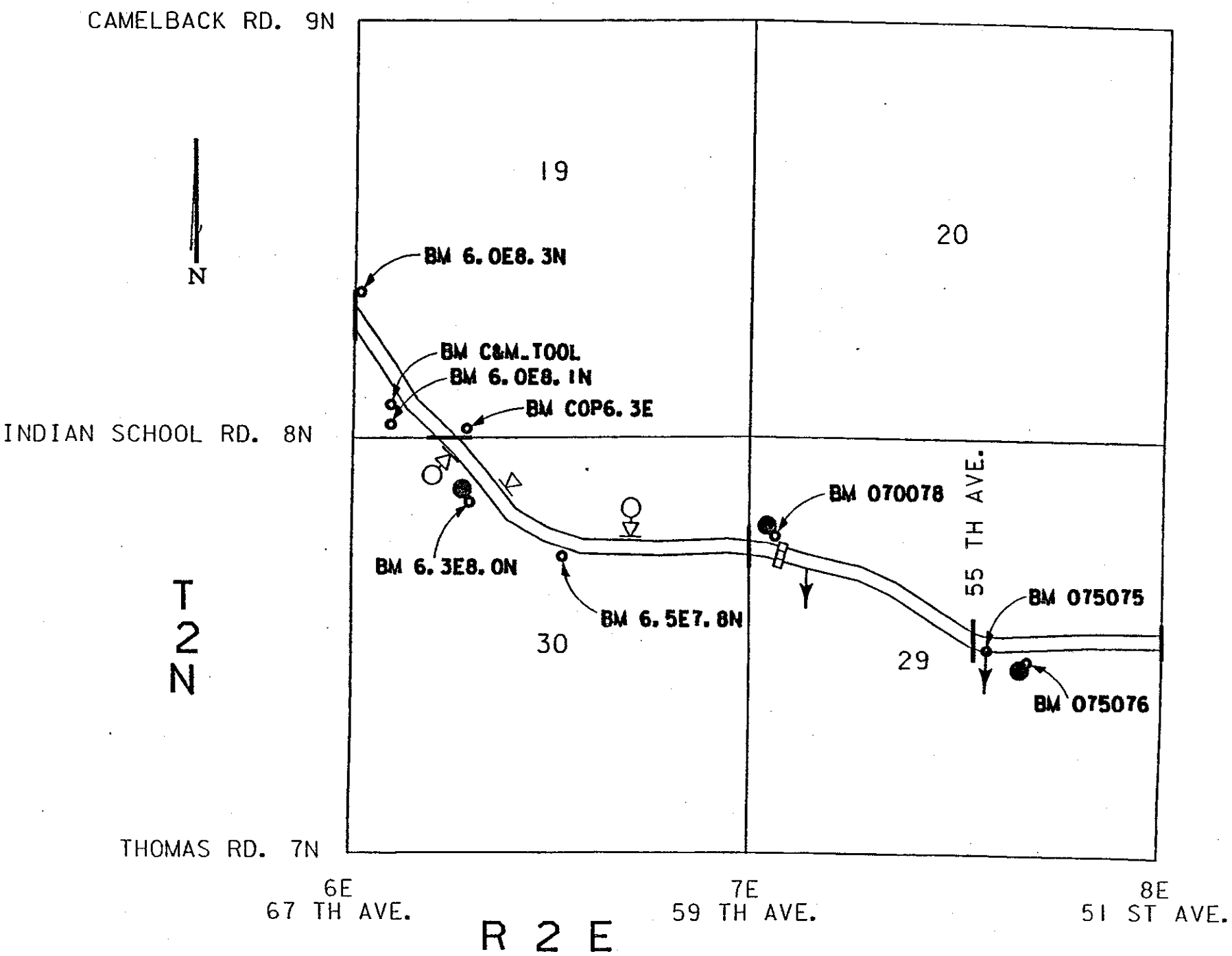
4) In January of 1994, the last circuit began at benchmarks established at the 59th Avenue bridge over the Grand Canal (from item 3), ran West along the Grand to the tail end at New River, looped back East to 83rd Avenue, deviate from the Grand Canal North along 83rd Avenue to Olive Avenue, East along Olive Avenue to Grand Avenue where the circuit tied into benchmarks which were also established in the 1991 surveys. This portion was also kept in the NA2000 module and compiled into the computer file GRAND.FBK.

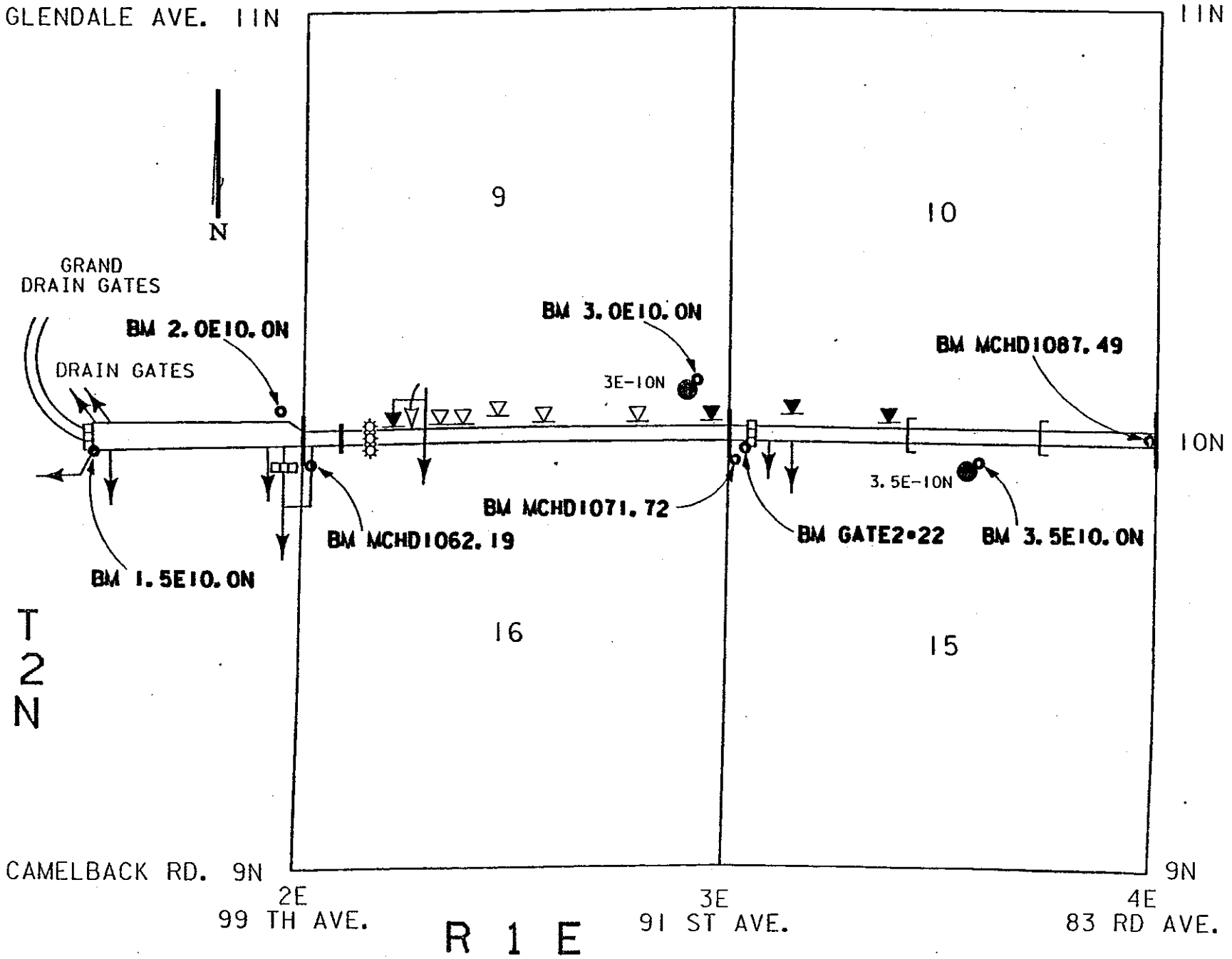
When the field observations were finished, all computer files and field book data were compiled into a single computer data file of the entire X-Cut and Grand Canal phase named GRAND.DAT. The format of this file enables the bulk input of the network to a program called STAR*LEV. Executing the STAR*LEV program checked the input data for obvious blunders, then performed a least squares (best fit) adjustment for any residual errors. For the desired final product, it created an ASCII file named GRAND.LST. This composition lists the unadjusted input observations, the network solutions, and a statistical summary of the confidence levels for those solutions. The network solutions generated by STAR*LEV was the source of any final elevations shown on all other diagrams in this report.

NEW X-CUT AND GRAND CANALS ELEVATION NETWORK

SYLLIBUS OF FINAL ELEVATIONS AND DESCRIPTIONS CONTINUED

SBIS FILE#	STATION	ELEVATION	SRP CO-ORD	MONUMENT DESCRIPTI
1535	070120	1159.3621	7.0E 12.0N	BC by AHD
1536	070125	1164.9923	7.0E 12.5N	3" AC by SRP
1537	7E*13N	1172.8827	7.0E 13.0N	Cotton Spindle
1538	070134	1175.6360	7.0E 13.4N	BC by COG
1539	6.5E7.8N	1098.5580	6.5E 7.8N	3" AC by SRP 1993
1540	6.3E8.0N	1098.3179	6.3E 8.0N	3" AC by SRP 1993
1541	COP6.3E	1098.8759	6.3E 8.0N	3" BC by COP
1542	6.0E8.1N	1095.1398	6.0E 8.1N	3" AC by SRP
1543	C&M_TOOL	1095.0758	6.0E 8.1N	3" AC by SRP
1544	6.0E8.3N	1099.4127	6.0E 8.3N	3" BC by COP
1545	055085	1093.5705	5.5E 8.5N	3" AC by SRP 1993
1546	050090	1097.0622	5.0E 9.0N	3" AC by SRP 1993
1547	BACK	1096.3632	5.0E 9.0N	3" AC by SRP 1993
1548	045095	1090.8919	4.0E 9.5N	3" AC by SRP 1993
1549	4.2E9.9N	1087.3517	4.2E 9.9N	3" AC by SRP 1993
1550	4.0E10.0N	1088.7506	4.0E 10.0N	3" AC by SRP 1993
1551	MCHD1087.4	1085.8336	4.0E 10.0N	3" BC by MCHD 1985
1552	3.5E10.0N	1073.9254	3.5E 10.0N	3" AC by SRP 1993
1553	MCHD1071.7	1070.0452	3.0E 10.0N	3" BC by MCHD 1981
1554	GATE2*22	1069.0532	3.0E 10.0N	3" BC by SRVWUA
1555	3.0E10.0N	1064.7422	3.0E 10.0N	3" AC by SRP 1993
1556	MCHD1062.1	1062.1758	2.0E 10.0N	3" BC by MCHD
1557	2.0E10.0N	1056.0028	2.0E 10.0N	3" AC by SRP 1993
1558	1.5E10.0N	1058.6136	1.5E 10.0N	3" AC by SRP 1993
1559	4.0E10.5N	1089.3244	4.0E 10.5N	3" AC by SRP 1993
1560	4.0E11.0N	1096.6582	4.0E 11.0N	3" AC by SRP 1993
1561	4.0E11.5N	1108.8910	4.0E 11.5N	3" BC by SRVWUA 19
1562	4.0E12.0N	1104.1888	4.0E 12.0N	3" AC by SRP 1993
1563	4.0E12.5N	1112.7436	4.0E 12.5N	3" AC by SRP 1993
1564	4.0E13.0N	1125.9094	4.0E 13.0N	3" BC by SRVWUA 19
1565	WELL4.5E13N	1128.9122	4.5E 13.0N	3" AC by SRP 1993
1566	BM2063*C	1130.6442	4.5E 13.0N	3" AC by ADOT 1983
1567	ADOT_BC	1134.0190	5.0E 13.0N	AC by ADOT
1568	5E_13N	1136.3060	5.0E 13.0N	Threaded Stud in H


CAMELBACK RD. 9N
INDIAN SCHOOL RD. 8N
THOMAS RD. 7N
N
19
20
30
29
BM 6.0E8.3N
BM C&M_TOOL
BM 6.0E8.1N
BM COP6.3E
BM 6.3E8.0N
BM 6.5E7.8N
BM 070078
BM 075075
BM 075076
55 TH AVE.
T 2 N
6E
67 TH AVE.
7E
59 TH AVE.
8E
51 ST AVE.
R 2 E


GLENDALE AVE. 11N
11N
N
9
10
GRAND
DRAIN GATES
DRAIN GATES
BM 2.0E10.0N
BM 3.0E10.0N
BM MCHD1087.49
3E-10N
10N
3.5E-10N
BM MCHD1071.72
BM MCHD1062.19
BM GATE2•22
BM 3.5E10.0N
BM 1.5E10.0N
T
2
N
16
15
CAMELBACK RD. 9N
9N
2E
99 TH AVE.
3E
91 ST AVE.
4E
83 RD AVE.
R 1 E

NEW CROSSCUT AND GRAND CANALS PHASE

BENCHMARK MONUMENT DESCRIPTIONS CONTINUED

DESIGNATION	DESCRIPTION
6.5E7.8N	3" aluminum cap located on the South sid of the Grand Canal in line with 63rd Avenue to the South on an abandoned headwall, stamped "SALT RIVER PROJECT BM 93" and "6.5E 7.8N".
6.3E8.0N	3" aluminum cap located on the SE corner of the well pad situated on the Southwesterly side of the Grand Canal and the South side of Indian School Road, stamped "SALT RIVER PROJECT BM 93" and "6.3E 8.0N".
COP6.3E	3" brass cap located on the wingwall at the NE corner of the Indian School Road bridge over the Grand Canal, stamped "CITY OF PHOENIX 19".
6.0E8.1N	3" aluminum cap located on the South end of the sidewalk situated on the East side of the Western C&M Building at the SRP 67th Avenue and Indian School facility, stamped "SALT RIVER PROJECT BM".
C&M TOOL	3" aluminum cap located on the sidewalk in front of the tool room situated at the East side of the Western C&M Building at the SRP 67th Avenue and Indian School Road facility, stamped "SALT RIVER PROJECT BM".
6.0E8.3N	3" brass cap located on the curbing at the NE corner of the 67th Avenue bridge over the Grand Canal, stamped "CITY OF PHOENIX 19".
055085	3" aluminum cap located on the NE corner of the well pad situated on the South side of the Grand Canal and West of 67th Avenue near 71st Drive and Sells Drive, stamped "055085".
050090	3" aluminum cap located on the SW corner of radial gate #2-20 near the SE corner of the intersection of 75th Avenue and Camelback Road, stamped "050090".
BACK	3" aluminum cap located at the North side of the Grand Canal and the West side of 75th Avenue, stamped "ARIZONA D.O.T. HWY. DIV." and "1986 GEODETIC SURVEY" and "BACK".

NEW CROSSCUT AND GRAND CANALS PHASE

BENCHMARK MONUMENT DESCRIPTIONS CONTINUED

DESIGNATION	DESCRIPTION
045095	3" aluminum cap located on the SE corner of the well pad situated on the South side of the Grand Canal and the East side of 79th Avenue, stamped "045095".
4.2E9.9N	3" aluminum cap located on the NW corner of the well pad situated on the North side of the Grand Canal and East of the intersection of 83rd Avenue and Bethany Home Road, stamped "SALT RIVER PROJECT BM 93" and "4.2E 9.9N".
4.0E10.0N	3" aluminum cap located on the SW corner of the radial gate #2-21 for the Grand Canal situated on the East side of 83rd Avenue, stamped "SALT RIVER PROJECT BM 93" and "4.0E 10.0N".
MCHD1087.49	3" brass cap located on the concrete guard rail situated on the West side of 83rd Avenue and the Grand Canal, stamped "MARICOPA COUNTY HIGHWAY DEPT. 1087.49 1985".
3.5E10.0N	3" aluminum cap located on the NE corner of the well pad situated on the South side of the Grand Canal near the NW corner of Welbor Substation site, stamped "SALT RIVER PROJECT BM 93" and "3.5E 10.0N".
MCHD1071.72	3" brass cap located on the South end of the East concrete guard rail for the 91st Avenue bridge over the Grand Canal, stamped "MARICOPA COUNTY HWY.DEPT. 1071.72 1981".
GATE2*22	3" brass cap located on the SW corner of the radial gate #2-22 for the Grand Canal situated East of 91st Avenue, stamped SRVWUA ENGINEERING DEPT. BENCHMARK" and "ELEV. 1069.94 LOCATION + ".
3.0E10.0N	3" aluminum cap located on the NE corner of the well pad situated on the North side of the Grand Canal and the West side of 91st Avenue.
MCHD1062.19	3" brass cap located on the South end of the East side guard rail for the 99th Avenue bridge over the Grand Canal, stamped "MARICOPA COUNTY HIGHWAY DEPT. 1062.19".

NEW CROSSCUT AND GRAND CANALS PHASE

BENCHMARK MONUMENT DESCRIPTIONS CONTINUED

DESIGNATION	DESCRIPTION
BM2063*C	3" aluminum cap located on a concrete pole riser foundation situated on the South side of Olive Avenue and 100' (more or less) West of 79th Avenue, stamped "ARIZONA D.O.T. HWY DIV. P&M" and "GEODETIC SURVEY BM 2063-C 1983".
ADOT_BC	ADOT aluminum cap located on the curbing at the NW corner of the intersection of 79th Avenue and Grand Avenue, stamped "1136.10".
5E_13N	Threaded stud in a hand hole located 3' West of the centerline of a gateway entrance to a wellsite situated West of 75th Avenue and NE of Grand Avenue.

BETHANY HOME ROAD
OUTFALL CHANNEL

CP# 4144

FCD No. 98-46

NATIONAL

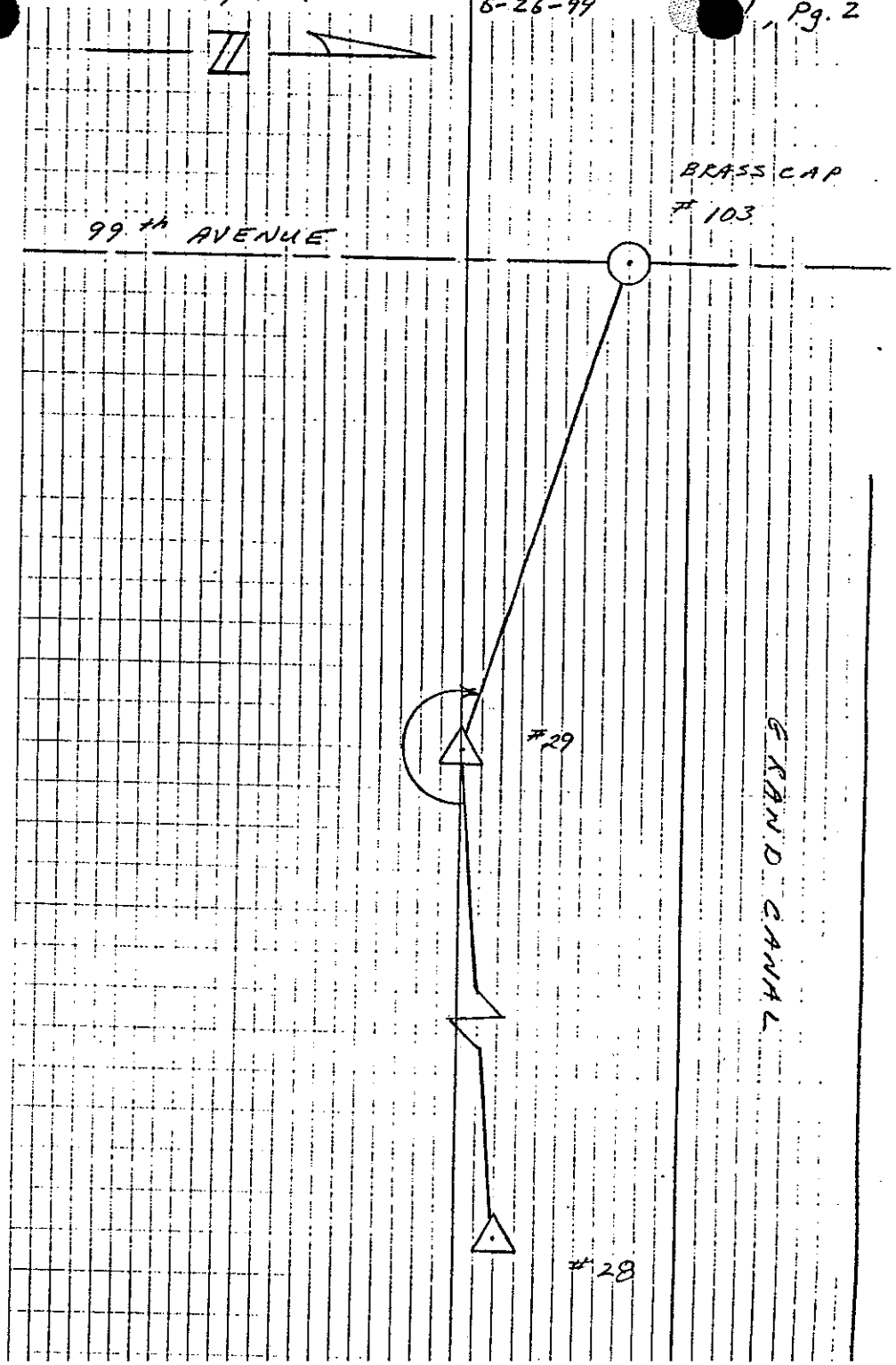
418

CP# 4144

OUTFALL CHANNEL

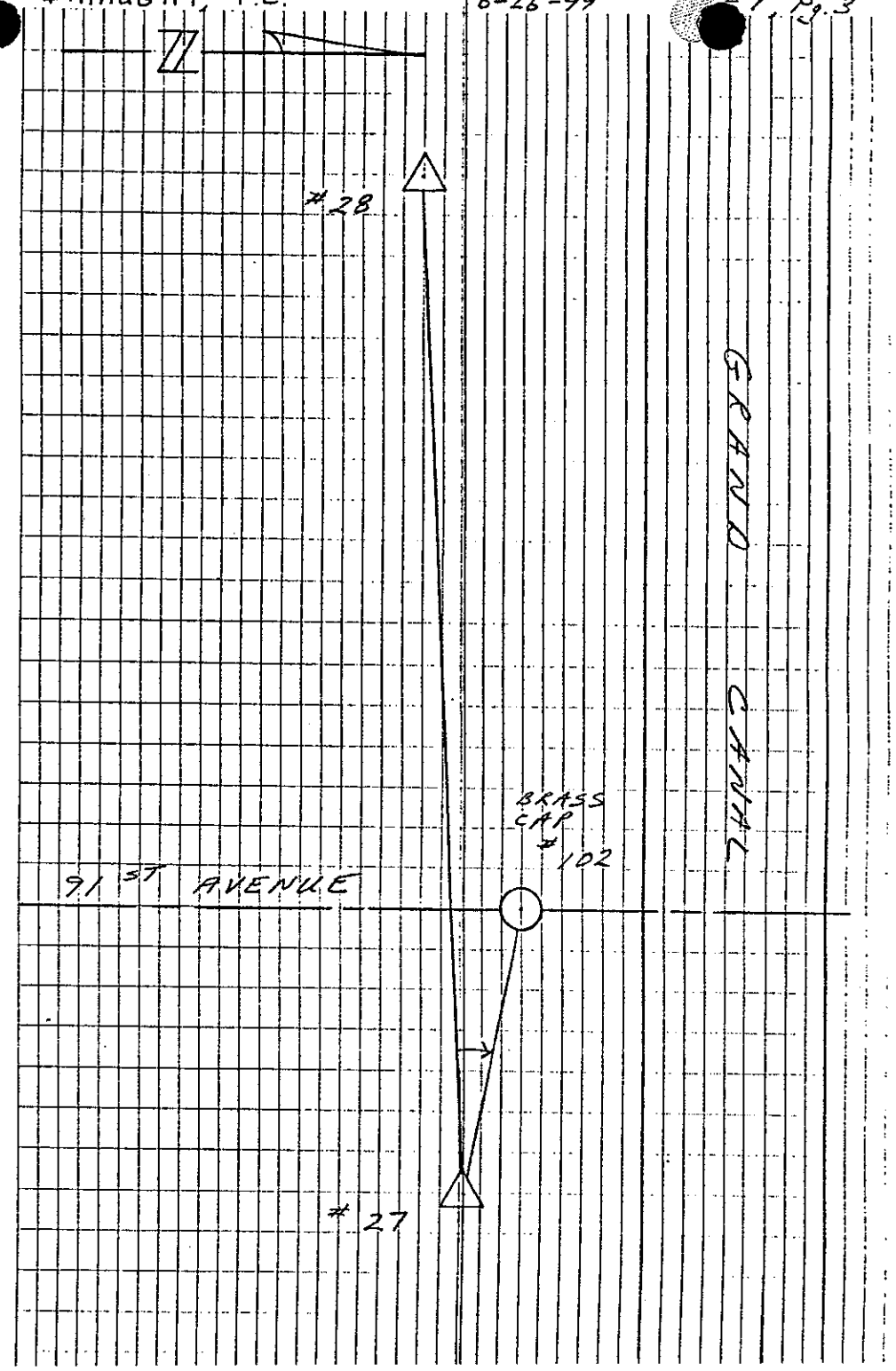
N.W.	COR	SEC. 16	T. 2 N.	R. 1 E			
B/S	28						
T	29						
F/S	103		99th AVE & BETHANY HOME ROAD				
	0° 00'	00"					
	201° 57'	15"		47.455	47.455		
	21° 57'	25"					
	179° 59'	55"					
M ∡	201° 57'	22.5"					
B/S	103						
T	29						
F/S	28						
	0° 00'	00"					
	158° 02'	50"					
	338° 02'	45"					
	180° 00'	00					
M ∡	158° 02'	47.5"					
TOTAL	360° 00'	10"					
RT ∡	201° 57'	17.5"					
H.D.	47.455						

D. HAUGHT, P.C. 6-26-99 1, Pg. 2

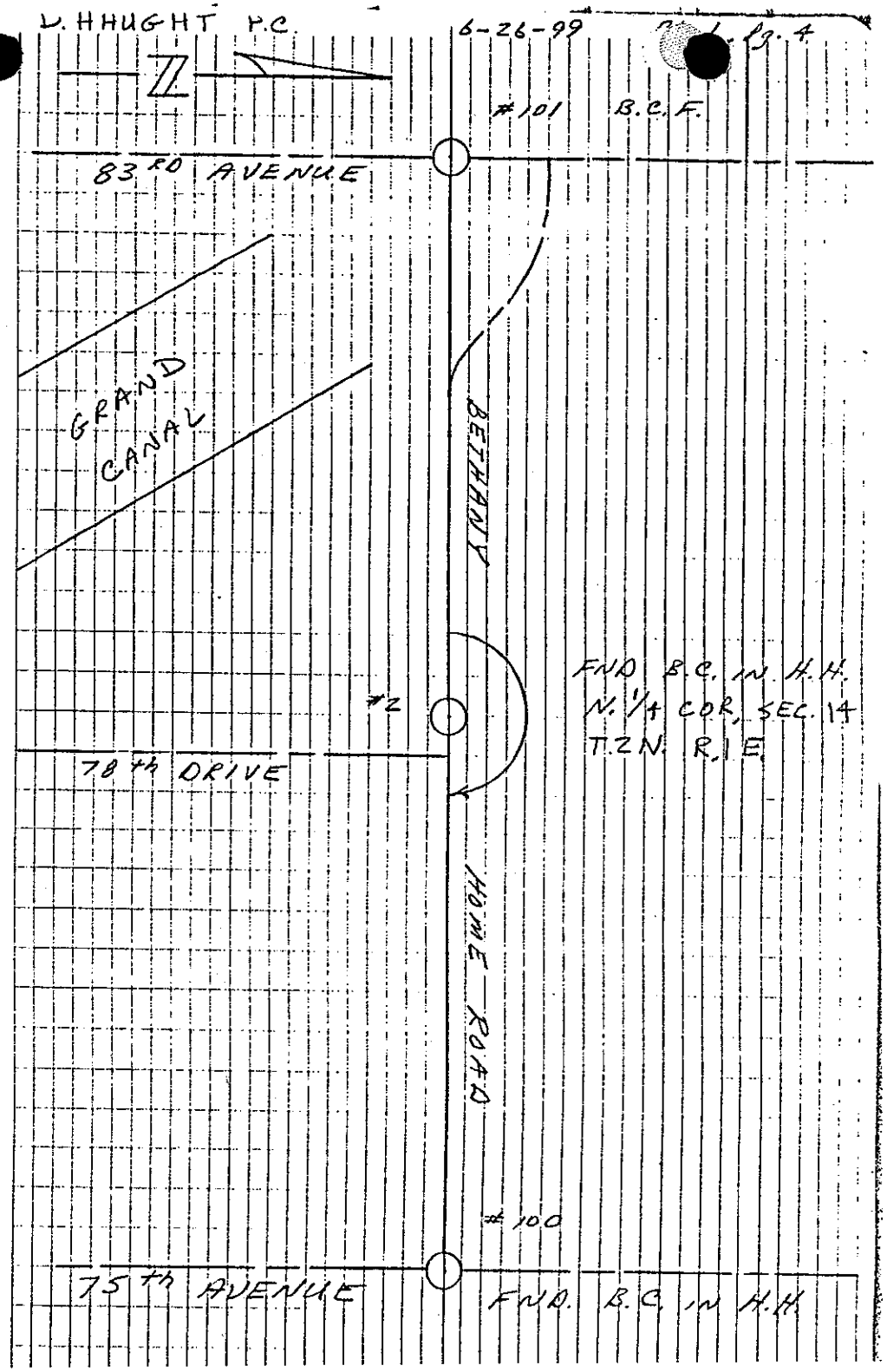


N.E.	COR.	SEC.16	T.2N.	R. 1 E.			
B/S	28						
T	27						
F/S	102		91 ST AVE & BETHANY HOME ROAD				
	0° 00'	00"		51.725	51.725		
	9° 17'	35"					
	189° 17'	30"					
	180° 00'	00"					
M ∡	9° 17'	32.5"					
B/S	102						
T	27						
F/S	28						
	0° 00'	00"					
	350° 42'	30"					
	170° 42'	25"					
	179° 59'	55"					
M ∡	350° 42'	30"					
TOTAL	360° 00'	02.5"					
RT ∡	9° 17'	31.25"					
H.D.	51.725						

D. HAUGHT, P.C. 6-26-99 Vol 1, Pg. 3

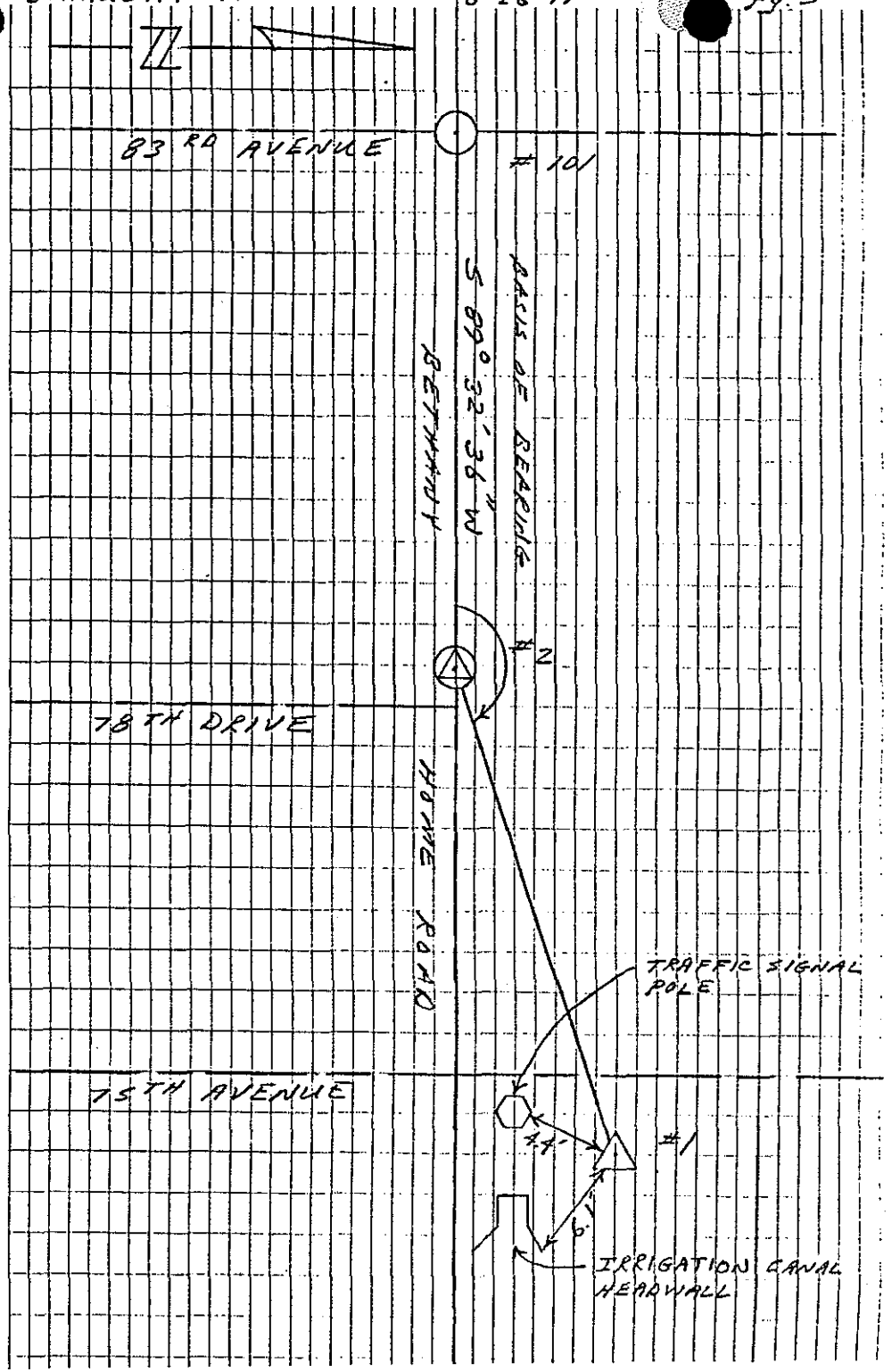


N.L.	COR.	SEC 14	T.2N.	R.1E.		
B/S	101					
π	2			2609.410	2609.410	
F/S	100		75th AVE. & BETHANY HOME ROAD			
	0° 00'	00"				
	180° 00'	10"		2610.360	2610.360	
	0° 00'	10"				
	179° 59'	55"				
M ∡	180° 00'	12.5"				
B/S	100					
π	2					
F/S	101					
	0° 00'	00"				
	179° 59'	45"				
	359° 59'	40"				
	179° 59'	50"				
M ∡	179° 59'	47.5"				
TOTAL	360° 00'	00"				
RT ∡	180° 00'	12.5"				
H.D.	2610.360					

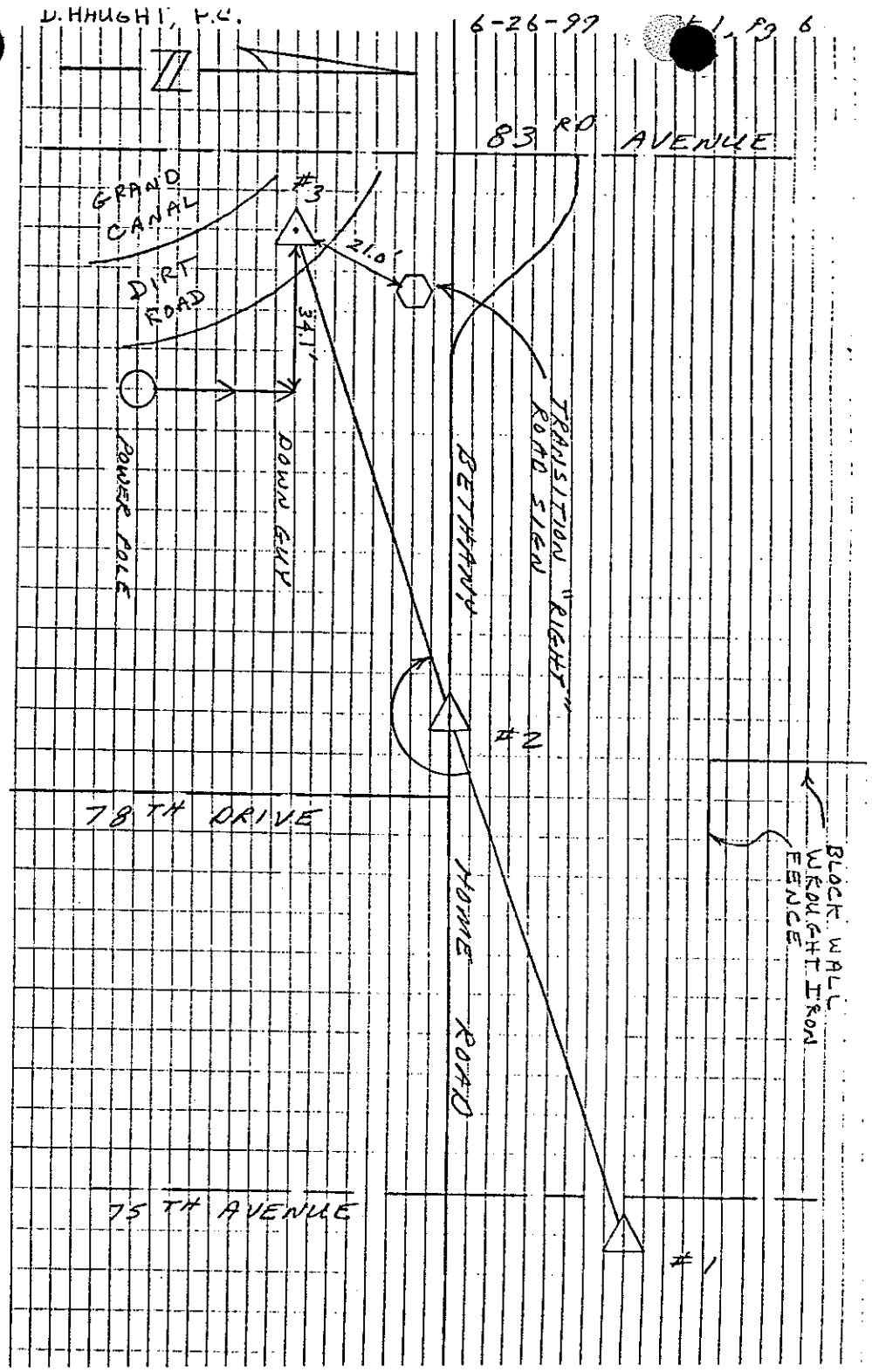


NORTHERLY CONTROL (BASIS OF BEARING)

B/S	101	B.C.F.	83rd AVE & BETHANY HOME ROAD			
T	2	B.C.	H.H.			
F/S	1	C.P.	1/2" IR			
	0° 00'	00"		2666.645	2666.650	
	179° 14'	45"				
	359° 14'	35"				
	179° 59'	55"				
MT	179° 14'	42.5"				
B/S	1					
T	2					
F/S	101					
	0° 00'	00"				
	180° 45'	20"				
	0° 45'	15"				
	179° 59'	55"				
MT	180° 45'	20"				
TOTAL	360° 00'	02.5"				
RT ∡	179° 14'	41.25"				
H.D.	2666.6475					



B/S	1	1/2" I.R.	C.P. @	75th AVE	& BETHANY HOME	ROAD	
⊼	2	B.C.F.	79th AVE	& BETHANY HOME	ROAD		
F/S	3	1/2" I.R.	C.P.				
	0°00'	00"		2042.660	2042.660		
	180°27'	00"					
	0°21'	5"					
	180°00'	00"					
M∡	180°26'	57.5"					
B/S	3						
⊼	2						
F/S	1						
	0°00'	00"					
	179°33'	05"					
	359°33'	00"					
	179°59'	55"					
M∡	179°33'	05"					
TOTAL	360°00'	02.5"					
RT ∡	180°26'	56.25"	55.51'				
H.D.	2042.660						



E 1/4 COR.	SEC. 14	T. 2 N.	R. 1 E.			
B/S	22	PK NAIL				
T	23	"X" IN CONC.				
F/S	104	75th AVE & MISSOURI AVE				
	0° 00'	00"				
	45° 27'	50"	54.610	54.610		
	225° 27'	30"				
	179° 59'	50"				
M ∡	45° 27'	45"				
B/S	104					
T	23					
F/S	22					
	0° 00'	00"				
	314° 32'	20"				
	134° 32'	10"				
	179° 59'	55"				
M ∡	314° 32'	17.5"				
TOTAL	360° 00'	02.5"				
RT ∡	45° 27'	43.75"				
H.D.	54.610					

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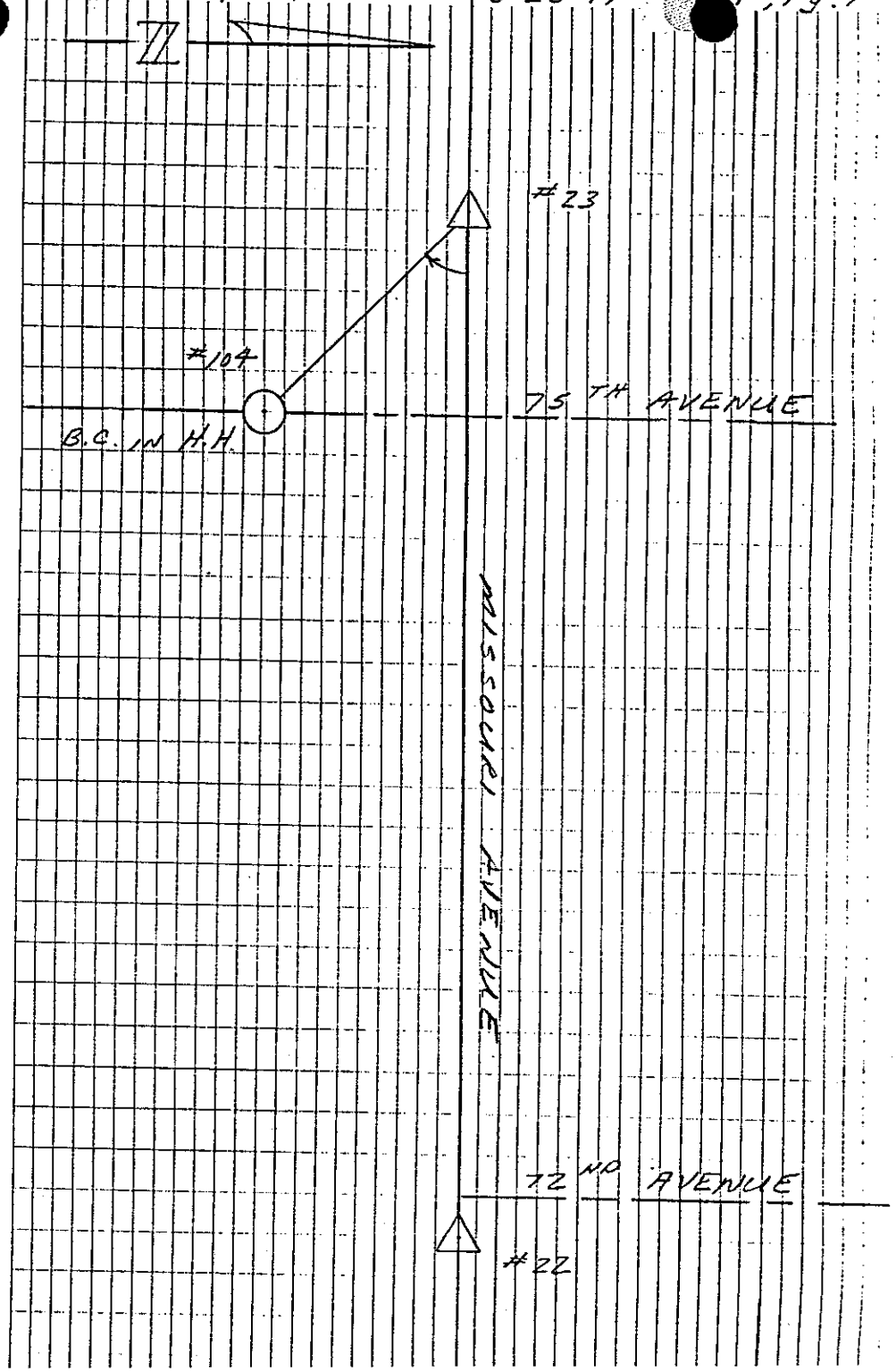
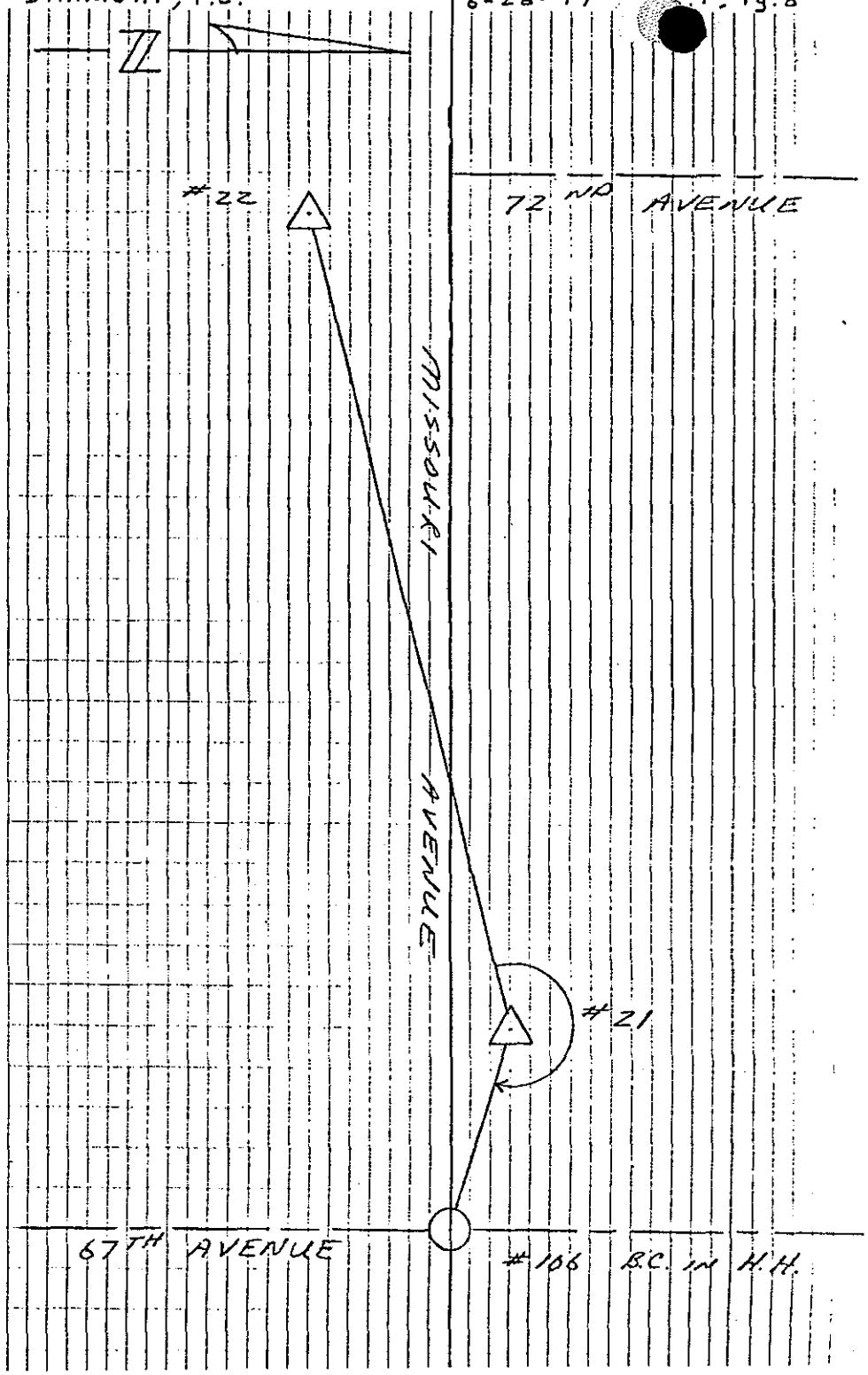


E. 1/4 COR. SEC 13 T. 2 N. R. 1 E.

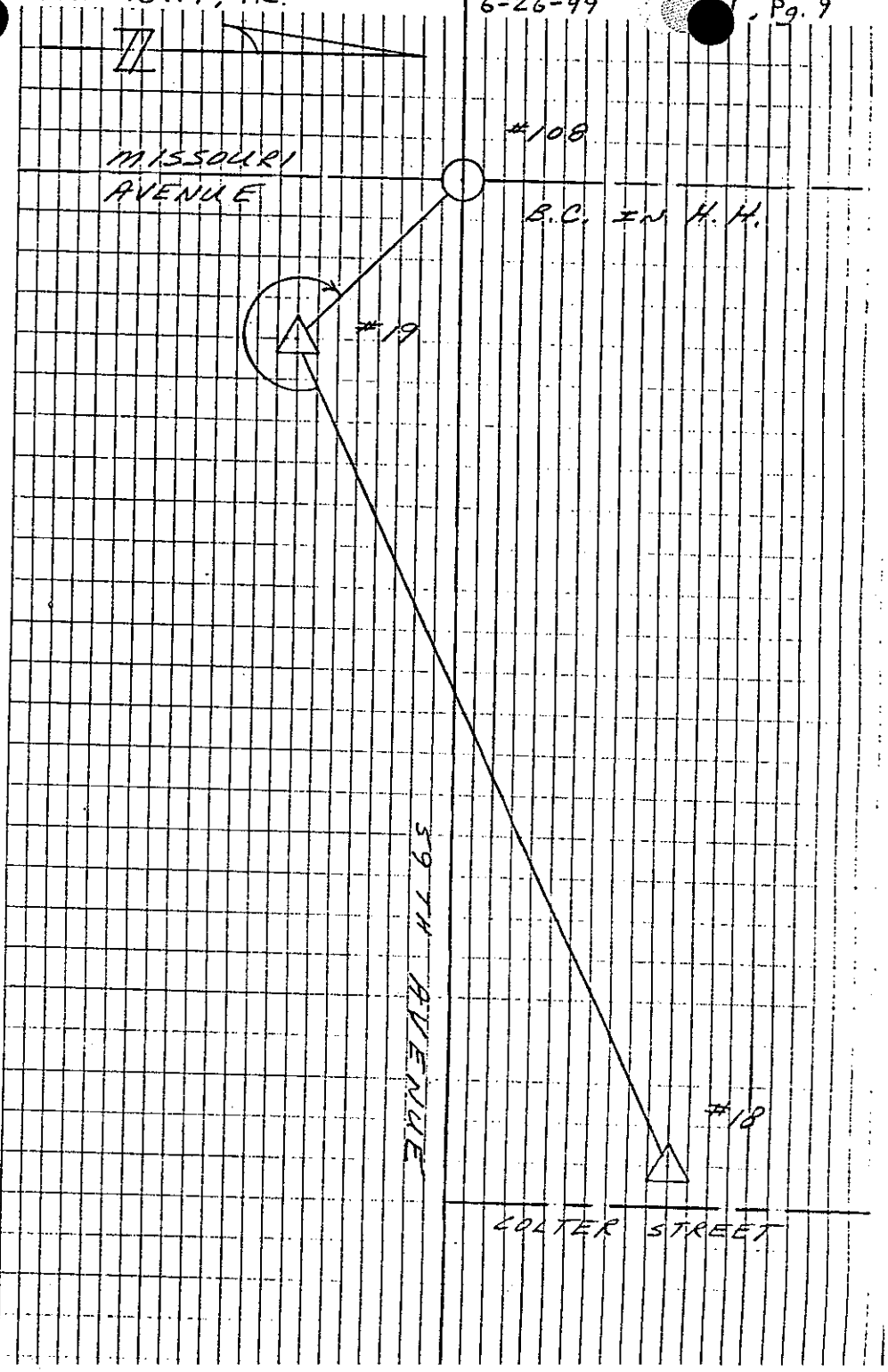
D. HAUGHT, P.C. 6-26-99 BK. 1, Pg. 8

B/S	22					
π	21					
F/S	106		67th AVE & MISSOURI AVE			
	0° 00'	00"				
	195° 30'	30"		83.945	83.945	
	15° 30'	25"				
	179° 59'	55"				
MΣ	195° 30'	30"				
B/S	106					
π	21					
F/S	22					
	0° 00'	00"				
	164° 29'	30"				
	344° 29'	20"				
	179° 59'	45"				
MΣ	164° 29'	32.5"				
TOTAL	360° 00'	02.5"				
RT ∡	195° 30'	28.75"				
H.D.	89.945					



# & 14	COR.	SEC. 18	T. 2 N.	R. 2 E.			
B/S	18						
T	19						
F/S	108		59th AVE &	Missouri	Ave.		
	0° 00'	00"					
	246° 32'	55"		68.100	68.100		
	66° 32'	55"					
	179° 59'	55"					
M ∡	246° 32'	57.5"					
B/S	108						
T	19						
F/S	18						
	0° 00'	00"					
	113° 27'	10"					
	293° 27'	00"					
	179° 59'	55"					
M ∡	113° 27'	07.5"					
TOTAL	360° 00'	05"					
RT ∡	246° 32'	55"					
H.P.	68.100						

D. HAUGHT, P.C. 6-26-99 , Pg. 9

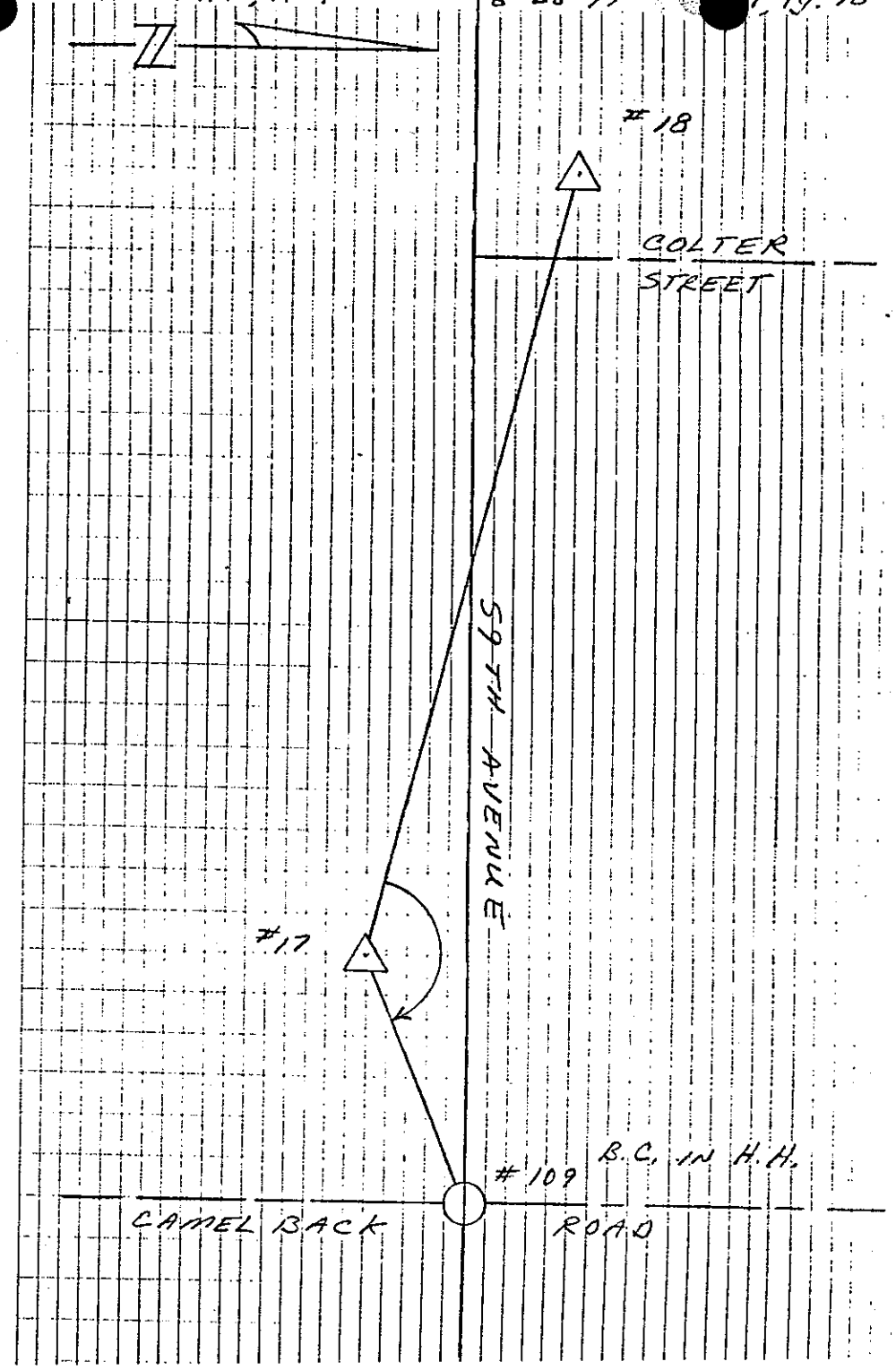


F.S.L.	COR.	SEC. 18	T. 2N.	R. 2 E.		
B/S	18					
T	17					
F/S	109		59th AVE	& CAMELBACK		ROAD
	0° 00'	00"				
	144° 09'	10"		81.025	81.025	
	324° 09'	05"				
	179° 59'	45"				
M∡	144° 09'	15"				
B/S	109					
T	17					
F/S	18					
	0° 00'	00"				
	215° 50'	45"				
	35° 50'	30"				
	179° 59'	45"				
M∡	215° 50'	45"				
TOTAL	360° 00'	00"				
RT∡	144° 09'	15"				
H.D.	81.025					

D. HAUGHT, P.C.

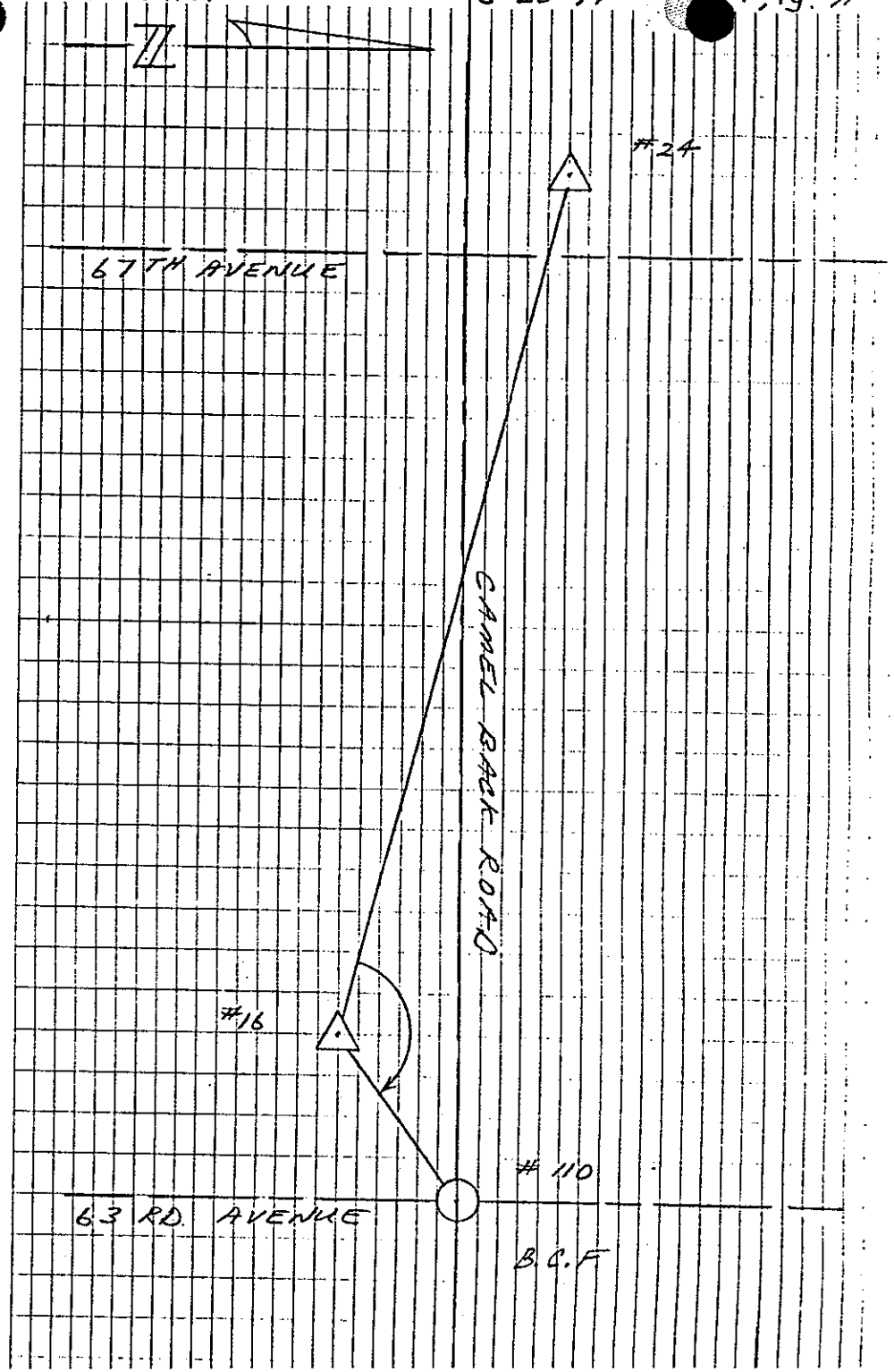
6-26-99

1, Pg. 10



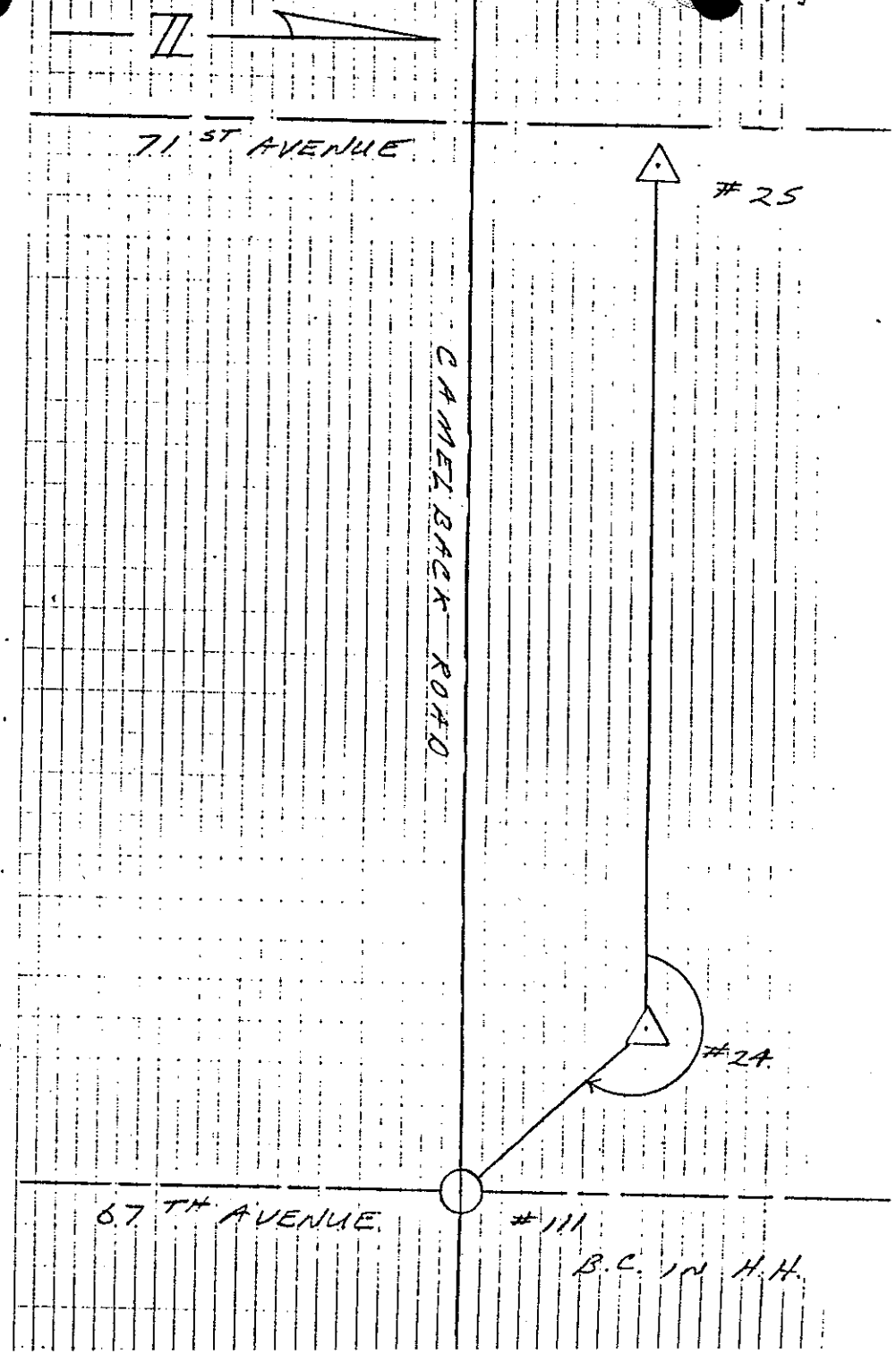
D. HAUGHT, P.C. 6-26-99 Vol 1, Pg. 11

S. 1/4	COR	SEC. 18	T. 2N.	R. 2 E			
B/S	24						
T	16						
F/S	110		63rd AVE &	CAMELBACK		ROAD	
	0° 00'	00"					
	121° 47'	45"		55.210	55.210		
	301° 47'	35"					
	179° 59'	50"					
M∡	121° 47'	45"					
B/S	110						
T	16						
F/S	24						
	0° 00'	00"					
	238° 12'	10"					
	58° 12'	05"					
	179° 59'	55"					
M∡	238° 12'	10"					
TOTAL	359° 59'	55"					
RT ∡	121° 47'	47.5"					
H.D.	55.210						



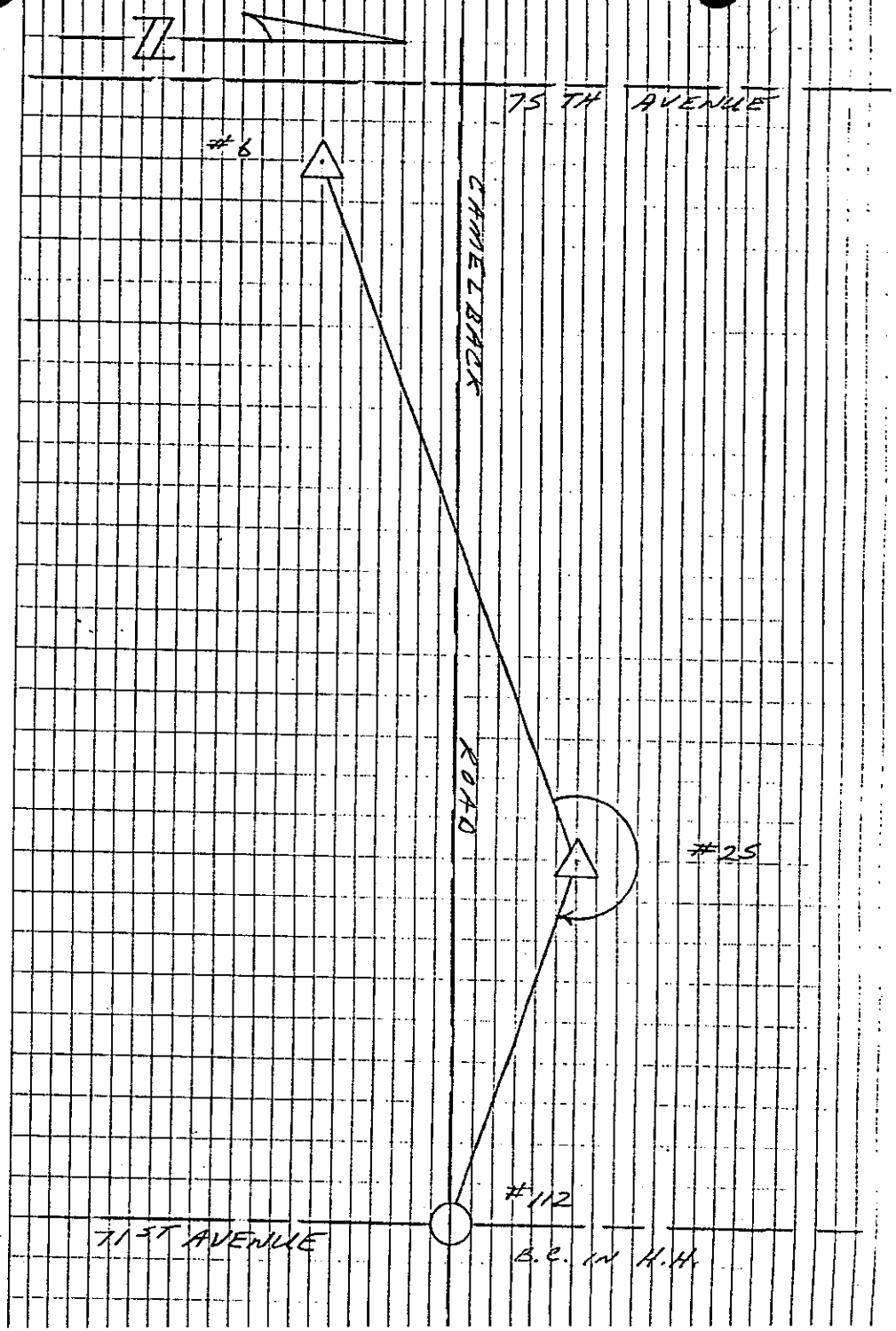
	D.E.	COR.	SEC. 13	T. 2 N.	R. 1 E.			
	B/S	25						
	T	24						
	F/S	111		67TH AVE & CAMELBACK ROAD				
		0° 00'	00"					
		205 14	55		89.335	89.335		
		25° 14'	40"					
		179° 59'	45"					
	M∡	205° 14'	55"					
	B/S	111						
	T	24						
	F/S	25						
		0° 00'	00"					
		154 45	00					
		334 44	50					
		179 59	45					
	M∡	154° 45'	02.5"					
7	TOTAL	359° 59'	57.5"					
1	RT∡	205° 14'	56.25"					
h	H.P.	89.335						

D. HAUGHT, P.C. 6-26-99 1, Pg. 12



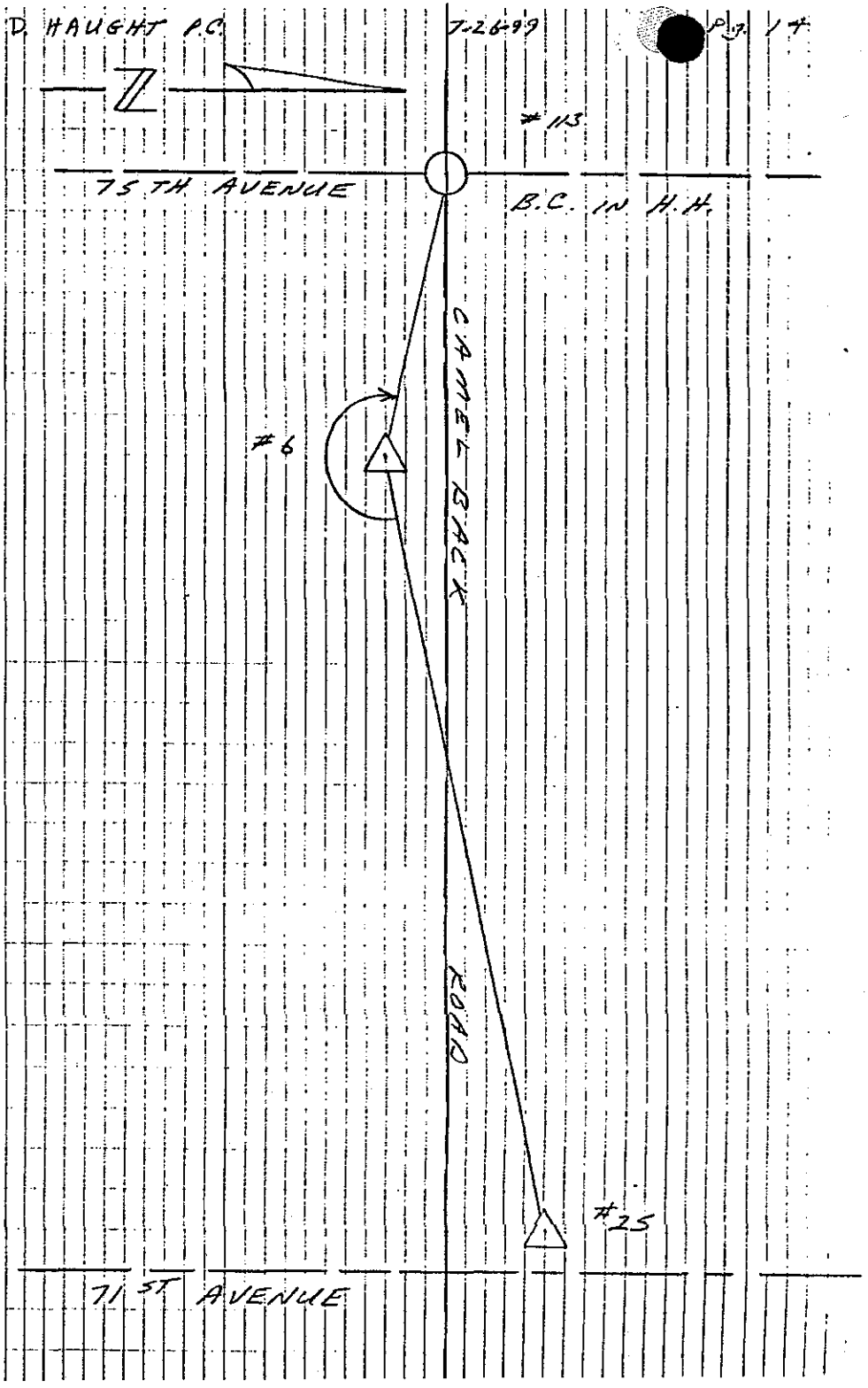
S. 1/4	SEC. 13	T. 2 N.	R. 1 E.				
B/S	6						
T	25						
F/S	112		71ST AVE & CAMELBACK ROAD				
	0° 00'	00"					
	208° 50'	30"		85.795	85.795		
	28° 50'	30"					
	179° 59'	45"					
M ∡	208° 50'	37.5"					
S/S	112						
T	25						
F/S	6						
	0° 00'	00"					
	151° 09'	10"					
	331° 09'	05"					
	179° 59'	45"					
M ∡	151° 09'	15"					
TOTAL	359° 59'	52.5"					
RT ∡	208° 50'	40.75"					
H.D.	85.795						

D. HAUGHT P.C. 6-26-99 Pg. 13



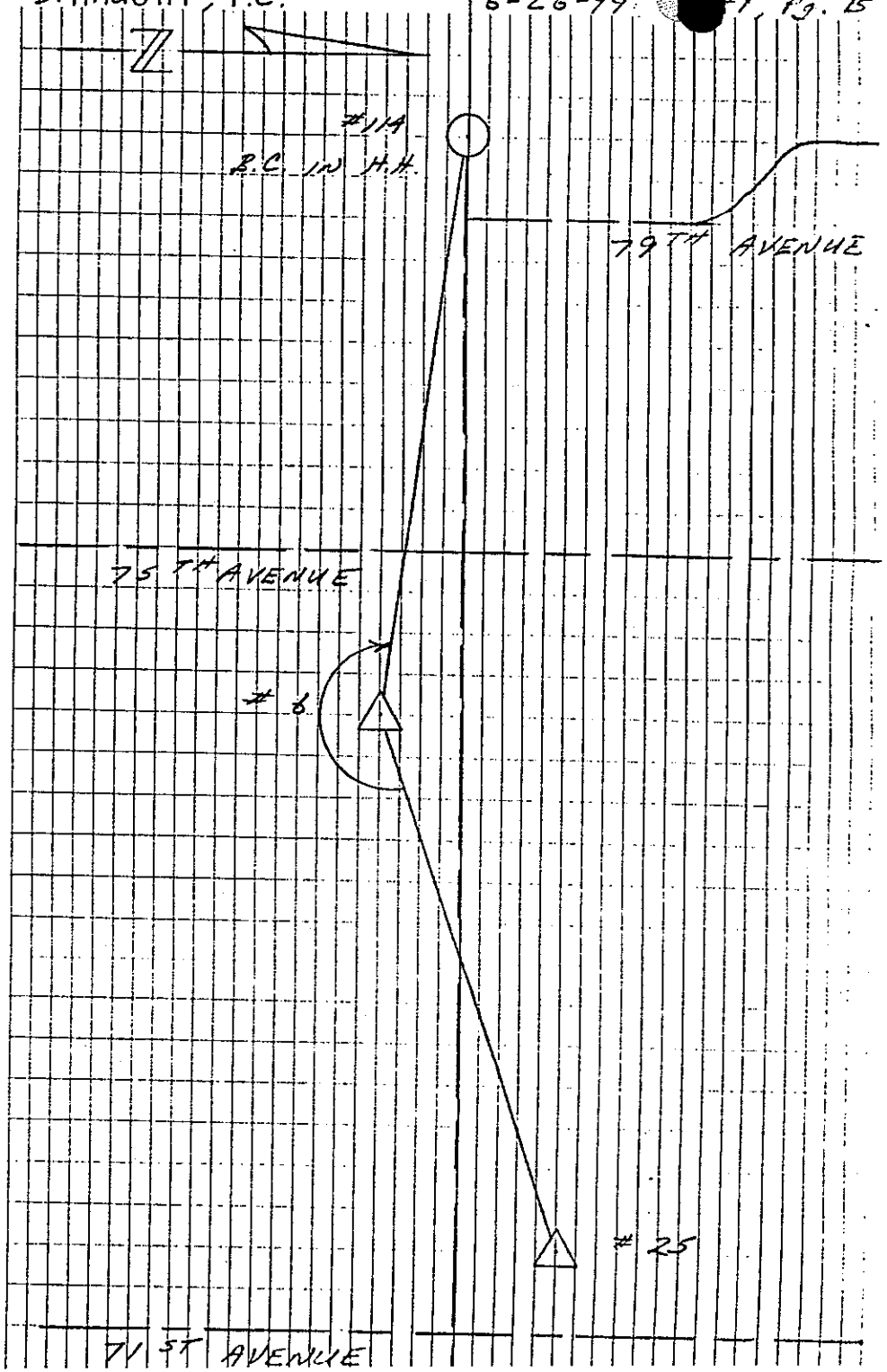
S.E.	COR.	SEC. 14	T. 2 N.	R. 1 E.		
B/S	25					
π	6					
F/S	113		75th AVE & CAMELBACK ROAD			
	0° 00'	00"				
	201 52'	55"		127.580	127.580	
	21 52'	35"				
	179° 59'	45"				
M∡	201° 52'	52.5"				
B/S	113					
π	6					
F/S	25					
	0° 00'	00"				
	158° 07'	10"				
	338° 06'	50"				
	179° 59'	55"				
M∡	158° 07'	02.5"				
TOTAL	359° 59'	55"				
RT∡	201° 52'	55"				
H.D.	127.580					

D. HAUGHT P.C. 7-26-99 Pg. 14

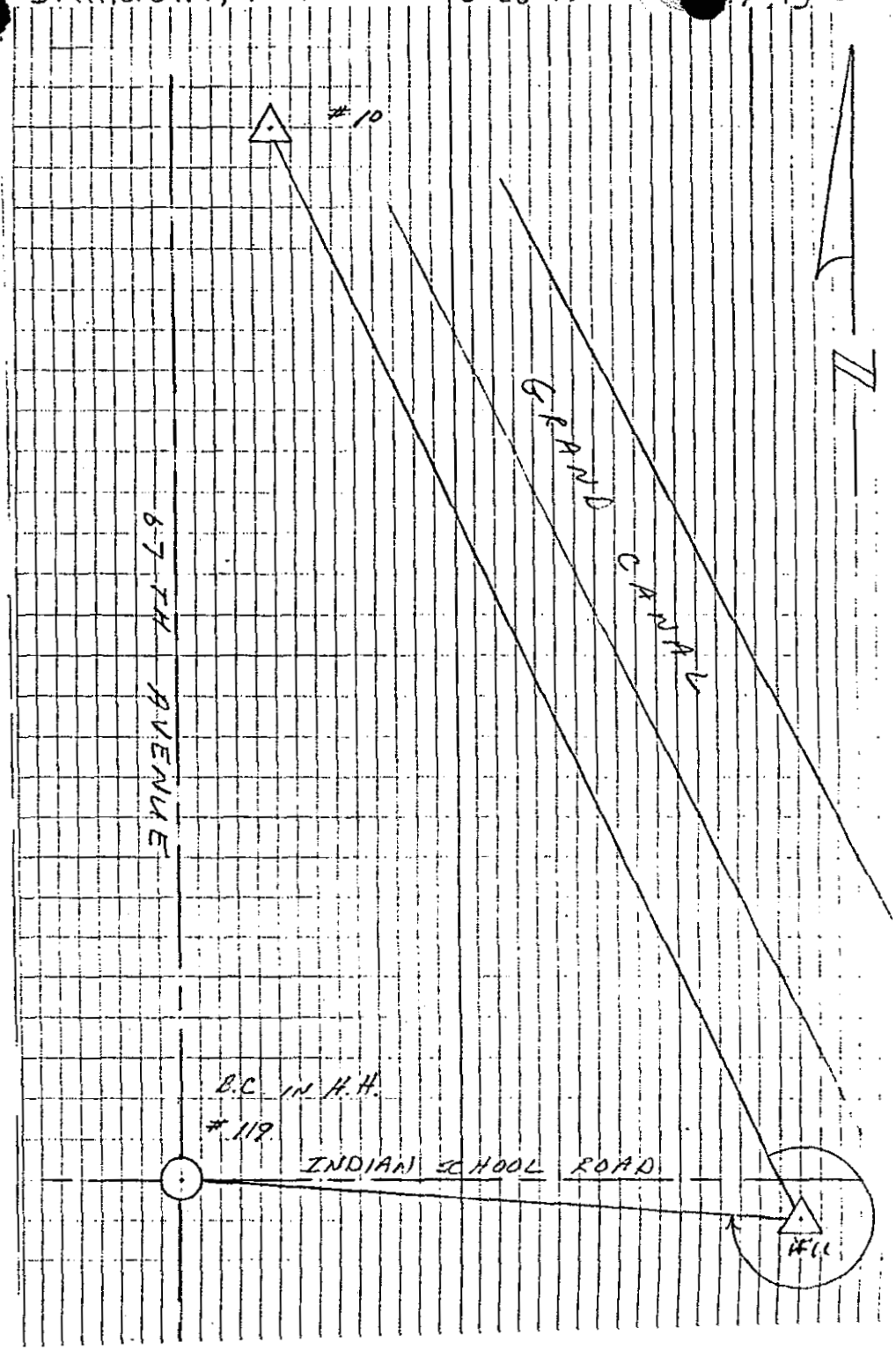


S. 1/4	C[illegible]	SEC. 14	T. 2 N.	R. 1 E.			
B/S	25						
T	6						
F/S	114		79th AVE & CAMELBACK ROAD				
	0° 00'	00"					
	183° 27'	0.5"		2740.445	2740.450		
	3° 26'	55"					
	179° 59'	40"					
MT	183° 27'	10"					
B/S	114						
T	6						
F/S	25						
	0° 00'	00"					
	176° 32'	40"					
	356° 32'	35"					
	179° 59'	40"					
MT	176° 32'	47.5"					
TOTAL	359° 59'	57.5"					
RT ∠	183° 27'	11.25"					
H.P.	2740.445						

D. HAUGHT, P.C. 6-26-99 [illegible]1, Pg. 15

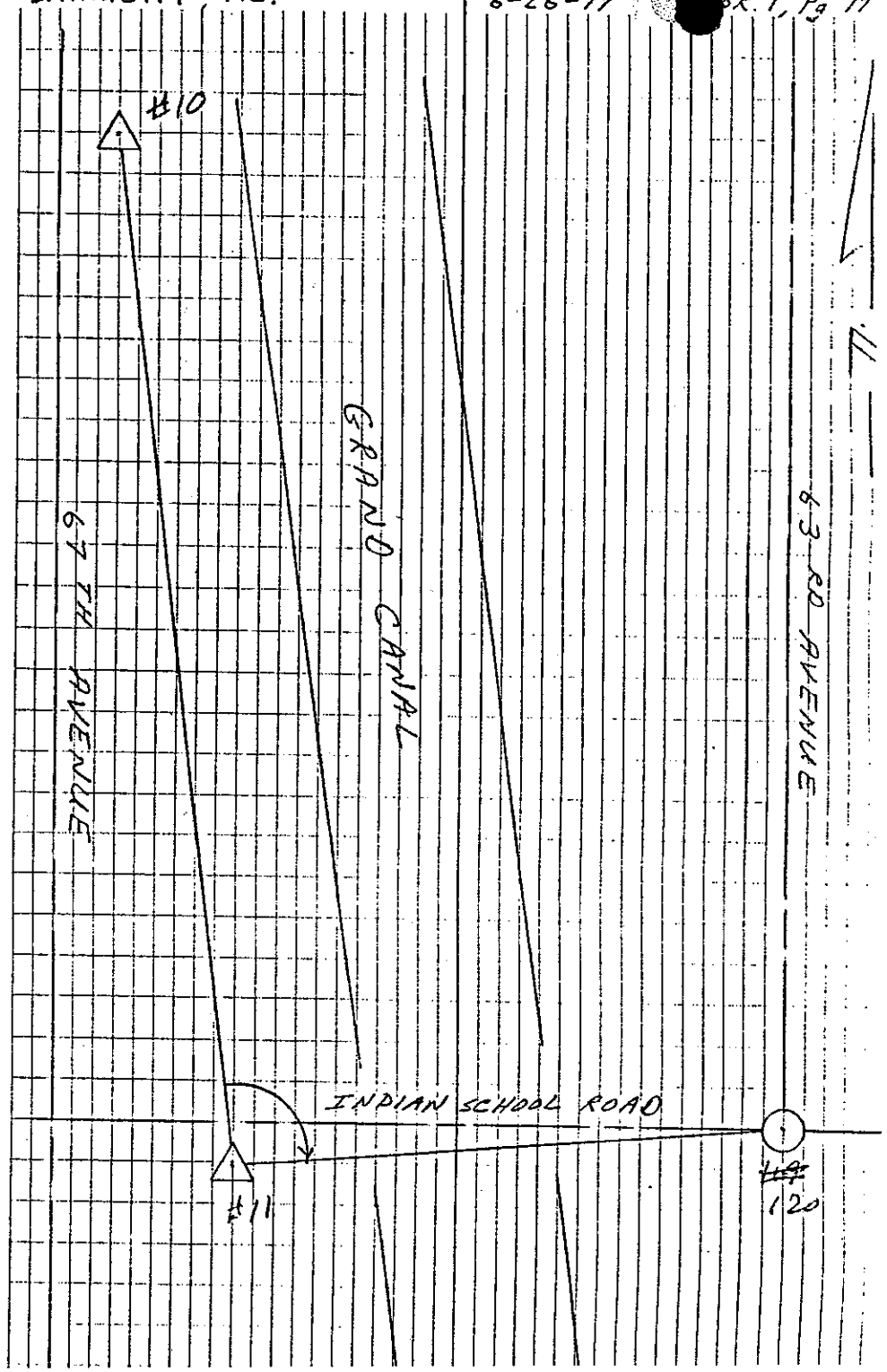


S.E.		SEC. 19	T.2N.	R.2E.	
B/S	10				
⊼	11				
F/S	119		67th AVE & INDIAN SCHOOL ROAD		
	0°	00'	00"		
	309°	57'	20"	1270.540	1270.540
	129°	57'	10"		
	179°	59'	55"		
M∡	309°	57'	17.5"		
B/S	119				
⊼	11				
F/S	10				
	0°	00'	00'		
	50°	02'	50"		
	230°	02'	45"		
	180°	00'	00"		
M∡	50°	02'	47.5"		
TOTAL	360°	00'	05"		
RT∡	309°	57'	15"		
H.D.	1270.540				



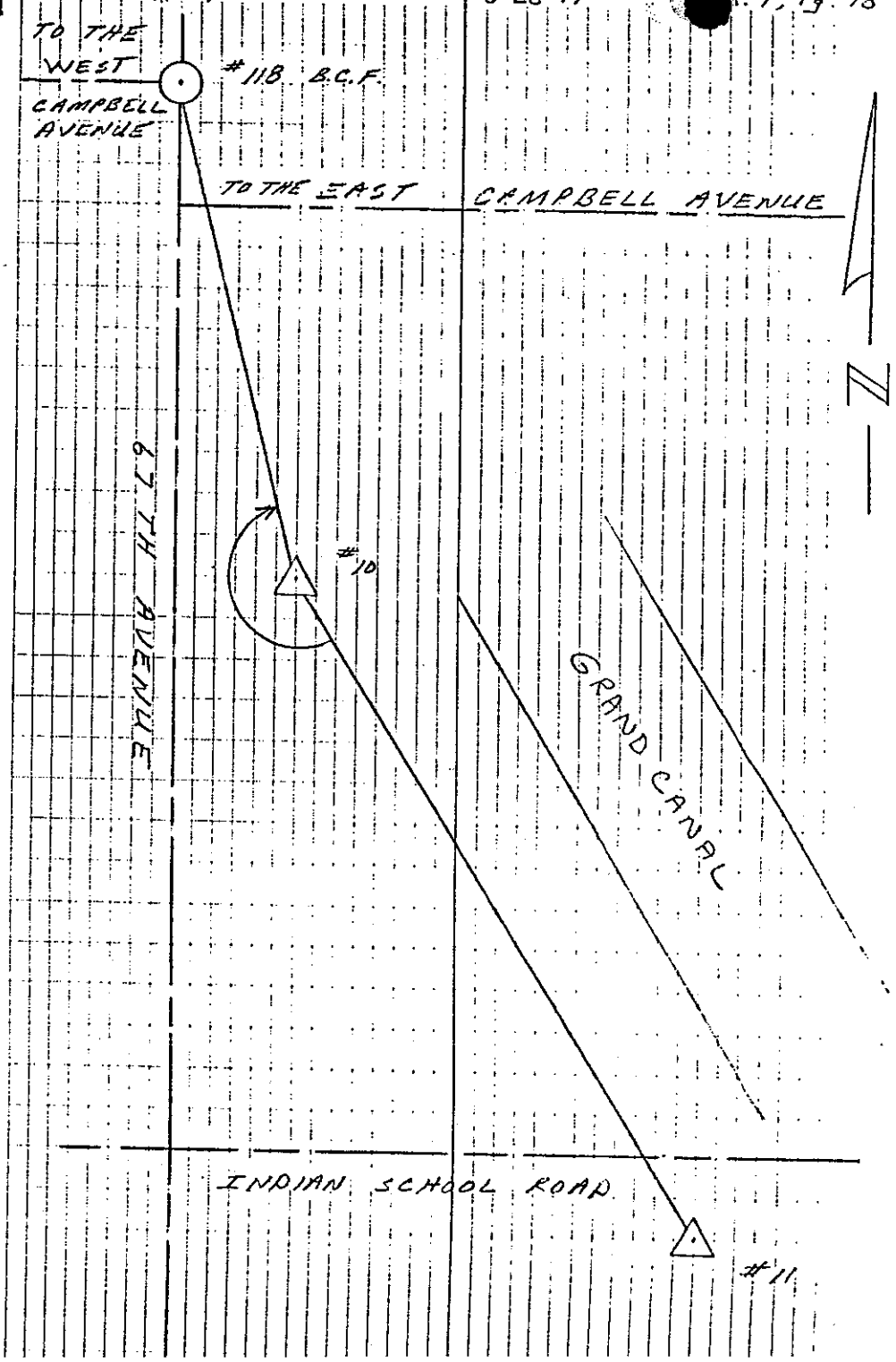
S. 1/4	Cor.	Sec. 19	T. 2 N.	R. 2 E.			
B/S	10						
T	11						
F/S	120		63rd AVE & INDIAN SCHOOL ROAD				
	0° 00'	00					
	126° 00'	40"		1203.350	1203.350		
	306° 00'	30"					
	179° 59'	45"					
M ∡	126° 00'	42.5"					
B/S	120						
T	11						
F/S	10						
	0° 00'	00"					
	233° 59'	05"					
	53° 59'	00"					
	179° 59'	50"					
M ∡	233° 59'	07.5"					
TOTAL	359° 59'	50"					
RT ∡	126° 00'	47.5"					
H.D.	1203.350						

D. HAUGHT P.C. 6-26-99 BK. 1, Pg 17

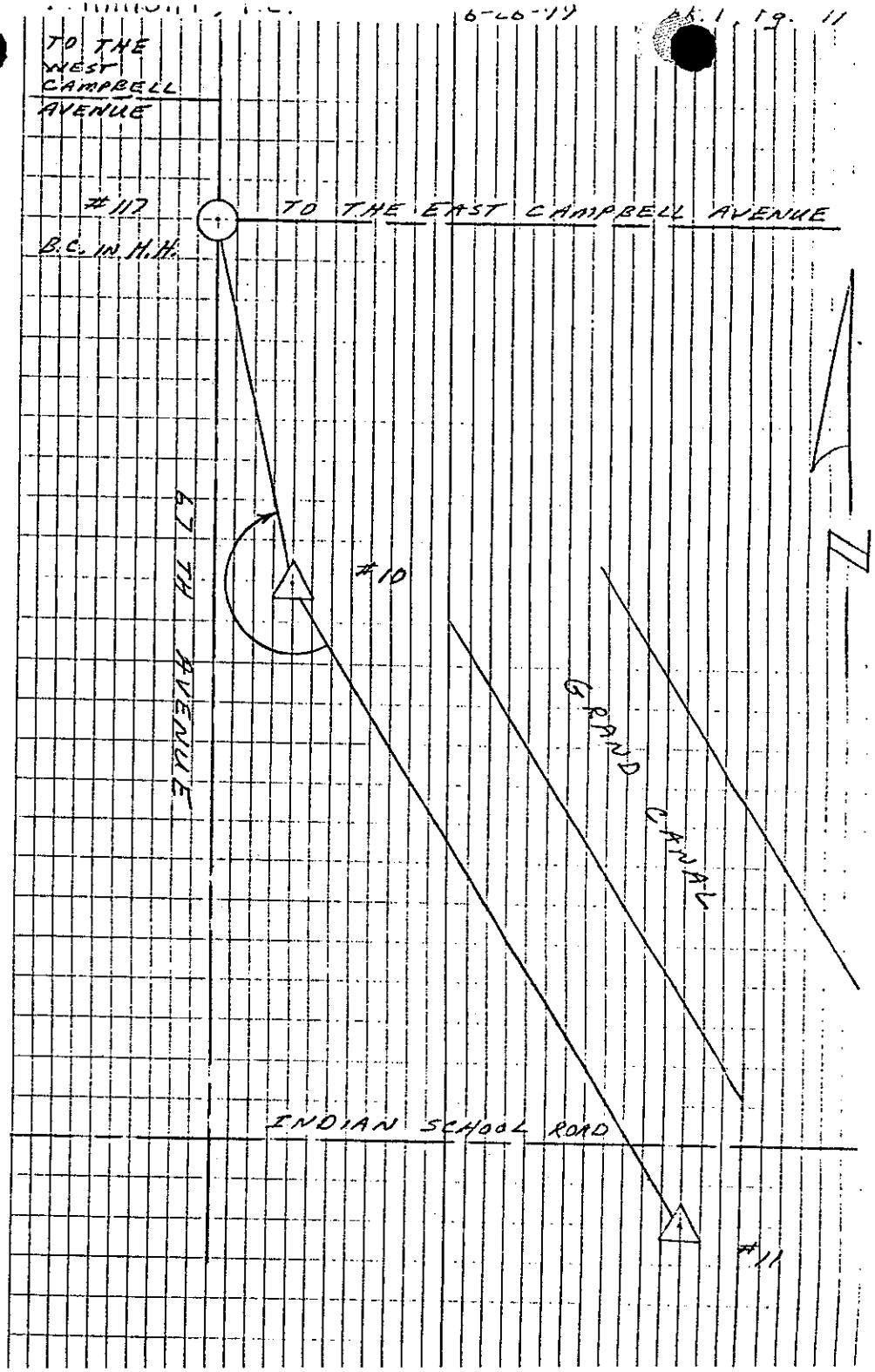


E. 1/4 COR.	SEC. 24	T. 2 N.	R. 1 E.			
B/S 11						
T 10						
F/S 118	B.C.F.	67th AVE & WEST CAMPBELL AVE.				
0° 00'	00"					
217° 43'	25"		1302.560	1302.565		
37° 43'	10" 15"					
179° 59'	55"					
M ∡ 217° 43'	20"					
B/S 118						
T 10						
F/S 11						
0° 00'	00"					
142° 16'	40"					
322° 16'	30" 40"					
179° 59'	50"					
M ∡ 142° 16'	40"					
TOTAL 360° 00'	00"					
RT ∡ 217° 43'	20"					
H.P. 1302.560						

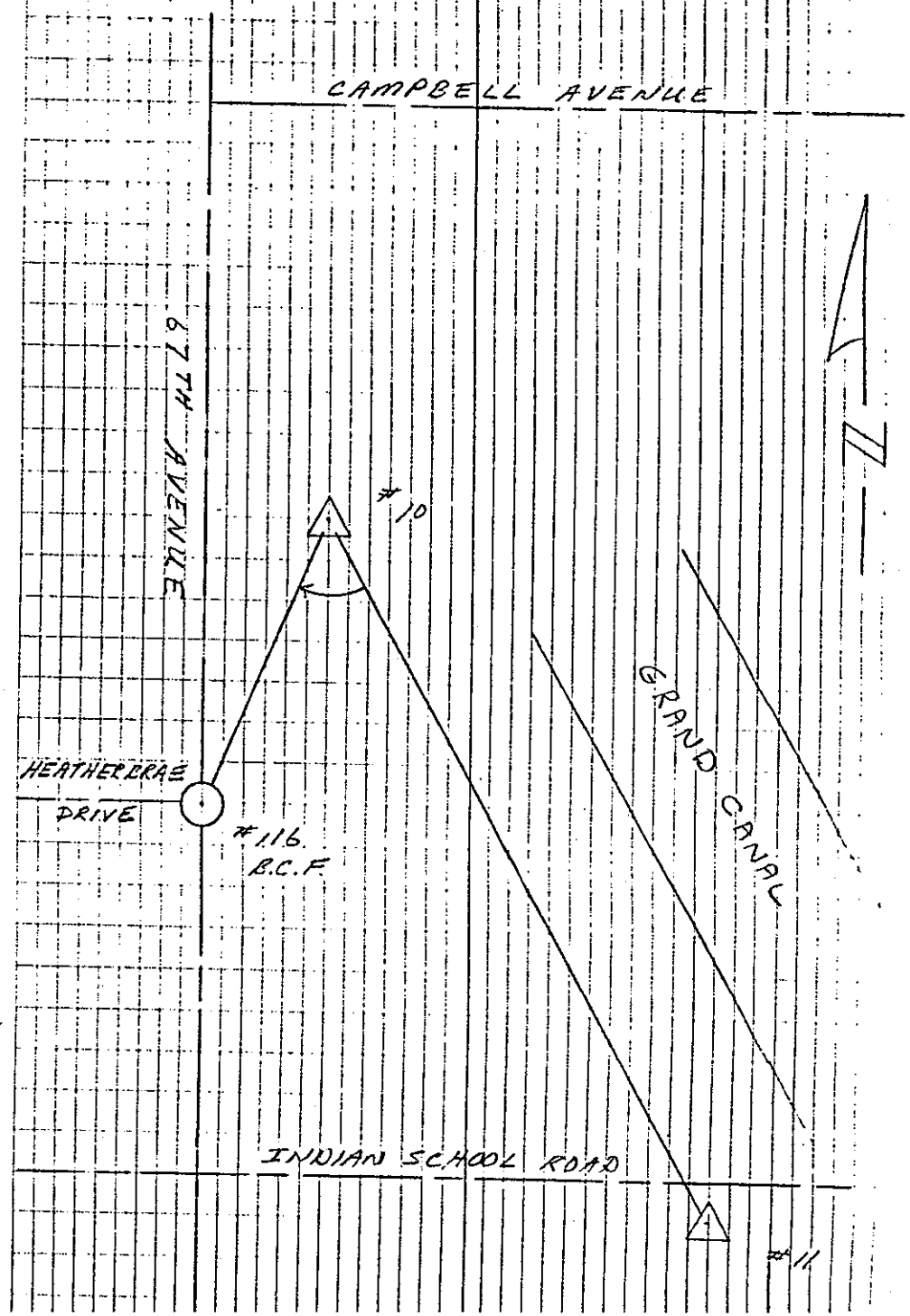
D. HAUGHT, P.C. 6-26-99 Bk. 1, Pg. 18



B/S	117					
T	10					
F/S	117	H.H.	67th AVE & EAST CAMPBELL AVE			
	0° 00'	00"				
	217 31	15		1150.045	1150.040	
	37 30	55	31 05			
	179° 59'	50"				
M ∠	217° 31'	10"				
B/S	117					
T	10					
F/S	11					
	0° 00'	00"				
	142 28	55				
	322 28	45				
	179 59	55				
M ∠	142° 28'	52.5"				
TOTAL	360° 00'	02.5				
RT ∠	217° 31'	08.75"				
H.D.	1150.0425					



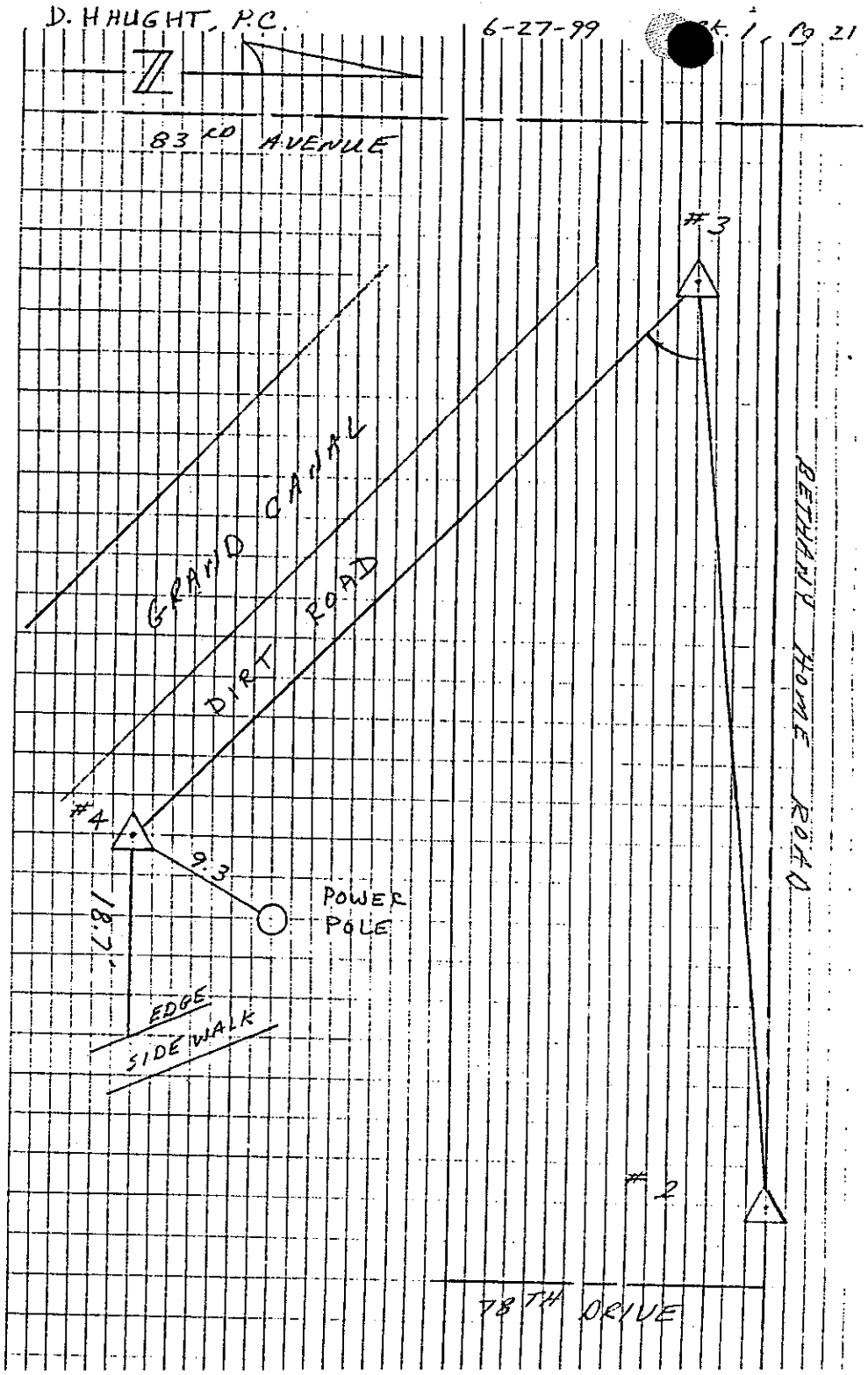
1/16		SEC. 24	T. 2 N.	R. 1 E.		
B/S	11	C.P.				
π	10	C.P.	ON SIDE WALK	EAST SIDE 67th AVE ON CANAL BRIDGE		
F/S	116	BCF	67th	AVE &	HEATHERBRAE	DR.
	0° 00'	00"				
	50 41	05		177.165	177.170	
	230 41	00				
	180 00	00				
M∡	50° 41'	02.5"				
B/S	116					
π	10					
F/S	11					
	0° 00'	00"				
	309 19	00				
	129 18	50				
	180 00	00				
M∡	309° 18'	55"				
TOTAL	359° 59'	57.5"				
RT ∡	50° 41'	01.25"				
H.D.	177.1675					



HORIZONTAL CONTROL

D. HAUGHT, P.C. 6-27-99 Bk. 1, Pg 21

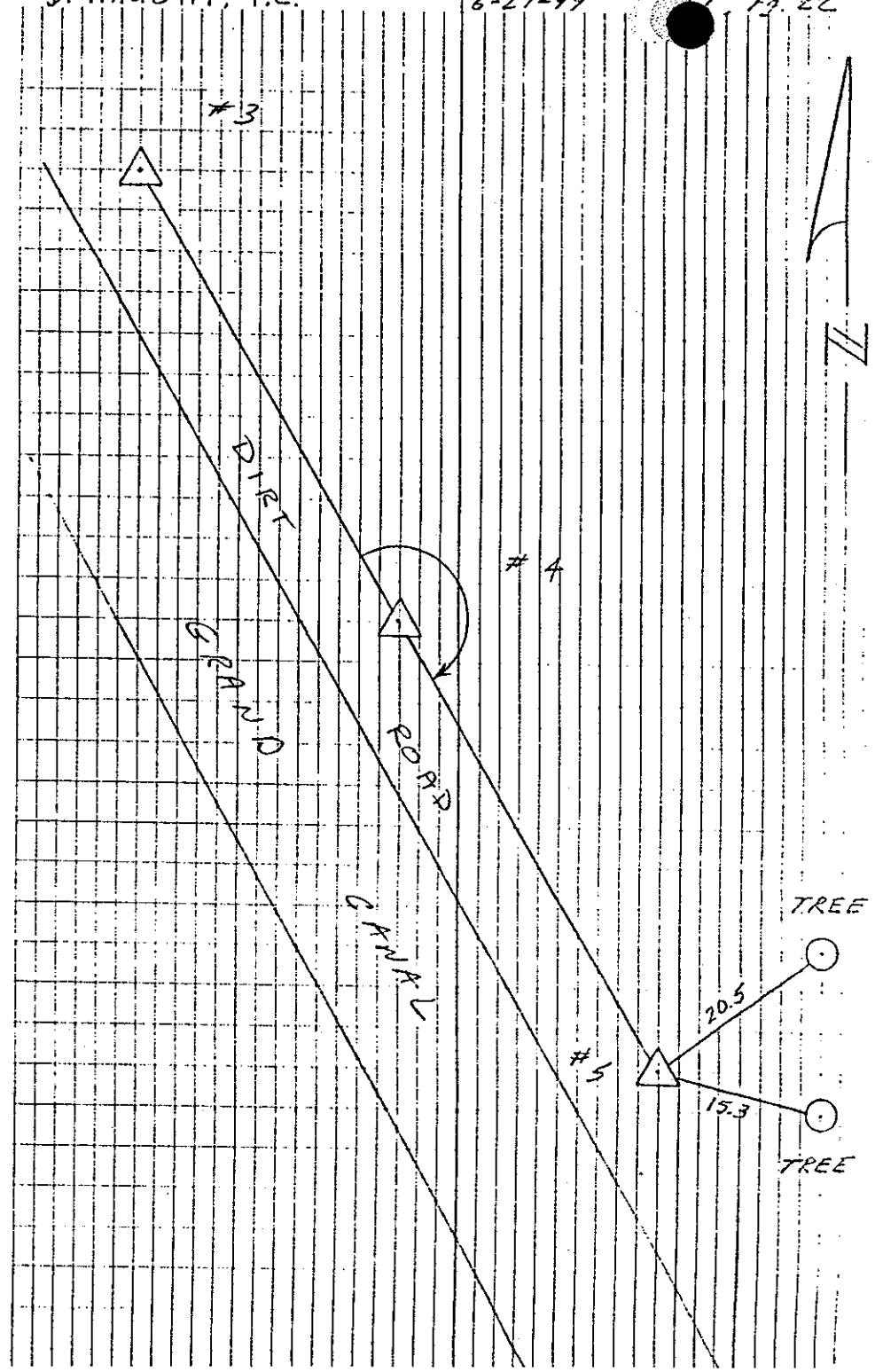
B/S	2	B.C. IN HH	N. 1/4 Cor.	Sec. 14	T. 2 N.	R. 1 E.	
⊼	3	1/2" I.P.					
F/S	4	1/2" I.R.					
	0° 00' 00"						
	47° 53' 10"			3382.530	3382.530		
	227° 53' 00"						
	179° 59' 45"						
MT	47° 53' 12.5"						
B/S	4						
⊼	3						
F/S	2						
	0° 00' 00"						
	312° 06' 45"						
	132° 06' 35"						
	179° 59' 50"						
MT	312° 06' 45"						
TOTAL	359° 59' 57.5"						
RT ⊼	47° 53' 11.25"		10.51"				
H.O.	3382.530						



HORIZONTAL CONTROL

D. HAUGHT, P.C. 6-27-99 Pg. 22

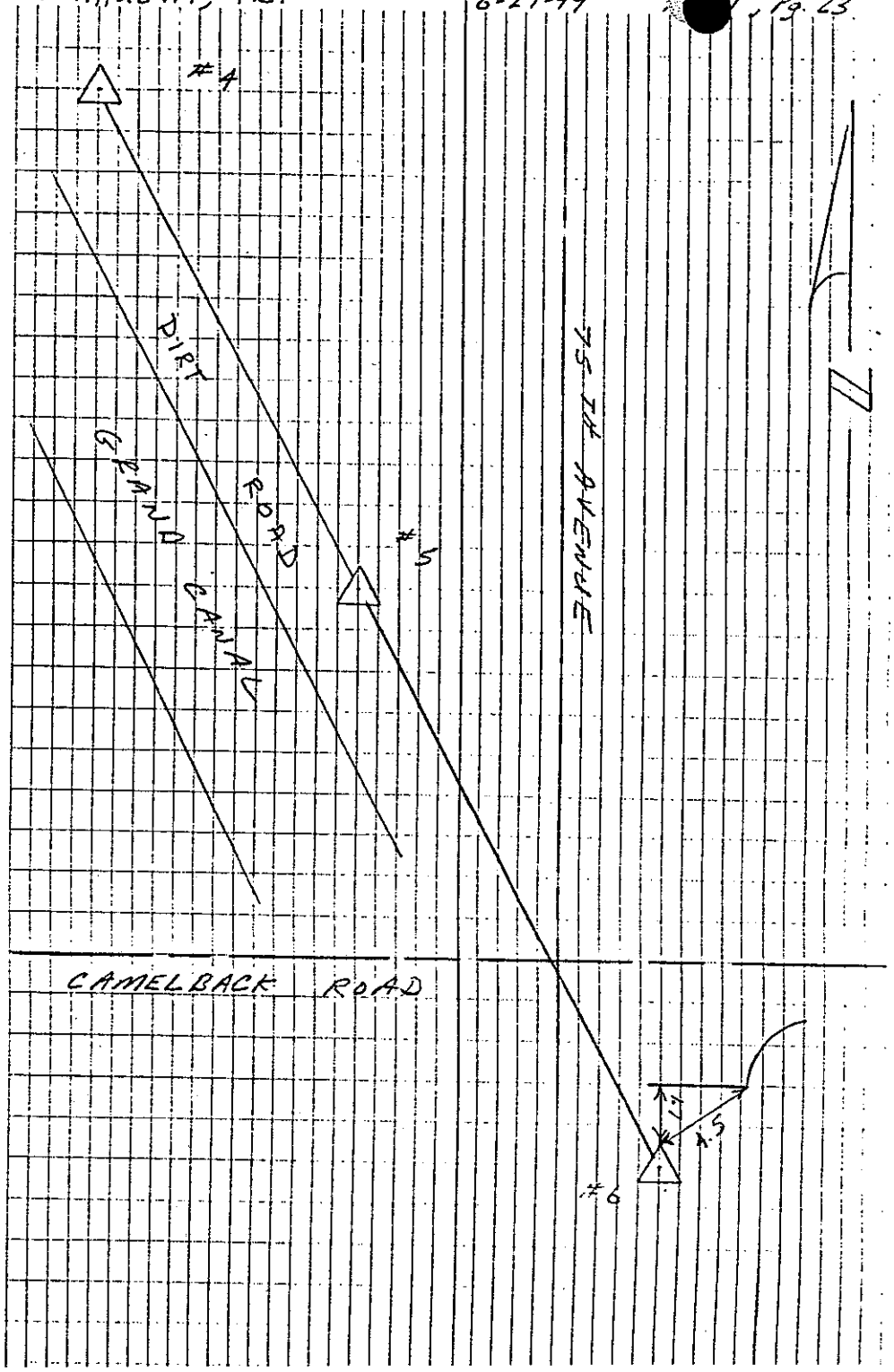
B/S	3	1/2" I.R.			
T	4	1/2" I.R.			
F/S	5	1/2" I.R.			
	0° 00'	00"			
	180° 11'	20"	2151.330	2151.080	
	0° 11'	15"			
	179° 59'	55"			
MT	180° 11'	20"			
B/S	5				
T	4				
F/S	3				
	0° 00'	00"			
	179° 48'	40"			
	359° 48'	35"			
	179° 59'	50"			
MT	179° 48'	42.5"			
TOTAL	360° 00'	02.5"			
RT	180° 11'	18.75"	18.01"		
H.D.	2151.080				



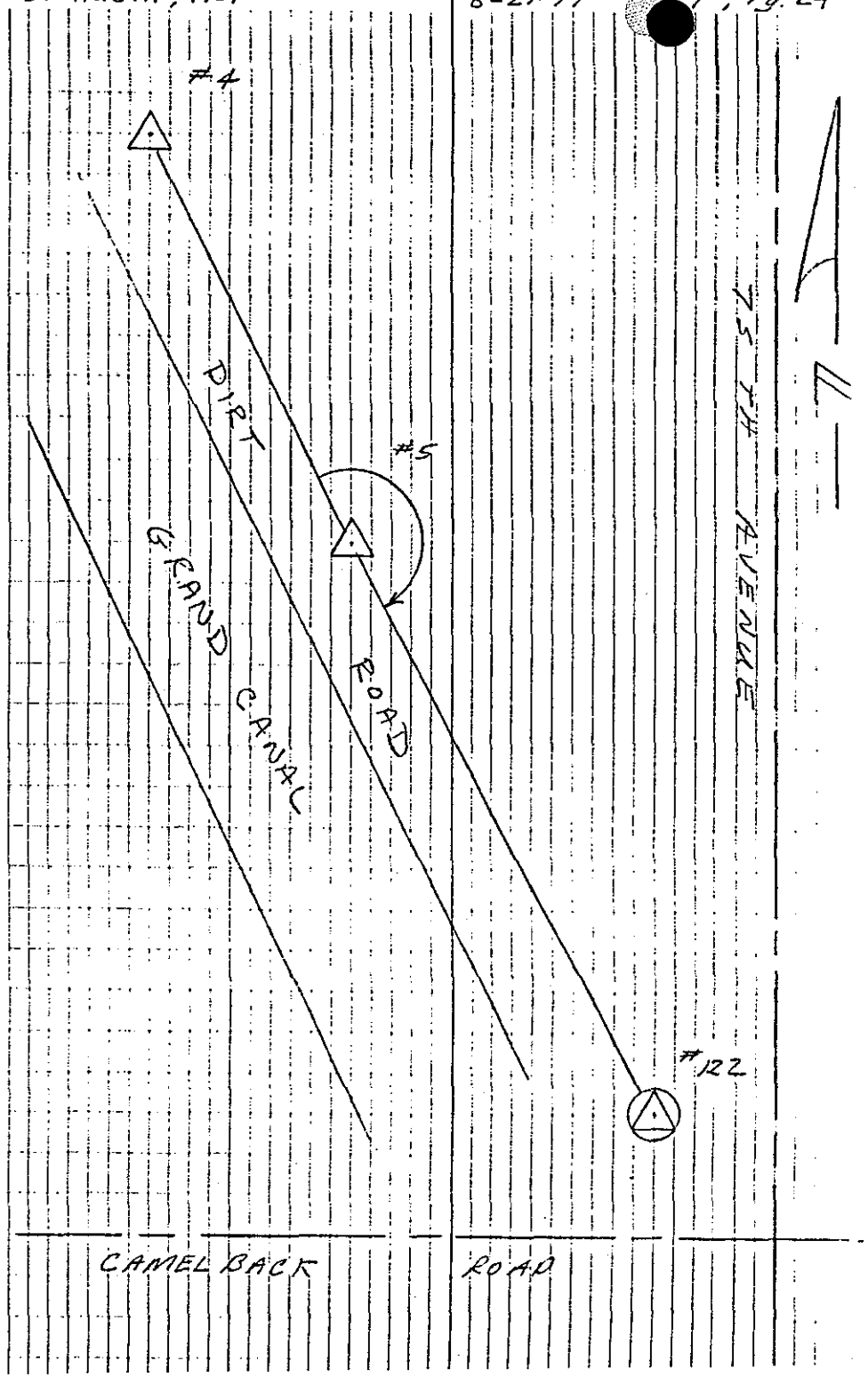
HORIZONTAL CONTROL

D. HAUGHT, P.C. 6-27-99 Pg. 23

B/S	4	1/2" I.R.				
π	5	1/2" I.R.				
F/S	6	1/2" I.R.				
	0° 00' 00"					
	182° 48' 45"			1564.725	1564.730	
	2° 48' 55"					
	180° 00' 00"					
M∡	182° 48' 50"					
B/S	6					
π	5					
F/S	4					
	0° 00' 00"					
	177° 11' 15"					
	357° 10' 55" 60					
	179° 59' 55"					
M∡	177° 11' 07.5"					
TOTAL	359° 59' 57.5"					
RT ∡	182° 48' 48.75"	48.01"				
H.O.	1564.7275					



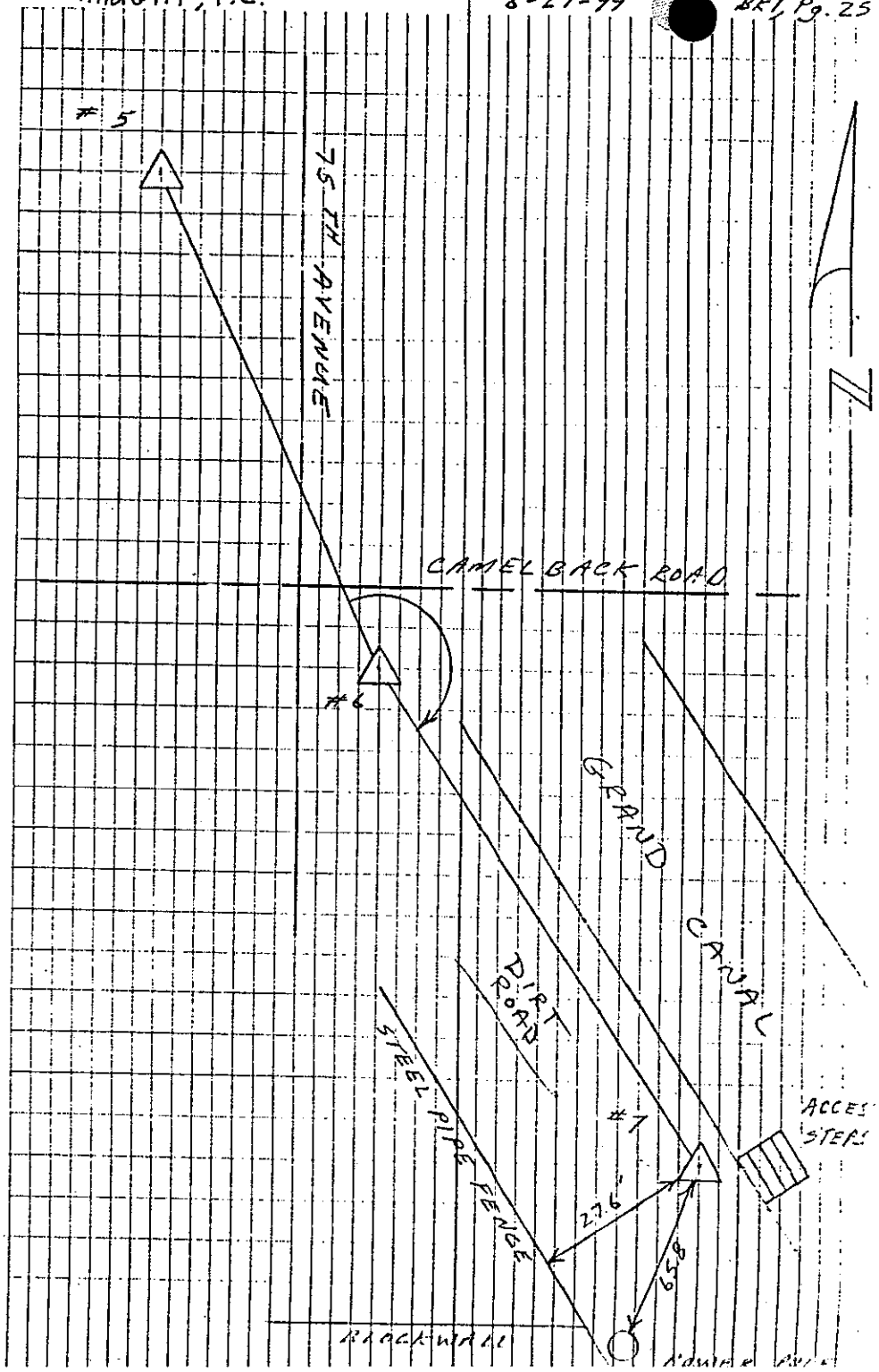
B/S	4	1/2" I.R.			
π	5	1/2" I.R.			
F/S	122	"BACK"	TRI-STATION		
	0° 00' 00"				
	180° 56' 25"			1250.585	1250.585
	0° 56' 30" 40				
	179° 59' 50"				
M∡	180° 56' 32.5"				
B/S	122				
π	5				
F/S	4				
	0° 00' 00"				
	179° 03' 40"				
	359° 03' 20" 30"				
	179° 59' 50"				
M∡	179° 03' 35"				
TOTAL	360° 00' 07.5"				
RT ∡	180° 56' 28.75"				
H.D.	1250.585				



HORIZONTAL CONTROL

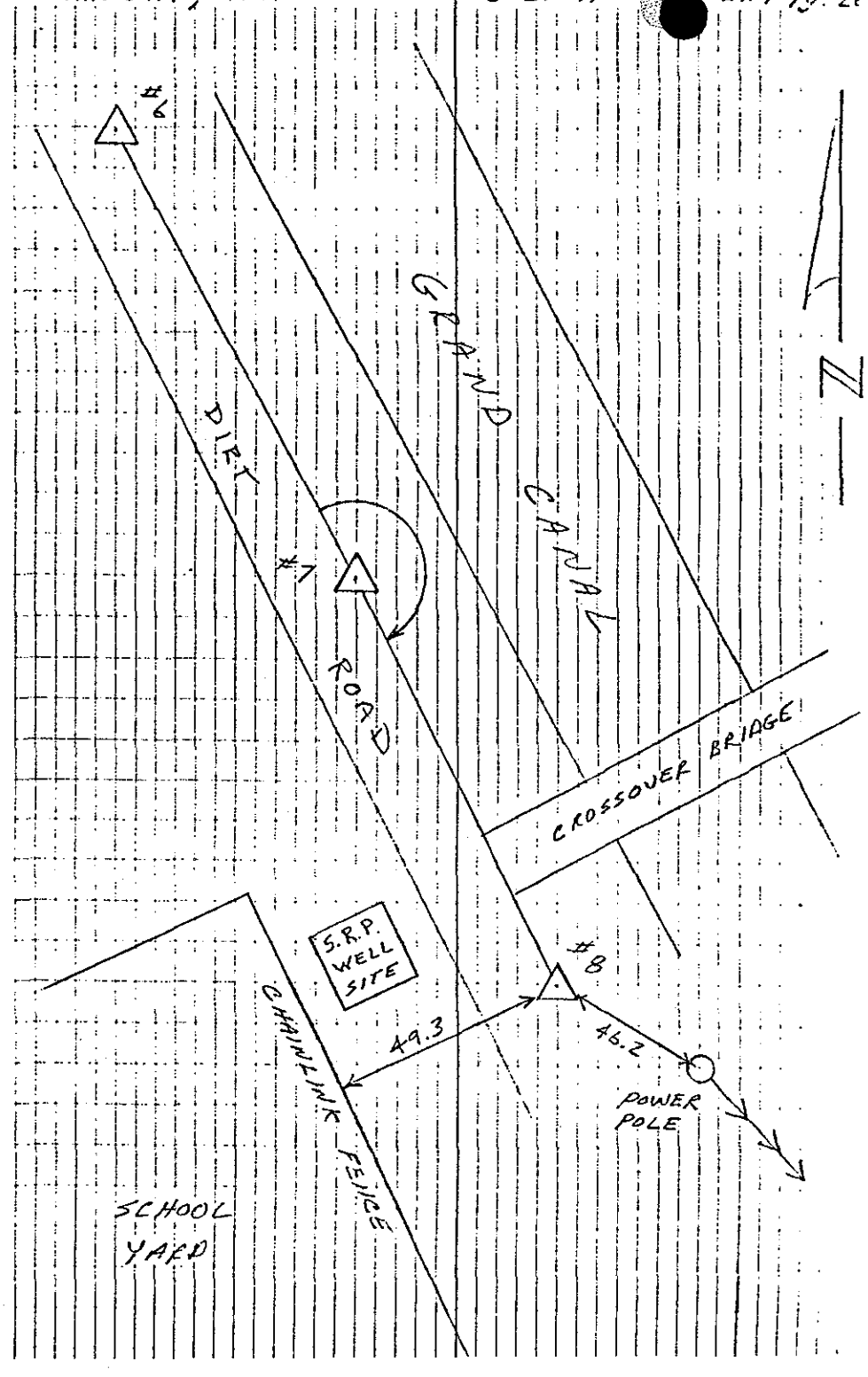
B/S		1/2" I.R.			
T	6	1/2" I.R.			
F/S	7	1/2" I.R.			
	0° 00' 00"				
	177° 16' 10"		2123.130	2123.130	
	357° 16' 00"				
	179° 59' 50"				
M∡	177° 16' 10"				
B/S	7				
T	6				
F/S	5				
	0° 00' 00"				
	182° 44' 00"				
	2° 43' 45" 50"				
	179° 59' 55"				
M∡	182° 43' 55"				
TOTAL	360° 00' 05"				
RT ∡	177° 16' 07.5"	06.76"			
H.P.	2123.130				

D. HAUGHT, P.C. 6-27-99 Bk1, Pg. 25



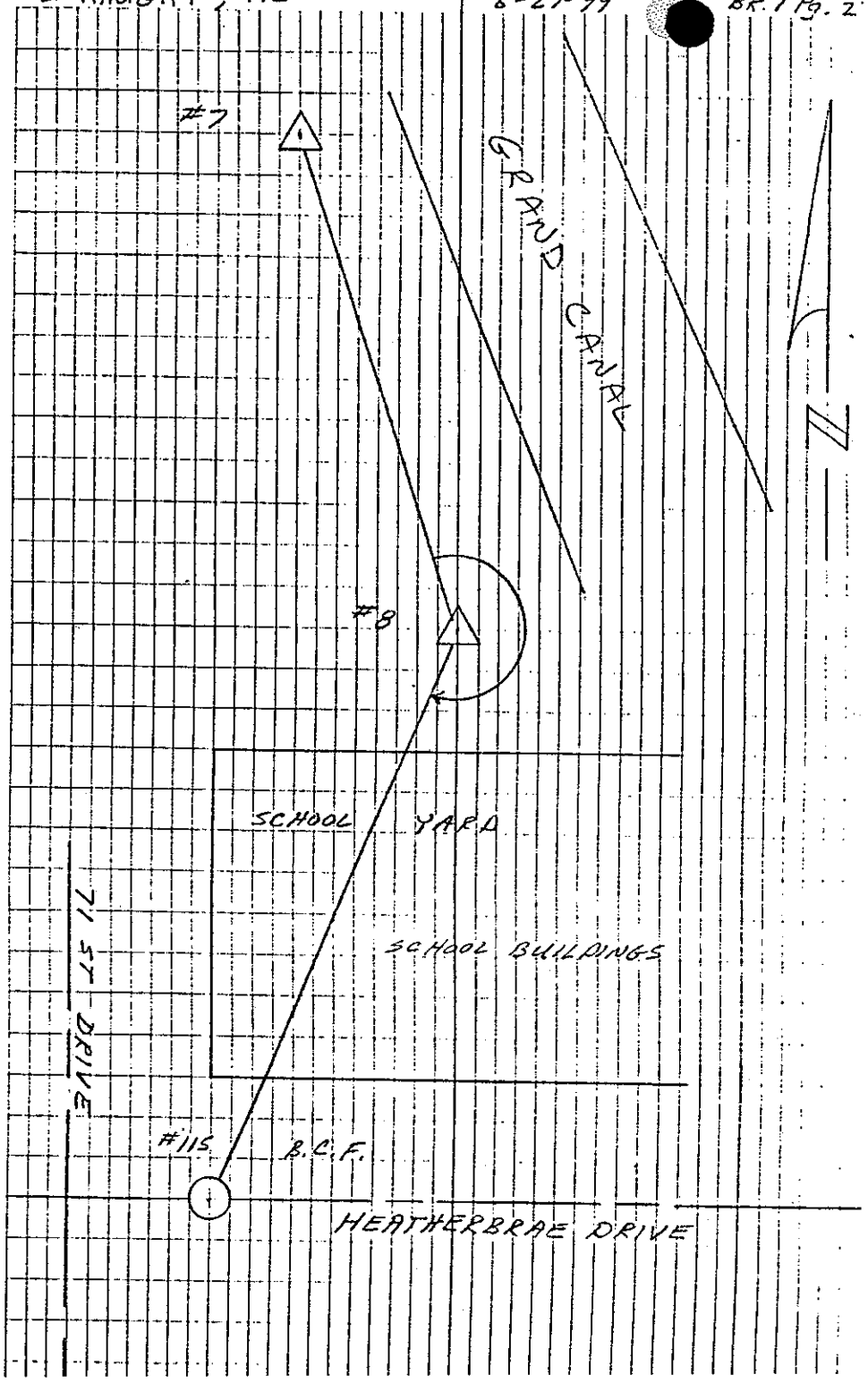
D. HAUGHT, P.C. 6-27-99 Bk 1 Pg. 20

HORIZONTAL CONTROL					
B/S	6	1/2" I.P.			
π	7	1/2" I.K.			
F/S	8	1/2" I.R.			
	0° 00'	00"			
	171° 47'	10"		1446.850	1446.850
	351° 47'	05" 10"			
	179° 59'	55"			
M ∡	171° 47'	10"			
B/S	8				
π	7				
F/S	6				
	0° 00'	00"			
	188° 12'	55"			
	8° 12'	50" 55			
	179° 59'	55"			
M ∡	188° 12'	55"			
TOTAL	360° 00'	05"			
RT ∡	171° 47'	07.5"	06.76"		
H.P.	1446.850				

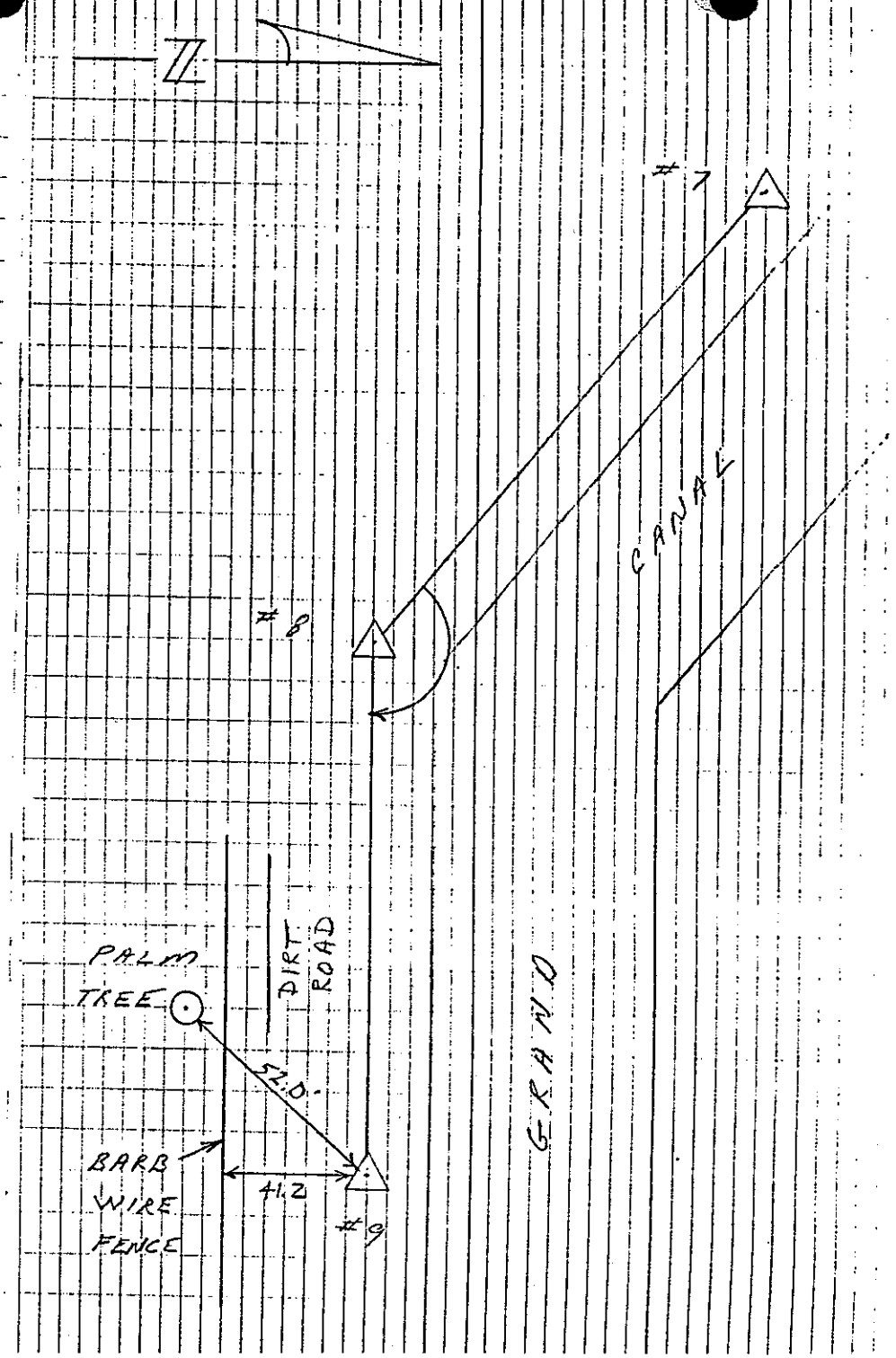


1/16	COR.	SEC. 24	T. 2 N	R. 1 E.				
B/S	7	1/2" I.R.						
T	8	1/2" I.R.						
F/S	115	B.C.F.	ON HEATHERBRAE, NEAR 71st Ave.					
	0° 00'	00"						
	233° 10	00"		1362.670	1362.665			
	53° 09	50" 55"						
	179° 59	55"						
M ∡	233° 09'	57.5"						
B/S	115							
T	8							
F/S	7							
	0° 00'	00"						
	126° 50'	00"						
	306° 49	55" 50' 00"						
	179° 59'	55"						
M ∡	126° 50'	00"						
TOTAL	359° 59'	57.5"						
RT ∡	233° 09'	58.75"	58.01"					

D. HAUGHT, P.C 6-27-99 BK. 1 Pg. 2



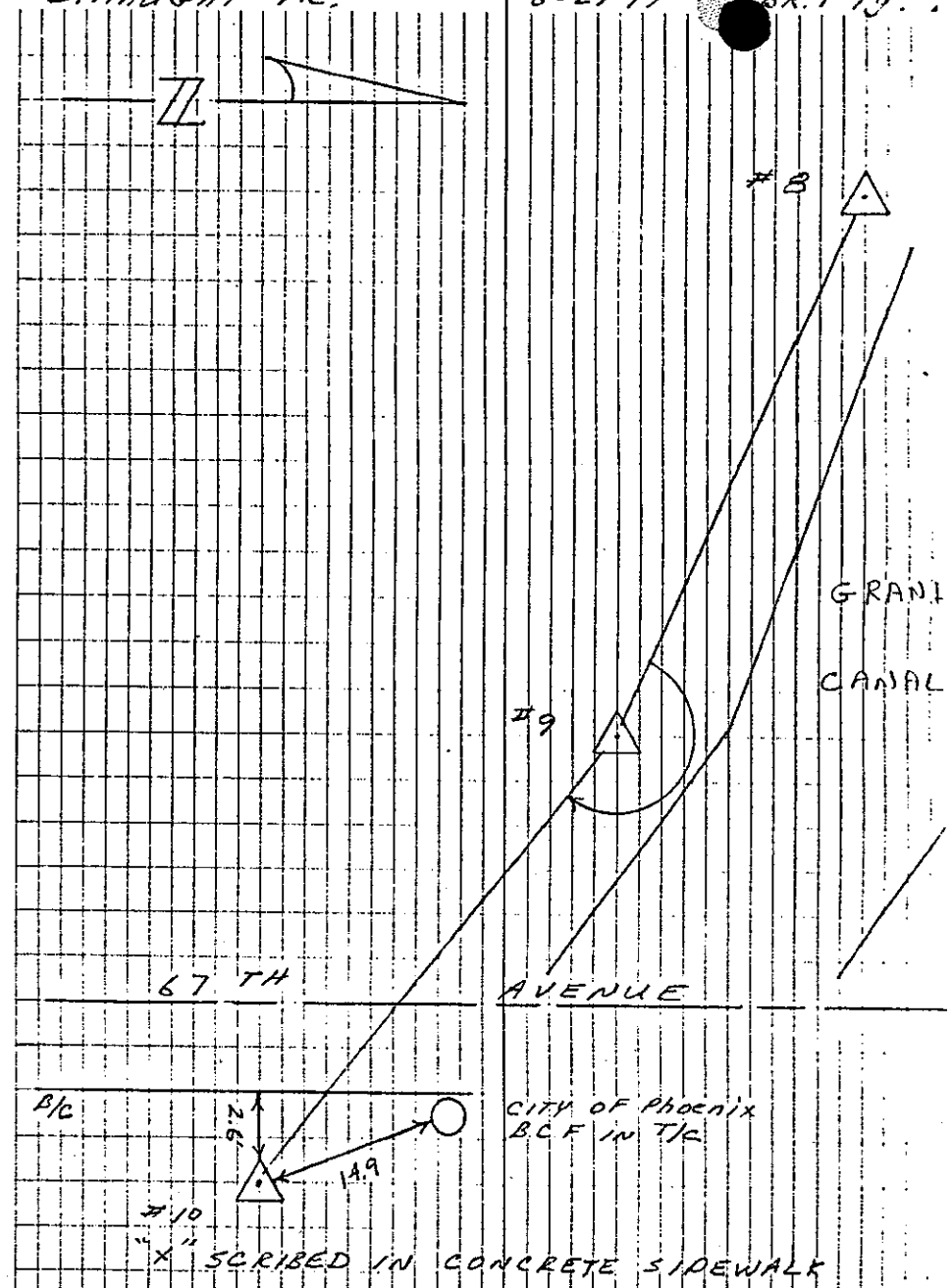
B/S	7	1/2" I.R.			
T	8	1/2" I.R.			
F/S	9	1/2" I.R.			
	0° 00'	00"			
	160° 05'	45"		1868.600	1868.600
	340° 05'	40" 50"			
	179° 59'	50"			
MT	160° 05'	47.5"			
B/S	9				
T	8				
F/S	7				
	0° 00'	00"			
	199° 54'	15"			
	19° 54'	00" 10"			
	179° 59'	50"			
MT	199° 54'	12.5"			
Σ TOTAL	360° 00'	00"			
RT	160° 05'	47.5"	46.76		
H.D.	1868.600				



HORIZONTAL CONTROL

B/S	8	1/2" I.R.			
π	9	1/2" I.R.			
F/S	10	"X" ON CONCRETE SIDEWALK			
	0° 00'	00"			
	193° 06'	10"		1015.650	1015.645
	13° 06'	00" 05"			
	179° 59'	55"			
M ∡	193° 06'	07.5"			
B/S	10				
π	9				
F/S	8				
	0° 00'	00"			
	166° 53'	50"			
	346° 53'	45" 60"			
	179° 59'	45"			
M ∡	166° 53'	55"			
TOTAL	360° 00'	02.5"			
RT ∡	193° 06'	06.25"	05.51"		
H.P.	1015.650				

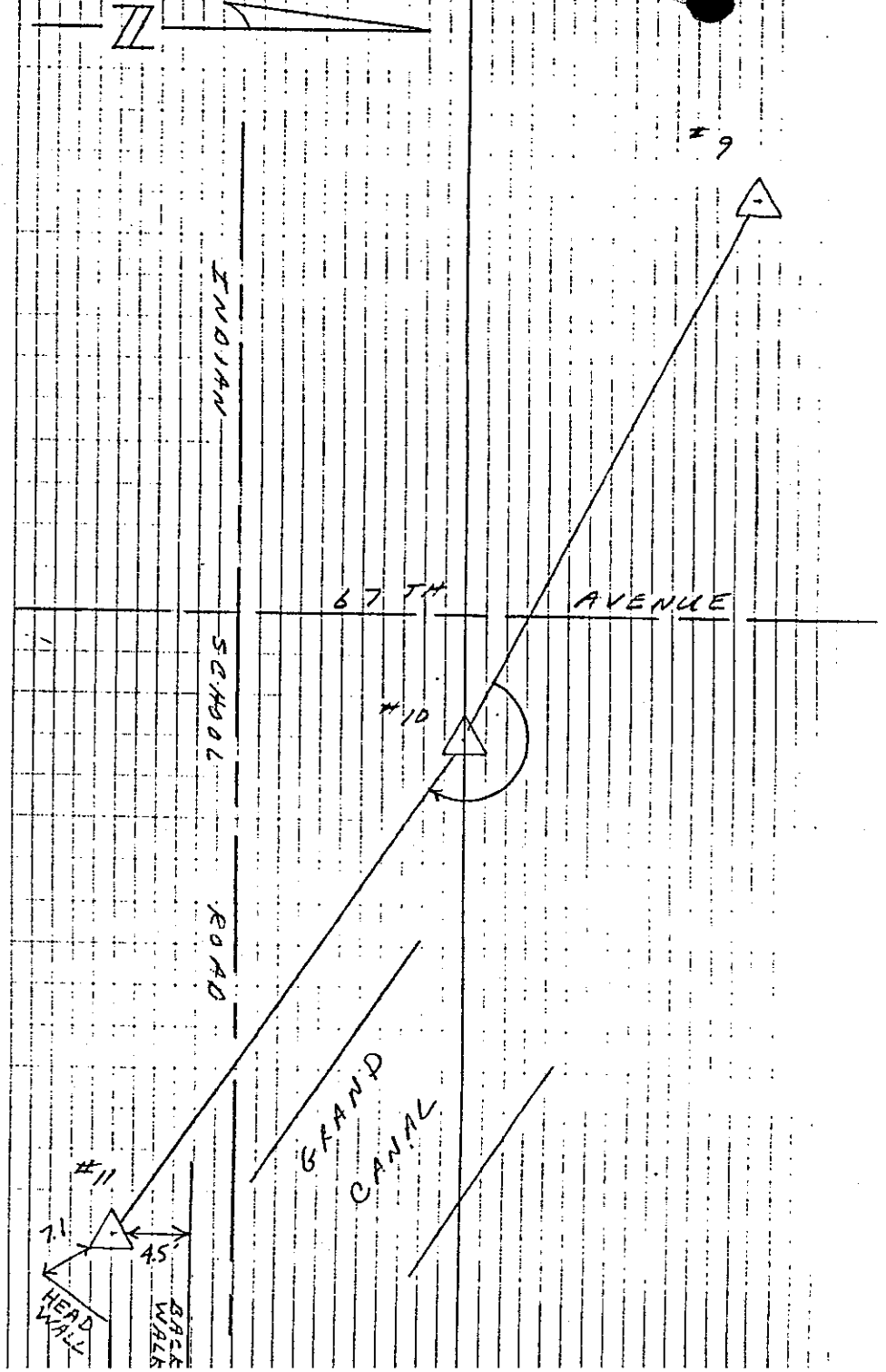
D. HAUGHT P.C. 6-27-99 BK. 1 PG.



D. HAUGHT, P.C. 6-27-99 BK. 1 PG. 3

HORIZONTAL CONTROL

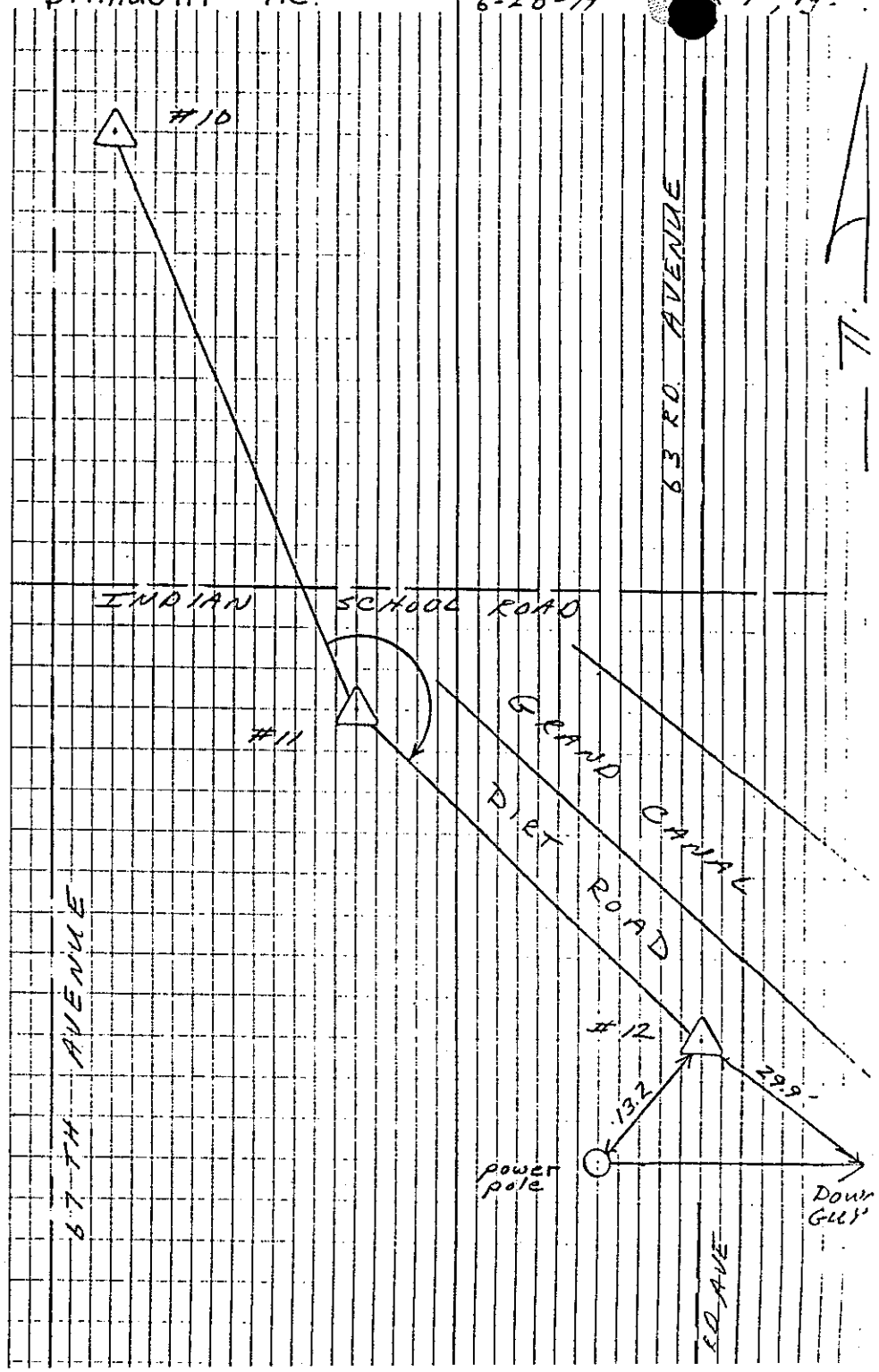
B/S	9	1/2" I.R.			
T	10	"X" ON CONCRETE SIDEWALK			
F/S	11	LARGE NAIL			
	0° 00'	00"			
	198° 45'	20"		1952.405	1952.405
	18° 45'	20" 30"			
	179° 59'	50"			
MT	198° 45'	25"			
B/S	11				
T	10				
F/S	9				
	0° 00'	00"			
	161° 14'	30"			
	341° 14'	20" 25			
	179° 59'	55"			
MT	161° 14'	27.5"			
TOTAL	359° 59'	52.5"			
RT ∡	198° 45'	21.25"	20.51"		
H.D.	1952.405				



HORIZONTAL CONTROL

D. HAUGHT P.C. 6-28-99 Bk 1, Pg. 7

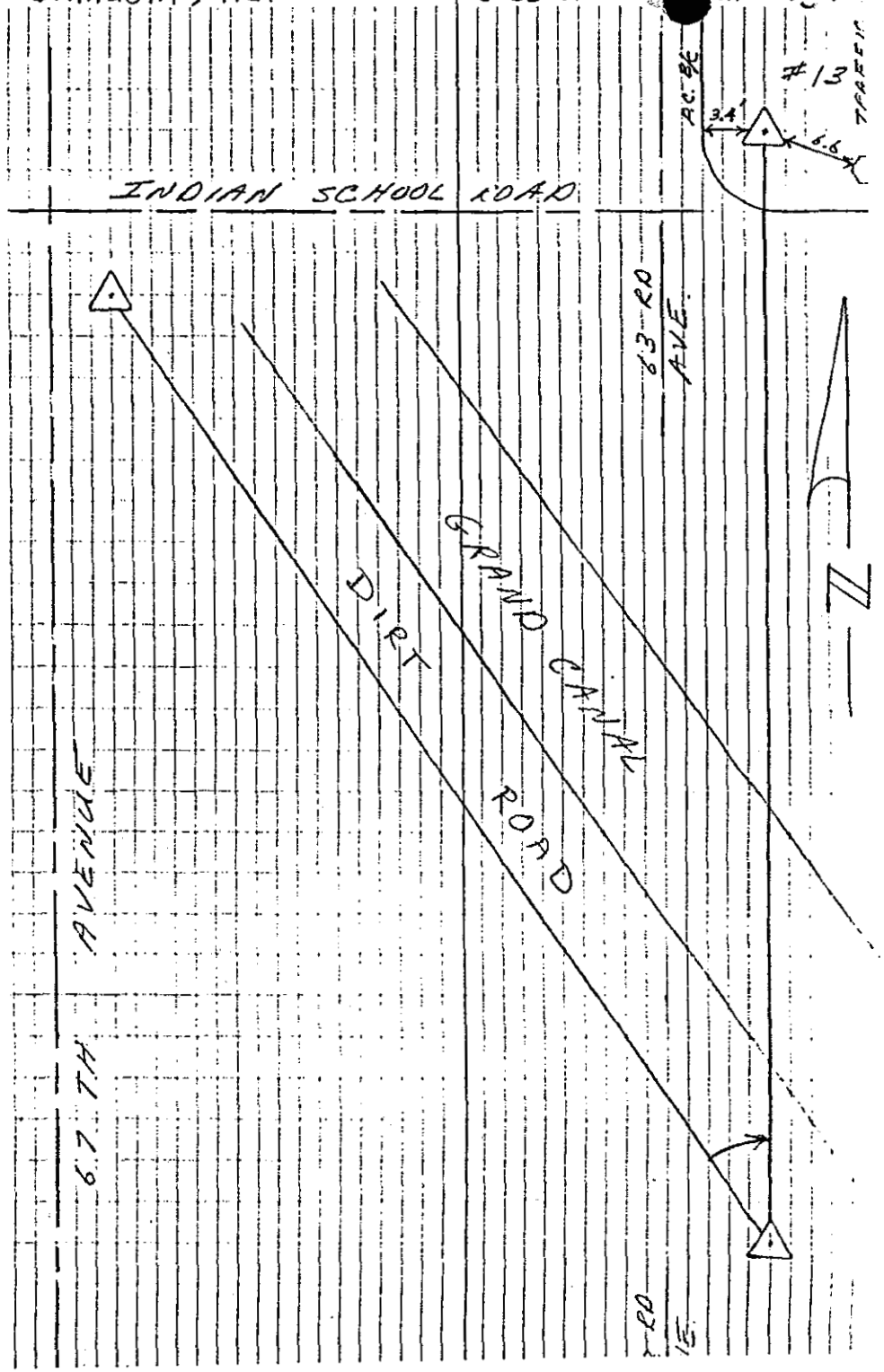
B/S	10	"X" ON SIDEWALK					
⊼	11	1/2" I.R.					
F/S	12	1/2" I.R.					
	0°	00'	00"				
	173°	47'	15"		1707.320	1707.320	
	353°	47'	10"				
	180°	00'	00"				
M⊼	173°	47'	12.5"				
B/S	12						
⊼	11						
F/S	10						
	0°	00'	00"				
	186°	12'	50"				
	6°	12'	45"				
	179°	59'	55"				
M⊼	186°	12'	50"				
TOTAL	360°	00'	02.5"				
RT ⊼	173°	47'	11.25"	10.51"			
H.P.	1707.320						



HORIZONTAL CONTROL

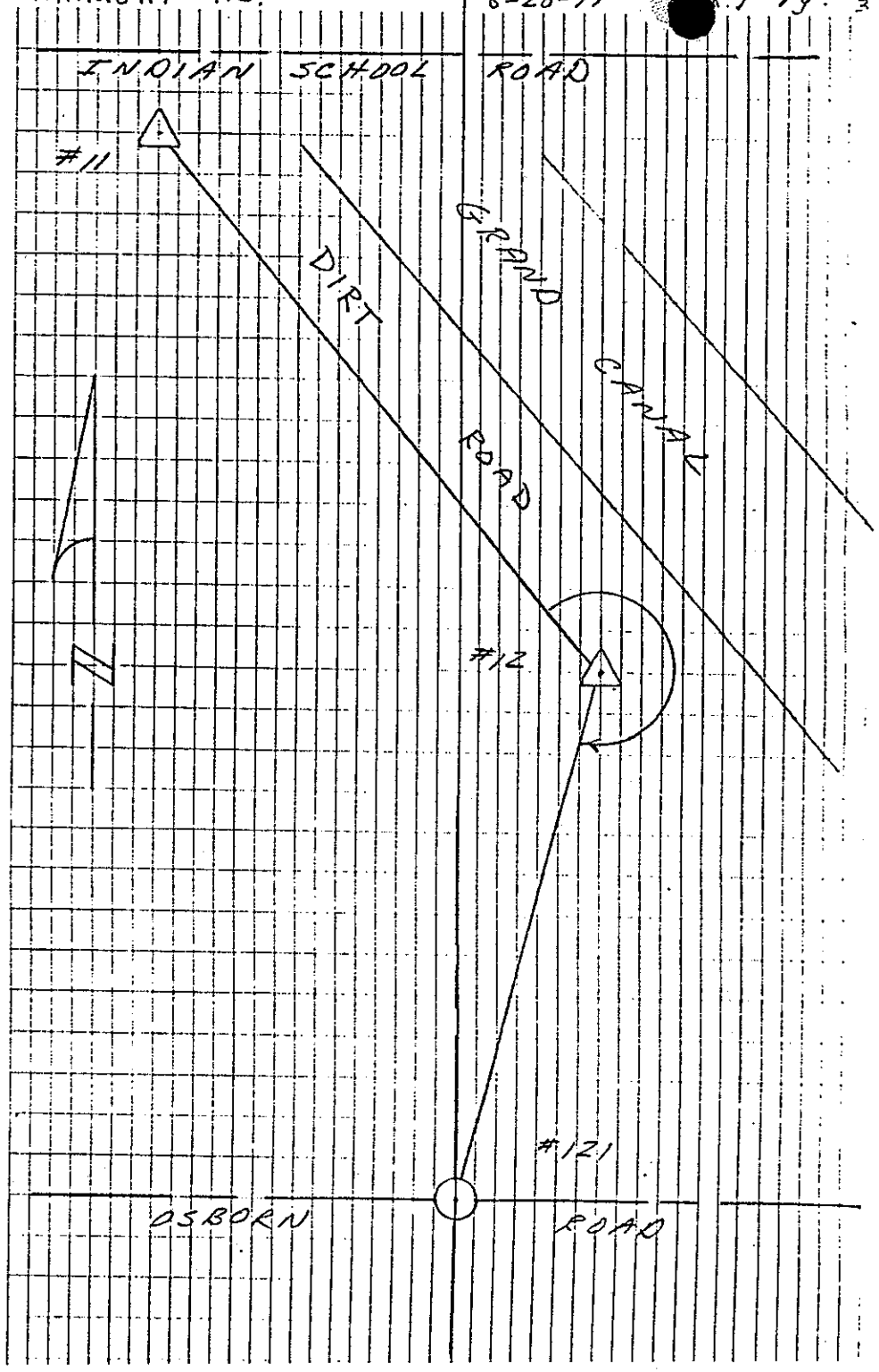
B/S	11	1/2" I.P.				
π	12	1/2" I.P.				
F/S	13	CHISELED "X"	on s/w @ 63rd Ave & Indian School Rd. N.E. Cor.			
	0° 00' 00"					
	45° 45' 25"			1325.735	1325.735	
	225° 45' 20" -30					
	179° 59' 50"					
M ∡	45° 45' 27.5"					
B/S	13					
π	12					
F/S	11					
	0° 00' 00"					
	314° 14' 40"					
	134° 14' 30" +35					
	179° 59' 55"					
M ∡	314° 14' 37.5"					
TOTAL	360° 00' 05"					
RT ∡	45° 45' 25"	24.26"				
H.P.	1325.735					

D. HAUGHT, P.C. 6-28-99 K.1 Pg.



C. 1/4	Cor	Sec 20	T. 2 E.	R. 2 E.			
B/s	11	1/2" I.P.					
π	12	1/2" I.P.					
F/s	121	B.C.F	63rd AVE & OSBORN ROAD				
	0° 00' 00"						
	225° 25' 00"			1371.340	1371.340		
	45° 25' 00" 05						
	179° 59' 55"						
M∡	225° 25' 02.5"						
B/s	121						
π	12						
F/s	11						
	0° 00' 00"						
	134° 35' 05"						
	314° 35' 00"						
	180° 00' 00"						
M∡	134° 35' 02.5"						
TOTAL	360° 00' 05"						
RT ∡	225° 25' 00"						
H.D	1371.340						

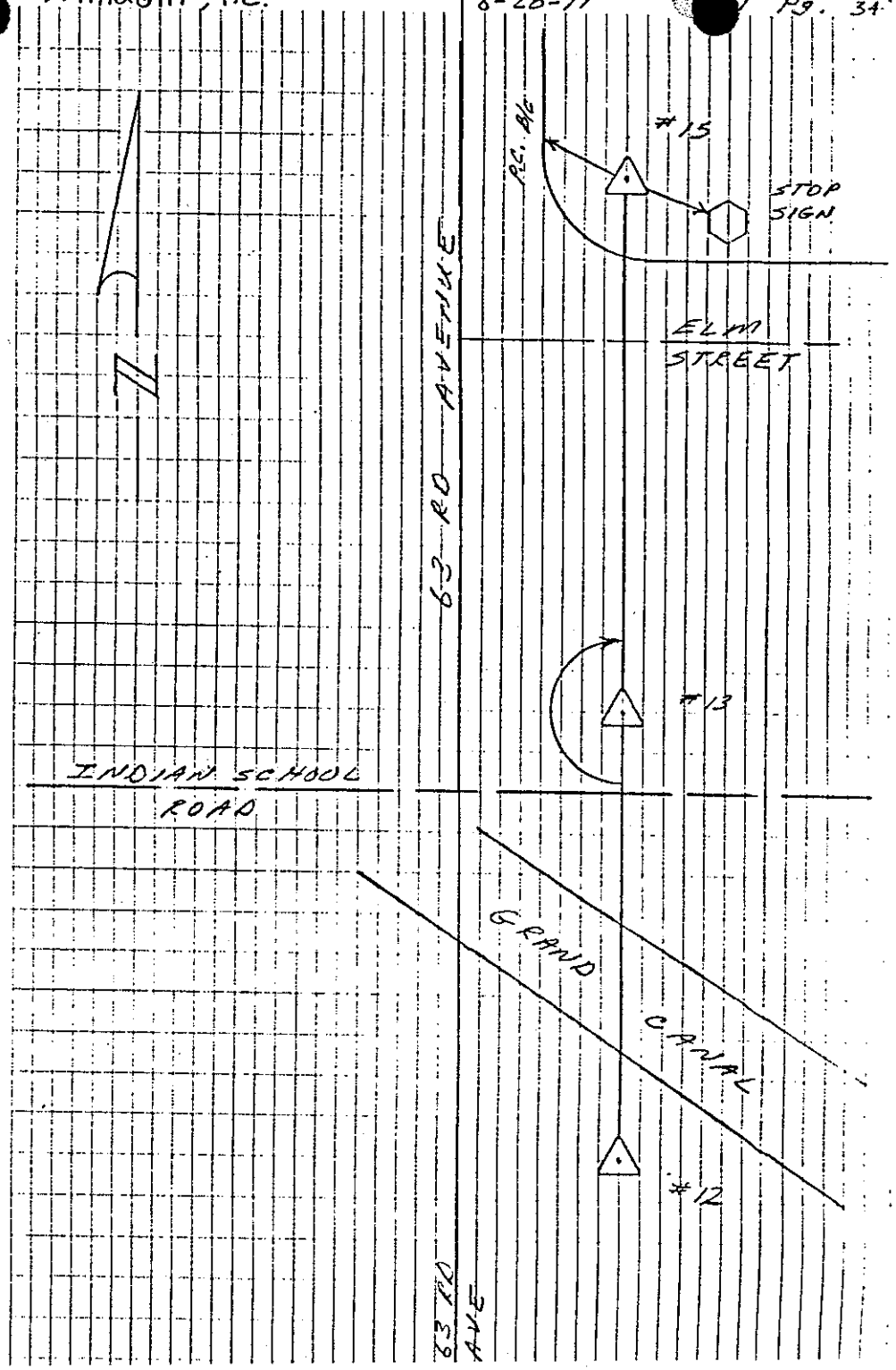
D. HAUGHT P.C. 6-28-99 Bk. 1 Pg. 3



HORIZONTAL CONTROL

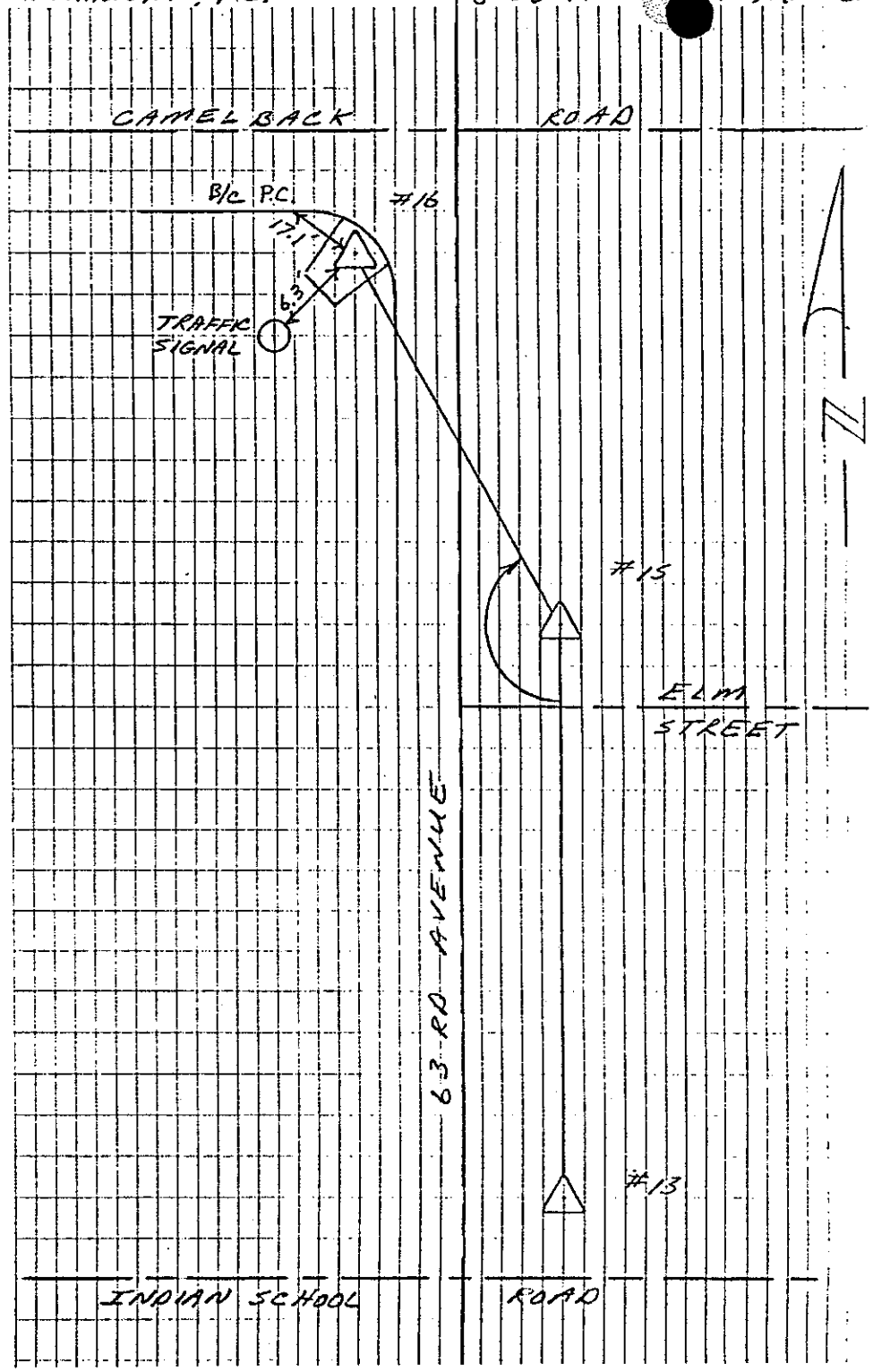
D. HAUGHT, P.C. 6-28-99 Pg. 34

B/S	12					
T	13					
F/S	15	CHISELED "X"	ON S/W	@ 63 AVE rd & ELM ST.	NS.	COR
	0° 00'	00"				
	179 41	55		3727.145	3724.140	
	359 41	50 55				
	179 59	55				
M ∡	179° 41'	55"				
B/S	15					
T	13					
F/S	12					
	0° 00'	00"				
	180° 18'	10"				
	0° 18'	05"				
	179 59	55				
M ∡	180° 18'	10"				
TOTAL	360° 00'	05				
RT ∡	179° 41'	52.5"	51.76"			
H.D.	3727.145					



HORIZONTAL CONTROL

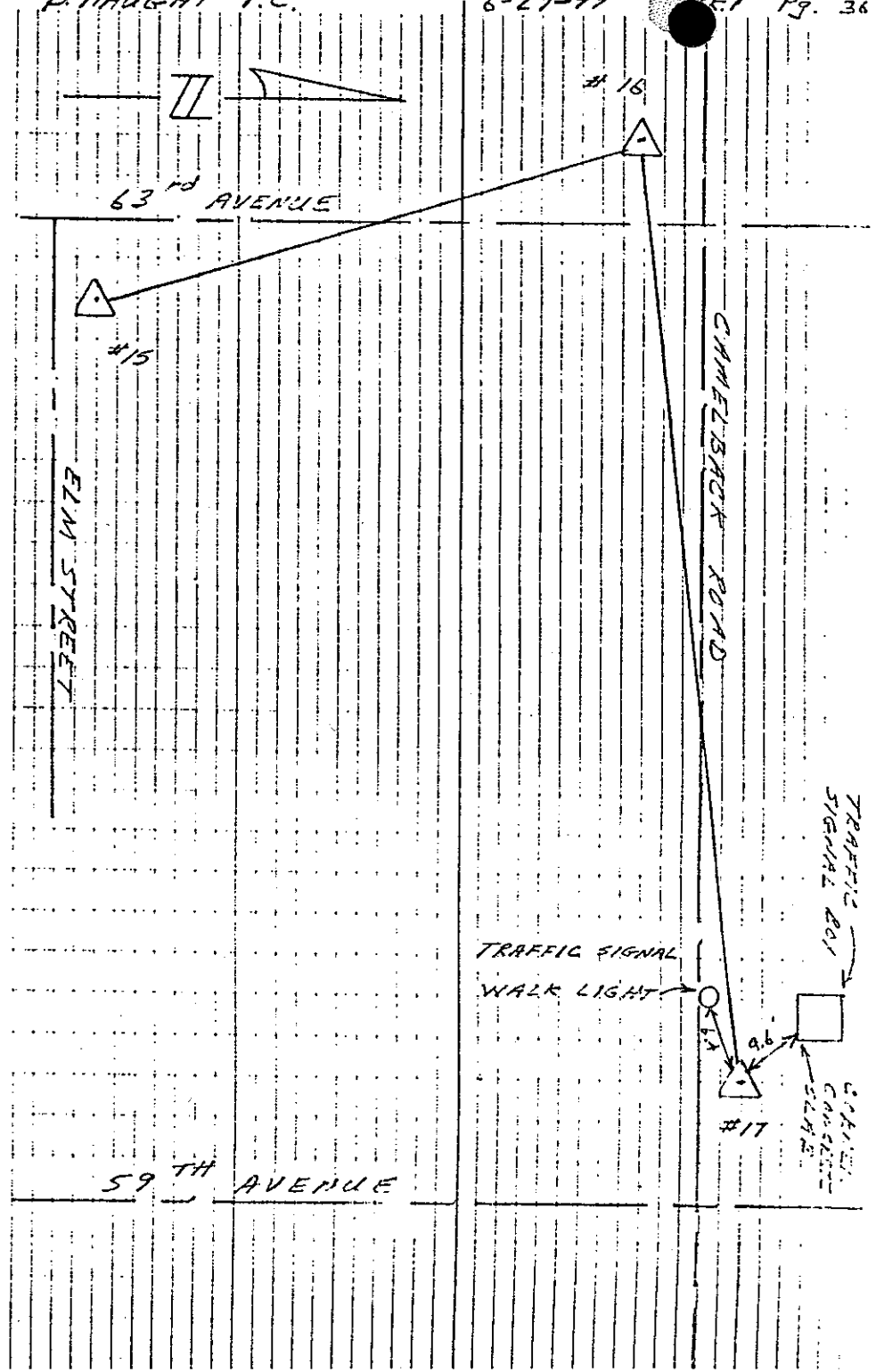
B/S	13	CHISELED "X" ON SIDEWALK				
T	15	CHISELED "X" ON SIDEWALK				
F/S	16	CHISELED "X" ON SIDEWALK (HANDICAP RAMP)				
	0° 00'	00"				
	177° 54'	55"		1454.190	1454.190	
	357° 54'	45" "55"				
	179° 59'	50"				
m ∡	177° 54'	55"				
B/S	16					
T	15					
F/S	13					
	0° 00'	00"				
	182° 05'	15"				
	2° 05'	10" 15"				
	179° 59'	55"				
m ∡	182° 05'	15"				
TOTAL	360° 00'	10"				
RT ∡	177° 54'	50"	49.26"			
H.P.	1454.190					



HORIZONTAL CONTROL

B/S	15	SCRIBED "X" ON SIDEWALK				N.E. COR. 63rd Ave & Elm	
T	16	SCRIBED "X" ON HANDICAP RAMP				S.W. COR 63 Ave & CAMEL BACK.	
F/S	17	SCRIBED "X" ON SIDEWALK				N.W. COR 59th Ave & CAMEL BACK	
	0° 00'	00"			.105	.095	
	268° 29'	50		2643.	095		
	88° 29'	45					
	179 59	50					
M ∡	268° 29'	52.5"					
B/S	17						
T	16						
F/S	15						
	0° 00'	00"					
	179° 59'	50"					
	91° 30'	05					
	271° 30'	05					
M ∡	91° 30'	10"					
TOTAL	360° 00'	02.5					
RT ∡	268° 29'	51.25"	50.51"				
H.D.	2643.	100					

P. HAUGHT P.C. 6-29-99 Bk.1 Pg. 36



B/S			SCRIBED "X" ON SIDEWALK	N.E. CORNER OF ELM ST. AND 63RD AVE.			
T	16		SCRIBED "X" ON HANDICAP RAMP	S.W. COR.			
F/S	24						
	0°	00'	00"				
	92	53	05		2522.185	2522.185	
	272	53	05				
	179	59	50				
M ∡	92°	53'	10"				
B/S	24						
T	16						
F/S	15						
	00°	00'	00"				
	267	06	45				
	87	06	45				
	180°	00	00				
M ∡	267°	06'	45"				
TOTAL	359°	59'	55"				
RT ∡	92°	53'	12.5"				
H.D.	2522.	185					

HORIZONTAL CONTROL

B/S	16				
⊼	17				
F/S	13				
	0°	00'	00"	1301.500	
	97°	09'	50"		1301.500
	277°	09'	45"		
	179°	59'	55"		
M⊼	97°	09'	50"		
B/S	18				
⊼	17				
F/S	16				
	0°	00'	00"		
	262°	50'	10"		
	82°	50'	05"		
	179°	59'	55"		
	262°	50'	10"		
TOTAL	360°	00'	00"		
RT⊼	97°	09'	50"	49.26"	
H.P.	1301.500				

HORIZONTAL CONTROL

D. HAUGHT P.C. 6-29-99 Bk. 1 Pg.

B/S	17					
T	18					
F/S	19					
	0° 00'	00"				
	172° 03'	10"		1244.045	1244.045	
	352° 03'	10"				
	179° 59'	50"				
MT	172° 03'	15"				
B/S	19					
T	18					
F/S	17					
	0° 00'	00"				
	187° 56'	25"				
	7° 56'	25"				
	179° 59'	55"				
MT	187° 56'	27.5"				
TOTAL	359° 59'	42.5"				
RT ∡	172° 03'	23.75"	23.01"			
H.D.	1244.045					

B/S	19					
⊼	20					
F/S	21					
	0° 00'	00"				
	180° 54'	15"		2648.415	2648.420	
	0° 54'	15"				
	179° 59'	50"				
MX	180° 54'	20"				
B/S	21					
⊼	20					
F/S	19					
	0° 00'	00"				
	179 05	30				
	359 05	35				
	180 00	00				
MX	179° 05	32.5"				
TOTAL	359° 59'	52.5"				
RT ∠	180° 54'	23.75"	23.01"			
H.D.	2648.4175					

B/S	19					
⊼	20					
F/S	107	63RD AVE & MISSOURI AVE				
	0° 00'	00"				
	194 18	20		104.430	104.430	
	14 18	15				
	179 59	50				
M ∡	194° 18'	22.5"				
B/S	107					
⊼	20					
F/S	19					
	0° 00'	00"				
	165° 41'	35"				
	345° 41'	35"				
	179° 59'	55"				
M ∡	165° 41'	37.5"				
TOTAL	360° 00'	00"				
RT ∡	194° 18'	22.5"				
H.D	104.430					

B/S	20						
T	21						
F/S	22						
	0° 00' 00"						
	177° 37' 00"			3041.415	3041.415		
	357° 36' 55"						
	180 00 05"						
M ∡	177° 36' 55"						
	0						
	182° 23' 05"	05"					
	2 23 00"	00"					
	179 59 55"	55"					
M ∡	182 23 05"						
TOTAL	360 00 00						
RT ∡	177° 36' 55"						
H.D.	3041.415						

B/S	21					
T	22					
F/S	23					
	0° 00'	00"				
	182° 28'	25"		2221.205	2221.205	
	2° 28'	25"				
	180° 00'	00"				
M∡	182° 28'	25"				
B/S	23					
T	22					
F/S	21					
	0° 00'	00"				
	177° 31'	50"				
	377° 31'	40"				
	180° 00'	00"				
M∡	177° 31'	45"				
TOTAL	360° 00'	10"				
RT∡	182° 28'	20"	19.26"			
H.P.	2221.	205				

C. 14	COR.	SEC 13	T. 2 N.	R. 1 E.			
B/S	21						
T	22						
F/S	105	BCF	@ 71ST AVE.	& Missouri		Center 1/4 Cor. Sec. 13	
	0° 00'	00"					
	358° 00'	10"		470.465	470.465		
	178° 00'	00"					
	180° 00'	00"					
M ∡	358° 00'	05"					
B/S	105						
T	22						
F/S	21						
	0° 00'	00"					
	1° 59'	50"					
	181° 59'	50" SS					
	179° 59'	55"					
M ∡	1° 59'	52.5"					
TOTAL	359° 59'	57.5"					
RT ∡	358° 00'	06.25"					
H.D.	470.465'						

B/S	22						
π	23						
F/S	34 (1)						
	0° 00'	00"					
	271° 49'	05"		2631.	730	263	1.730
	91° 49'	05"					
	179° 59'	50"					
M ∡	271° 49'	10"					
B/S	34 (1)						
π	23						
F/S	22						
	0° 00'	00"					
	88° 10'	55"					
	268° 10'	55"					
	180° 00'	00"					
M ∡	88° 10'	55"					
TOTAL	360° 00'	05"					
RT ∡	271° 49'	07.5"	06.76"				
H.P.	2631.	730					

B/S	25			
T	1			
F/S	35 (2)			
	0°	00'	00"	
	86°	37'	40"	
	266°	37'	40"	
	179°	59'	55"	
M ∡	86°	37'	42.5"	
B/S	35 (2)			
T	34 (1)			
F/S	23			
	0°	00'	00"	
	273°	22'	20"	
	93°	22'	10"	
	180°	00'	00"	
M ∡	273°	22'	15"	
TOTAL	359°	59'	57.5"	
RT ∡	86°	37'	43.75"	43.01"
H.P.	2666.	6475		
	3600°	00'	16.25"	22 angles = 0.74"
	3600	00	17.50	

B/S	16			2522.135		
π	24					
F/S	25					
	0° 00'	00"				
	177° 33'	20"		2642.055		2642.055
	357° 33'	20"				
	179° 59'	55"				
M ∡	177° 33'	22.5"				
B/S	25					
π	24					
F/S	16					
	0° 00'	00"				
	182° 26'	40"				
	02° 36'	35"				
	179° 59'	55"				
M ∡	182° 26'	40"				
TOTAL	360° 00'	02.5"				
RT ∡	177° 33'	21.25"				
H.D.	2642.055					

B/S	24						
π	25						
F/S	06						
	0° 00'	00"					
	178° 05'	25"		2451	795	2451.	790
	358° 05'	20"					
	180° 00'	00"					
M ∡	178° 05'	22.5"					
B/S	06						
π	25						
F/S	24						
	0° 00'	00"					
	181° 54'	35"					
	01° 54'	30"					
	179° 59'	55"					
M ∡	181° 54'	35"					
TOTAL	359° 59'	57.5"					
RT ∡	178° 05'	21.25"					
H.D.	2451.	7925					

HORIZONTAL CONTROL

D. HAUGHT, P.C. 7-6-99 Pg. 50

B/S	25	
π	06	
F/S	07	
	0°00'	00"
	50°34'	35"
	230°34'	35"
	180°00'	05"
M ∡	50° 34'	32.5"
B/S	07	
π	06	
F/S	25	
	0°00'	00"
	309°25'	25"
	129°25'	20"
	179°59'	55"
M ∡	309°25'	25"
TOTAL	359°59'	57.5"
∠T ∡	50° 34'	31.25"

HORIZONTAL CONTROL

D. HAUGHT, P.C. 7-6-99 BK 1 Pg.

B/S	02						
⊼	03						
F/S	26						
	0° 00'	00"					
	180° 41'	00"		3214	655	3214	65'
	0° 41'	00"					
	179° 59'	55"					
M∡	180° 41'	02.5"					
B/S	26						
⊼	03						
F/S	02						
	0° 00'	00"					
	179° 19'	00"					
	359° 19'	00"					
	180° 00'	00"					
M∡	179° 19'	00"					
TOTAL	360° 00'	02.5"					
RT∡	180° 41'	01.25"					
H.D.	3214.	655					

B	BIS	32			3300	750	3300	755
T	π	33(03)						
F	FIS	02						
		0°00'	00"					
		190°24'	45"					
		10°~~25~~ 24'	45"					
		180°00'	00"					
	M∡	190°24'	45"					
	BIS	02						
	π	33(03)						
	FIS	32						
		0°00'	00"					
		169°35'	20"					
		349°35'	15"					
		180°00'	00"					
	M∡	189°35'	175"					
	TOTAL	360°00'	02.5"					
	RT. ∡	190°24'	43.75"					

HORIZONTAL CONTROL

D. HAUGHT, P.C. 7-6-99 BK 1, Pg. 5

B/S	03						
T	26						
F/S	27						
	0°00'	00"					
	180°34'	10"		2599	190	2599	190
	0°34'	05"					
	180°00'	00"					
M ∡	180°34'	07.5"					
B/S	27						
T	26						
F/S	03						
	0°00'	00"					
	179°25'	45"					
	359°25'	45"					
	180°00'	00"					
M ∡	179°25	45"					
TOTAL	359° 59'	52.5"					
RT ∡	180°34'	1125"					
H.D.	2599.	190					

B/S	30			2932.	285	2932.	285
T	31	B1/4	1MIL				
F/S	32						
	0° 00'	05"					
	214° 53'	40"		2658.	175	2658.	170
	34° 53'	30"					
	180° 00'	00"					
M ∡	214° 53'	32.5"					
B/S	32						
T	31						
F/S	30						
	0° 00'	00"					
	145° 06'	25"					
	325° 06'	35"					
	180° 00'	05"					
M ∡	145° 06'	27.5"					
TOTAL	359° 59'	60"					
RT ∡	214° 53'	32.5"					
H.D.	2658.	175					

B/S	31	
⊼	32	
F/S	33 (03)	
	0° 00'	00"
	154° 30'	10"
	334° 30'	10"
	179° 59'	55"
M ∡	154° 30'	12.5"
B/S	33 (3)	
⊼	32	
F/S	31	
	0° 00'	00
	205° 29'	50"
	25° 29	45"
	180° 00'	00"
M ∡	205° 29'	47.5"
TOTAL	360° 00	00"
RT ∡	154° 30'	12.5"
H.D	3300.	7525

B/S	26						
T	27						
F/S	28						
	0° 00'	15"					
	178°48'	50"		2791	460	2791	460
	358 48	55"					
	180°00'	10"					
MT	178°48'	40"					
B/S	28						
T	27						
F/S	26						
	0° 00'	00"					
	181° 11'	20"					
	01°11'	10"					
	179°59'	55"					
MT	181°11'	17.5					
TOTAL	359°59'	57.5"					
RT ∡	178°48'	41.25"					
H.D.	2791.	460					

HORIZONTAL CONTROL

D. HAUGHT, P.C. 7-6-99 1, Pg 57

B/S	27						
π	28						
F/S	29						
	0° 00'	00"					
	177° 30'	35"		2508	160	2508	165
	357° 30'	35"					
	180° 00'	00"					
M∡	177° 30'	35"					
B/S	29						
π	28						
F/S	27						
	0° 00'	00"					
	182° 29'	25"					
	02° 29'	30"					
	180° 00'	05"					
M∡	182° 29'	25"					
TOTAL	360° 00'	00"					
RT∡	177° 30'	35"					
HD	2508.	1625					

MORI CONTRA CONTROL

D. HAUGHI, P.C. 7-6-44 19 58

B/S	28			
T	29			
F/S	30			
	0° 00'	00"	359° 59'	30"
	21° 45'	15" 25		
	201° 45'	15" 30		
	179° 59'	45"		
M ∡	21° 45'	27.5"		
B/S	30			
T	29			
F/S	28			
	0° 00'	00"		
	338° 14'	20"		
	158° 14'	30"		
	180° 00'	10"		
M ∡	338° 14'	20"		
TOTAL	359° 59'	47.5"		
RT ∡	21° 45'	33.75"		
H.D.	2690.	3025		

B/S	2			2670	305	2670	310
T	30						
F/S	31						
	0° 00'	00"					
	140° 51'	35"		2932	280		
	320° 51'	30"					
	179° 59'	55"					
M ∡	140° 51'	35"					
B/S	31						
T	30						
F/S	29						
	0° 00'	00"					
	219° 08'	30"					
	39° 08'	30"					
	180° 00'	00"					
M ∡	219° 08'	30"					
TOTAL	360° 00'	05"					
RT ∡	140° 51'	32.5"					
H.D.	2932.	285					

Is		Fs	RT. ∠ BALANCED		HORZ. DIST.
1	2	3	180°26'55.45"		2042.660
2	3	4	47°53'10.45"		3382.530
3	4	5	180°11'17.95"		2151.080
4	5	6	182°48'47.95"		1564.7275
5	6	7	177°16'06.70"		2123.130
6	7	8	171°47'06.70"		1446.850
7	8	9	160°05'46.70"		1868.600
8	9	10	193°06'05.45"		1015.650
9	10	11	198°45'20.45"		1952.405
10	11	12	173°47'10.45"		1707.320
11	12	13	45°45'24.20"		1325.735
12	13	15	179°41'51.70"		3727.145
13	15	16	177°54'49.20"		1454.190
15	16	17	268°29'50.45"		2643.100
16	17	18	97°09'49.20"		1301.500
17	18	19	172°03'22.95"		1244.045
18	19	20	93°20'37.95"		2497.8525
19	20	21	180°54'22.95"		2648.4175
20	21	22	177°36'54.20"		3041.415
21	22	23	182°28'19.20"		2221.205
22	23	34(1)	271°49'06.70"		2631.730
23	34(1)	35(2)	86°37'42.95"		2666.6475

B/S		F/S	RT. ∡	BALANCED		HORIZ.	DIST.
2	3	26	180° 41'	00.83"		3214.	655
3	26	27	180° 34'	10.83"		2599.	190
26	27	28	178° 48'	40.83"		2791.	460
27	28	29	177° 30'	34.58"		2508.	1625
28	29	30	21° 45'	33.33"		2690.	3075
29	30	31	140° 51'	32.08"		2932.	285
30	31	32	214° 53'	32.08"		2658.	175
31	32	33	154° 30'	12.08"		3300.	7525
32	33	36	190° 24'	43.33"			

B/S	T	F/S	RT. ∡	BALANCED		HORIZ.	DIST.
15	16	24	92° 53'	12.5"		2522.	185
16	24	25	177° 33'	21.25"		2642.	055
24	25	36(6)	178° 05'	21.25"		2451.	7925
25	36 (6)	7	50° 34'	31.25			

4144

Gething Home Outfall

10/19/99 R/W survey, Green Canal

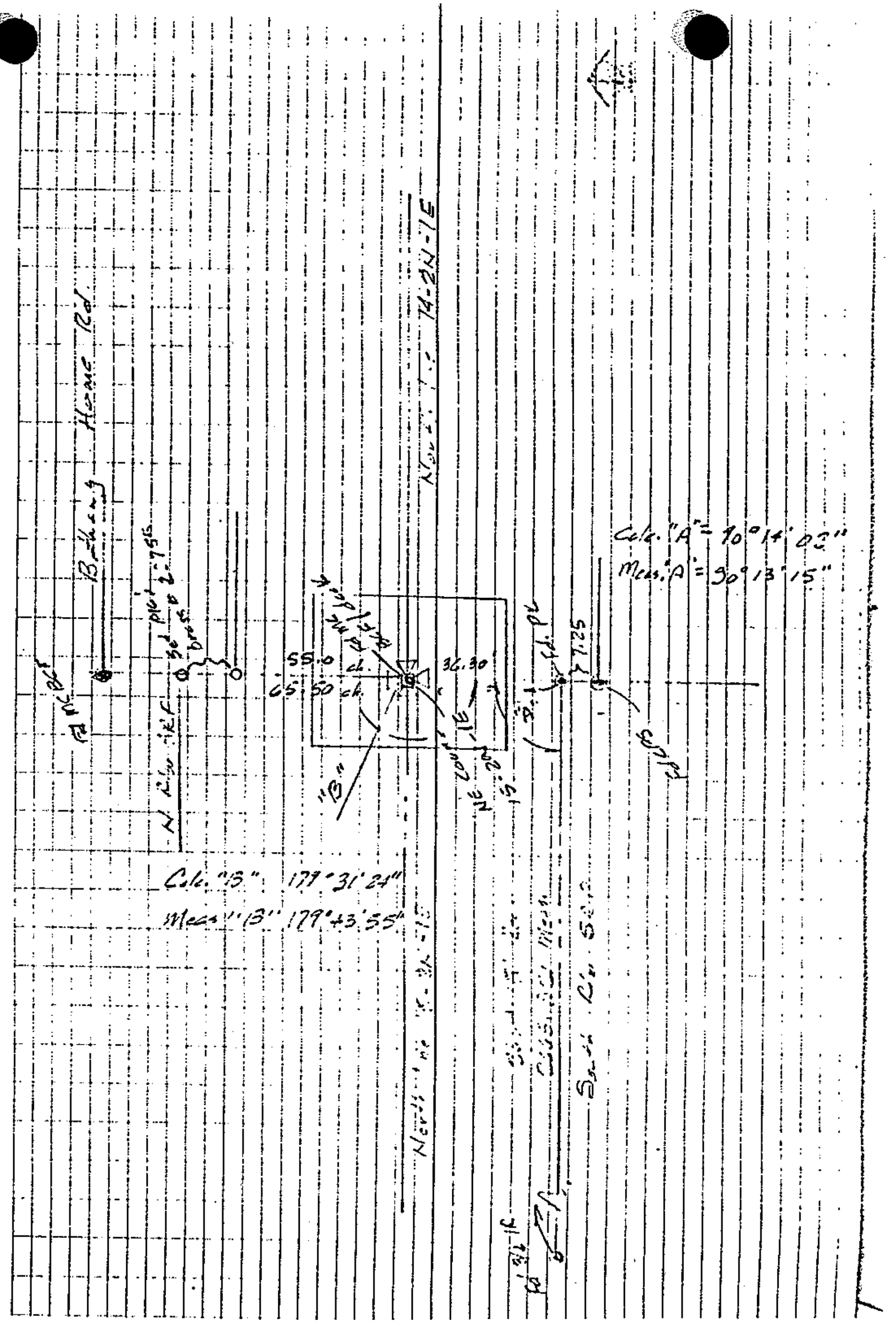
Cont. from pg. 75

M Colling

λ Harmon — Sections 9 & 10 - 2N-1E

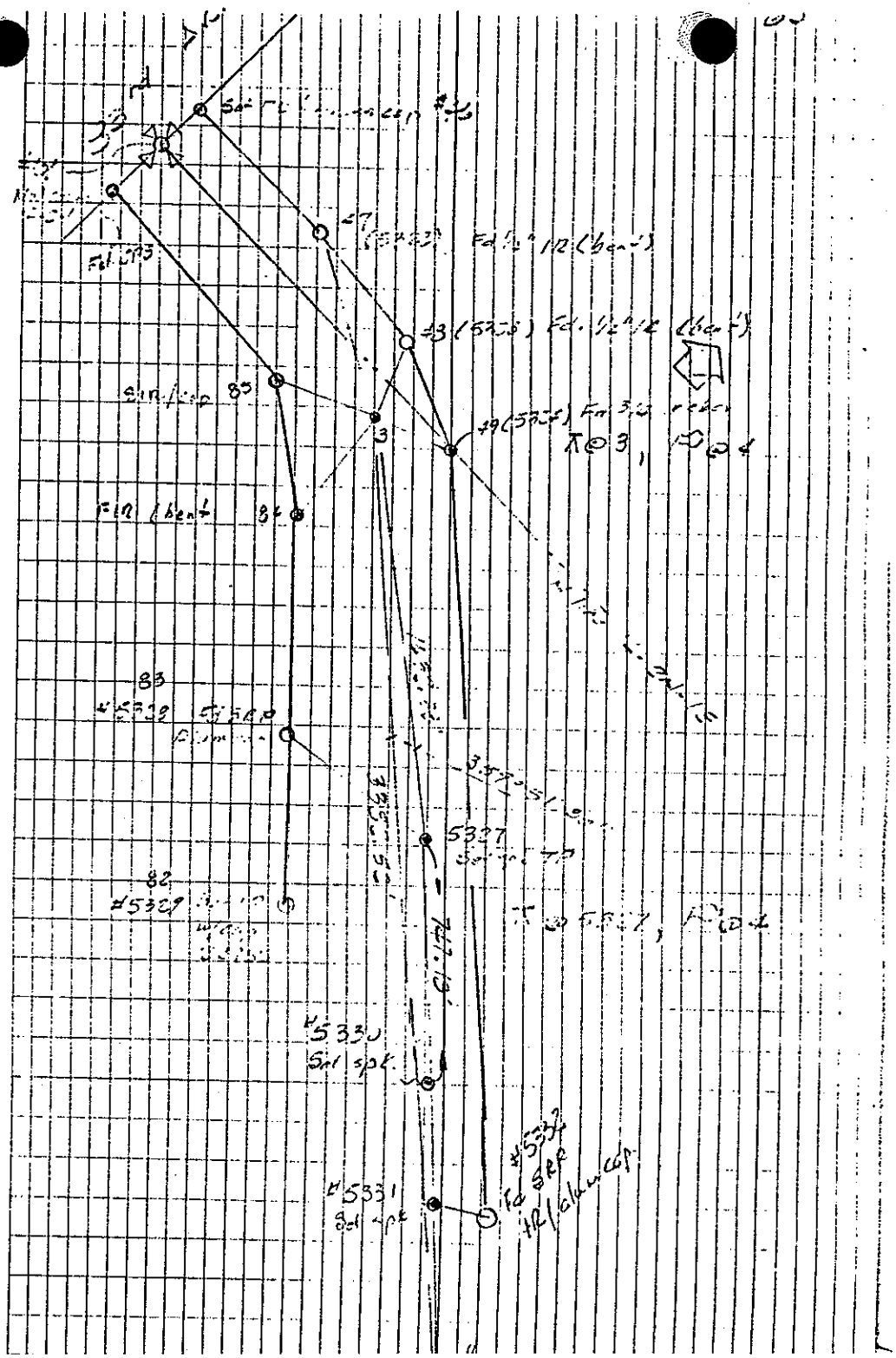
Sunny & Cool

Data file 4144RW1.crs



10/17/99 Cont from prev. pg.
KW Sum, Crow Creek
41-5 PNTS, or 5

Collins



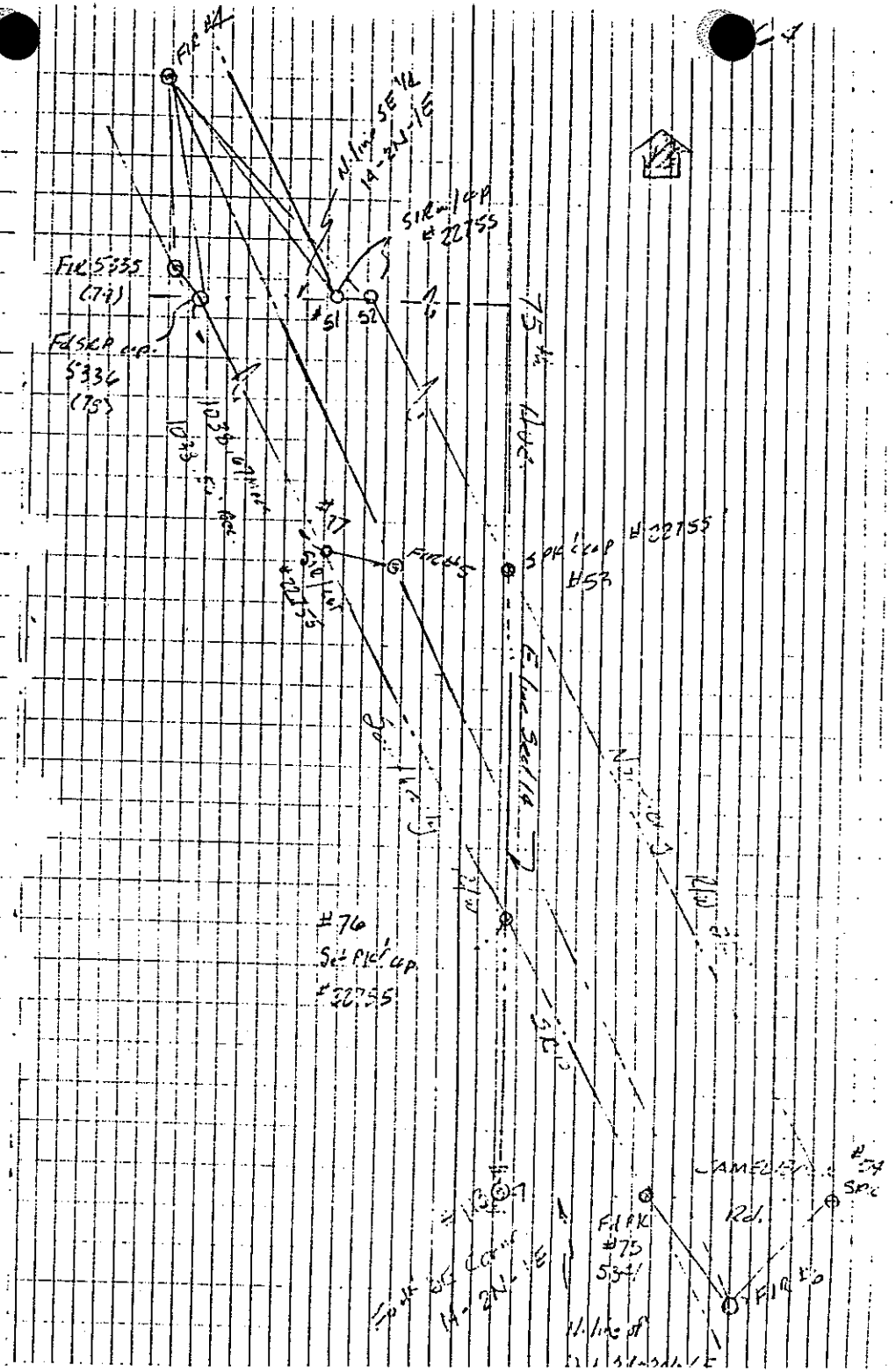
10/23/99

2/: Spring Grand Canal

Cont from prev. pg 4144PNTS.cr5

M. Collins

T. Hanson



10/23/99

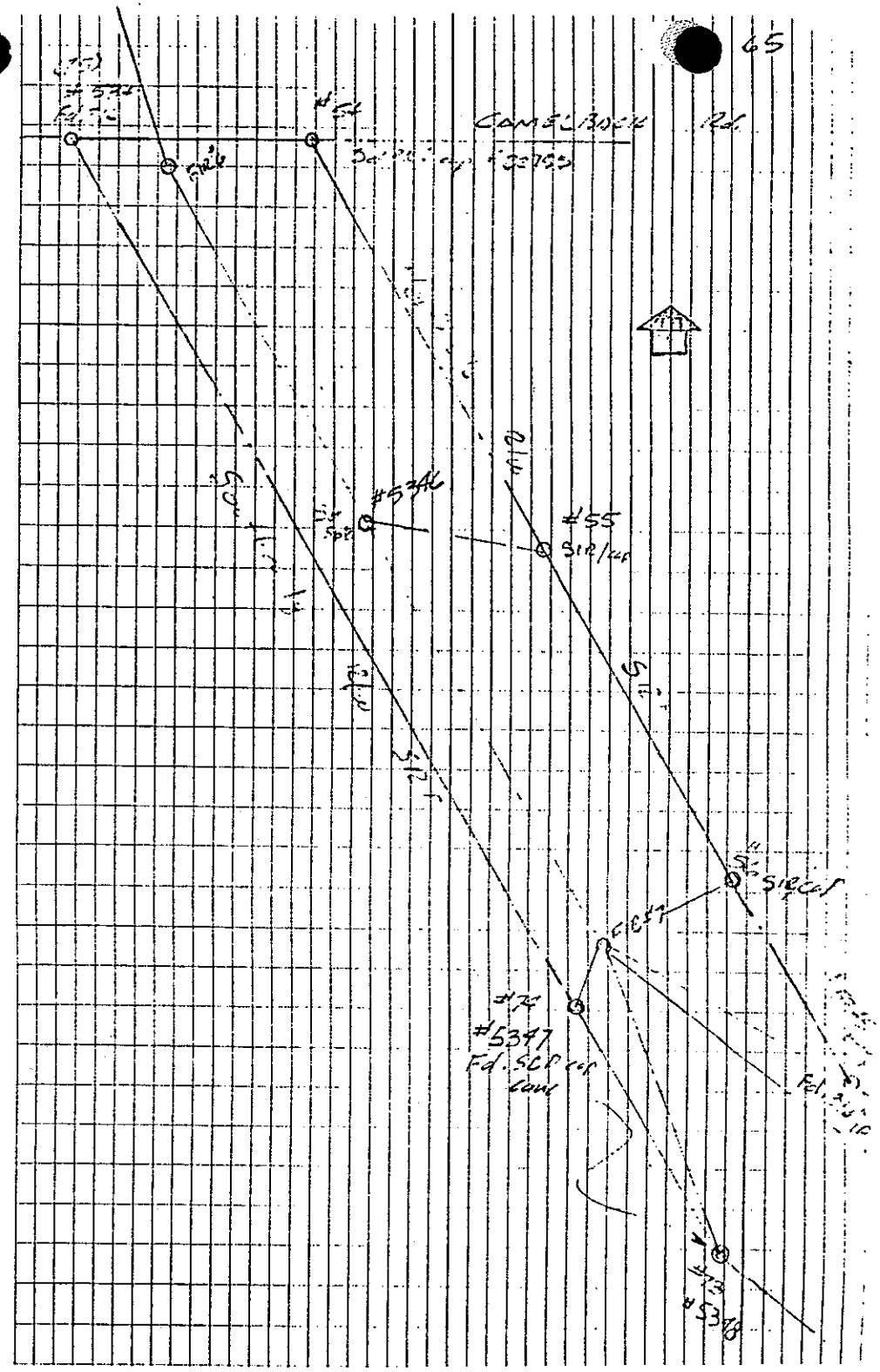
Clay [illegible] Cont. from pre. pg.

4:54 PM S. cr 5

M. Collins

A. Harris

Continued 3



Base vandom 4od [200]
"get", "set"

12 Aug 99
Haught
Sample
Reis

edit el [4] from 1098.48 to 1091.01

edit el [30] from 1056.00 to 1056.37

edit el [107] from 1106.91 to 1098.46

edit el [108] from 1127.61 to 1127.75

edit el [20] from 1120.44 to 1120.76

Begin localize

		N	E	el	S	R
– [4]	H&V	0.0000	.0000	.0000	1.00...	0.00...
[113]	H&V	.0000	.0000	.0000	1.000053	00.0960
[114]	H&V	.0075	.0050	.0000	1.000056	00.0960
[29]	H&V	.0026	.0011	.9837	1.000058	00.0959
[30]	H&V	.0053	.0142	.9126	1.000059	.0958
[27]	H&V	.0346	.0171	1.9046	1.000059	.0958
[201]	V	.0346	.0171	2.2850	1.000059	.0958

localize
Re-solve

		N	E	el	S	R
[4]	H&V	.0346	.0171	.0291	1.000059	.0958
[30]	H&V	.0346	.0171	.0291	1.000059	.0958

Continue localize

	[32]	H&V	.0433	.0171	.0276	1.000058	.0958
(202)	[201]	V	.0433	.0171	.0261	1.000058	.0958
	[3]	H&V	.0432	.0175	.0254	1.000058	.0958
	[1]	H&V	.0424	.0239	.0267	1.000059	.0958

Continue localize

		N	E	El	S	R
104	H & V	.0438	.0229	.0257	1.000059	.0959
106	H & V	.0512	.0213	.0247	1.000059	.0959
107 ~~20~~	H & V	.0536	.0250	.0239	1.000059	.0959
108	H & V	.0595	.0254	.0231	1.000059	.1000
109	H & V	.0638	.0306	.0284	1.000058	.1000
110	H & V	.0621	.0377	.0426	1.000058	.1000
111	H & V	.0604	.0379	.0418	1.000057	.1000
10	H & V	.0584	.0452	.0452	1.000057	.1001
8	H & V	.0571	.0500	.0443	1.000056	.1001
204	V	.0571	.0500	.0491	1.000056	.1001
203	V	.0571	.0500	.0491	1.000056	.1001
12	H & V	.0642	.0452	.0491	1.000056	.1001

end localize

19 Horiz
21 Vert

4144

12 Aug 94
Haught
Sample
Reis

NLW BASE POINT RESULTS

PT #	DELTA NORTHING	DELTA EASTING	DELTA ELEVATION
301	1.50	0.56	-0.05
303	1.48	0.63	-0.12
304	1.40	0.65	-0.17
305	1.35	0.63	-0.19
3	0.56	0.62	-0.13
300	0.07	-0.09	-0.12
25	0.19	0.20	-0.18
26	0.13	0.29	-0.22
17	0.44	0.41	-0.14
10	1.14	0.61	-0.19
11	0.92	0.57	-0.21
68	-0.37	0.28	-0.13
71	-0.81	0.34	-0.13
54	-0.77	0.03	-0.16
35	-0.67	-0.52	-0.07
43	-0.17	-0.25	-0.23
00	0.36	0.35	-0.21

91 ST AVENUE @ GRAND CANAL

B/S	26	5.66	C/P	
T	27	5.35	C/P	
F/S	1000 so	5.43	W/P	N. GRAND CANAL W. 91 ST
F/S	1001	5.34	W/P	S. GRAND CANAL E 91 ST
B/S	27	5.395		
T	1001	5.305		

SOUTH OF GRAND CANAL
R.O.W. ON 91 ST AVE
PTS. 1002 → 1400

27	6.01
1000	5.52

DATA FILE 4140TOPO. r5 pc

10-5-99 pg 1 B.69

83RD AVENUE, GRAND CANAL, & BETHANY HOME RD

PT #	DESC	DIR.	INV.
2821	SSMH	N/S	13.10
2823	WV		3.50
2822	SSMH	N/S	12.52
2824	WV		3.70
2835	WV		2.45
2834	WV		1.60
2833	WV		3.70
2831	WV		3.75
2830	WV		2.70
2318	WV		3.10
2319	WV		CANNOT OPEN
2847	WV		2.60
2848	SSMH	N/S	11.75
2857	WV		3.25
2836	SSMH	E/S.W.	8.85

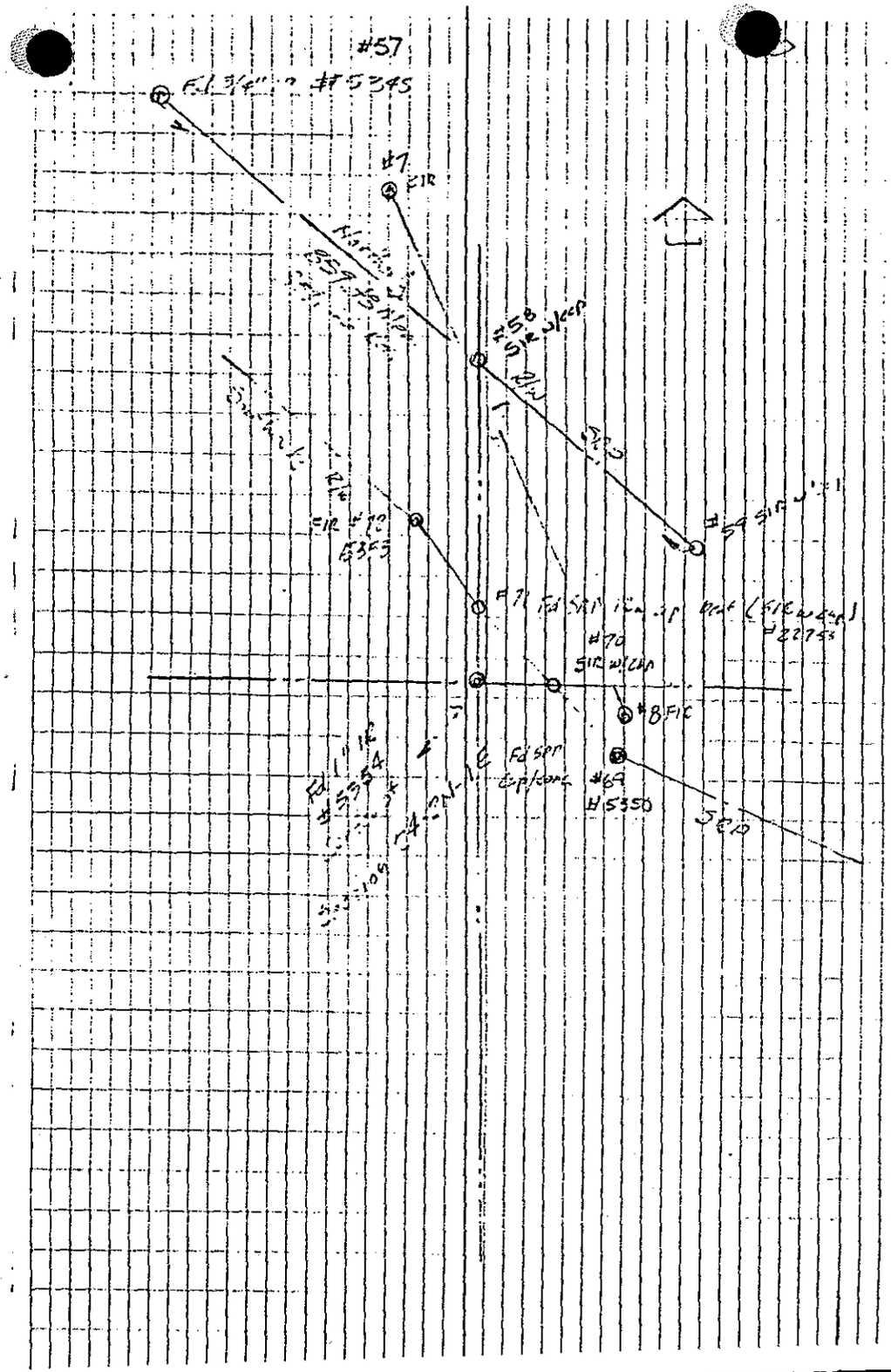
(JOB)
DATA FILE: 4144TOPZ (2000 points → 2877)

Cont. from p. 65
Rio Grande Canal
4144 Pitts. Co.

Colony

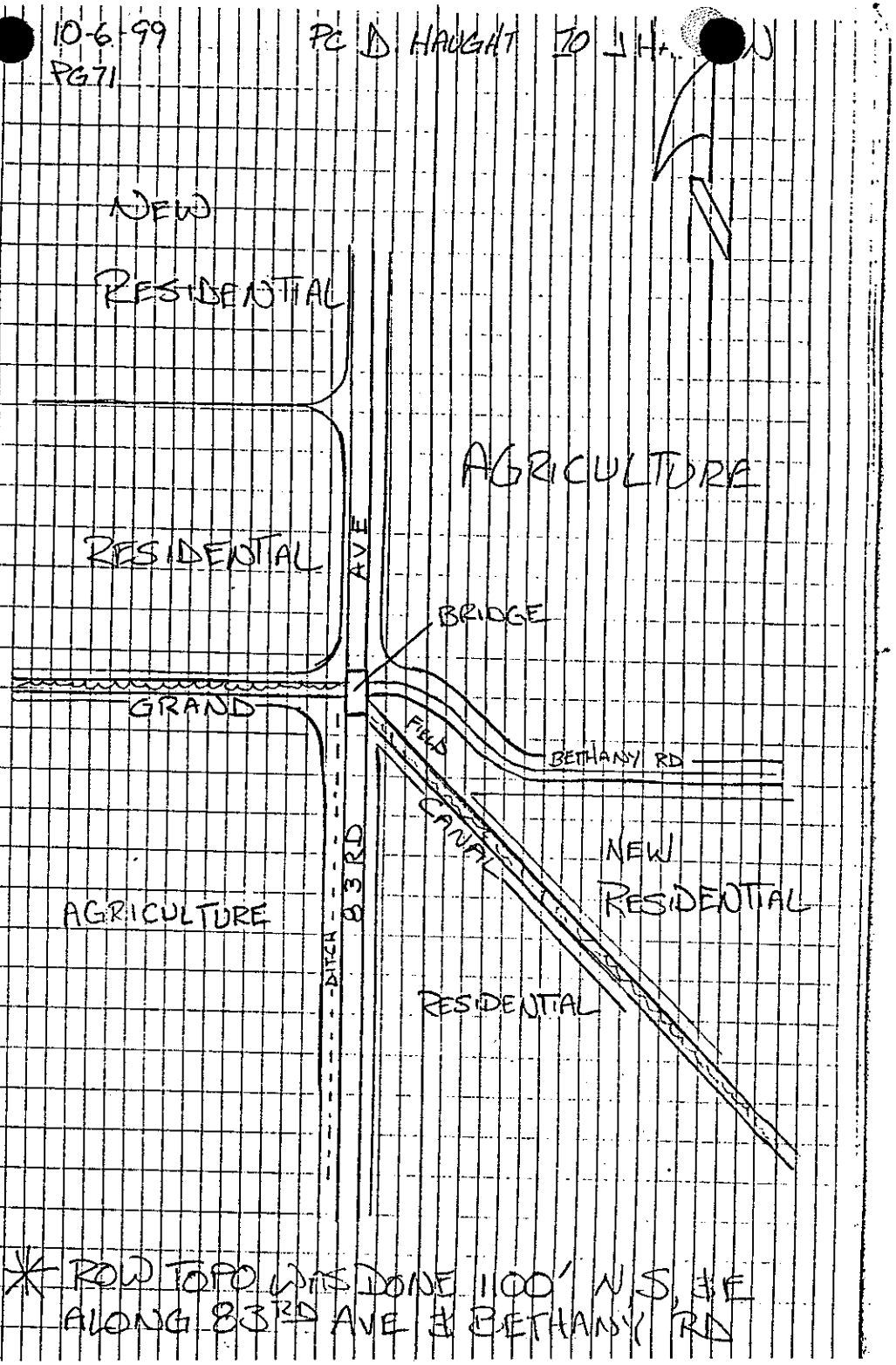
Acres

A 2.3
P 5.5 /



10-6-99
PG71

PC D. HAUGHT TO J. H.



* ROW TOPO WAS DONE 1100' N S, & E ALONG 83RD AVE & BETHANY RD

INVERT MEASUREMENTS:
91 ST. & GRAND CANAL

J. HARMON

10-6-17

Pg. 7E

PT. #	DESC.	INV.	FLOW
1793	WV	-3.55	
	MH	-12.40	N & S
1815	WV	-4.25	
1630	MH		
833	MH		
853	MH	-11.75 -11.45	N & S E
861	MH	-11.30	N & S
862	MH		
870	WV	-4.40	
851	WV	-4.10	
828	WV		
817	WV	-4.60	
816	WV	-3.50	

@ STA. -6+30, 35' RT

#2 SEE SHEET

#2 SEE SHEET

SEWER (C.O.G.)

SEWER (C.O.G.)

SRP ELECTRIC (CANNOT OPEN)

(CANNOT OPEN)

#444

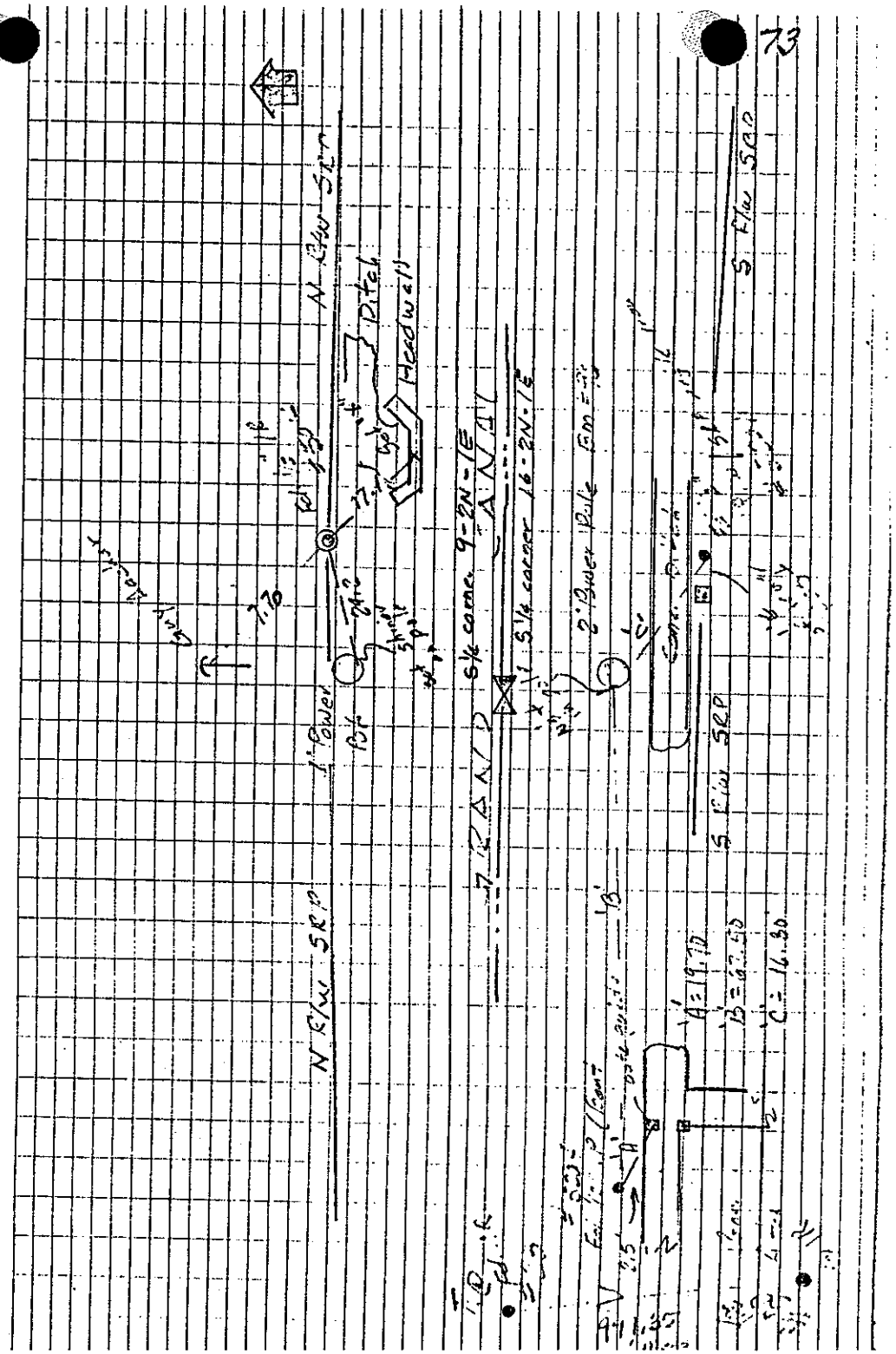
Bailey Home Outlet

10/15/99 R/W Control Survey

M Collins Path Finder File 444.dwl.dwg

Section 9-2N-1E

T Harmon



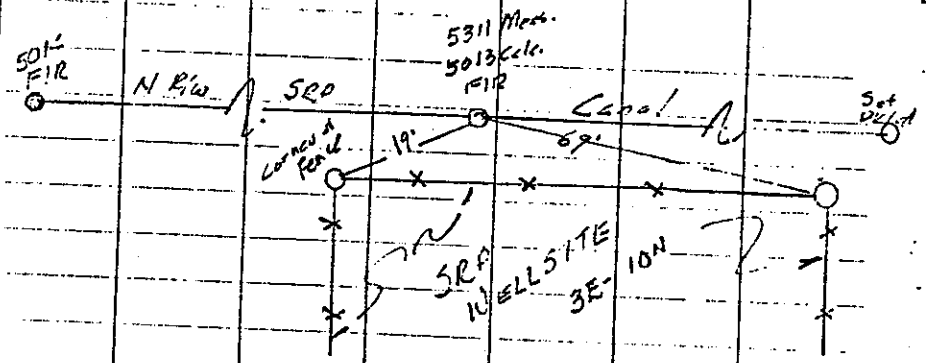
10/13/99

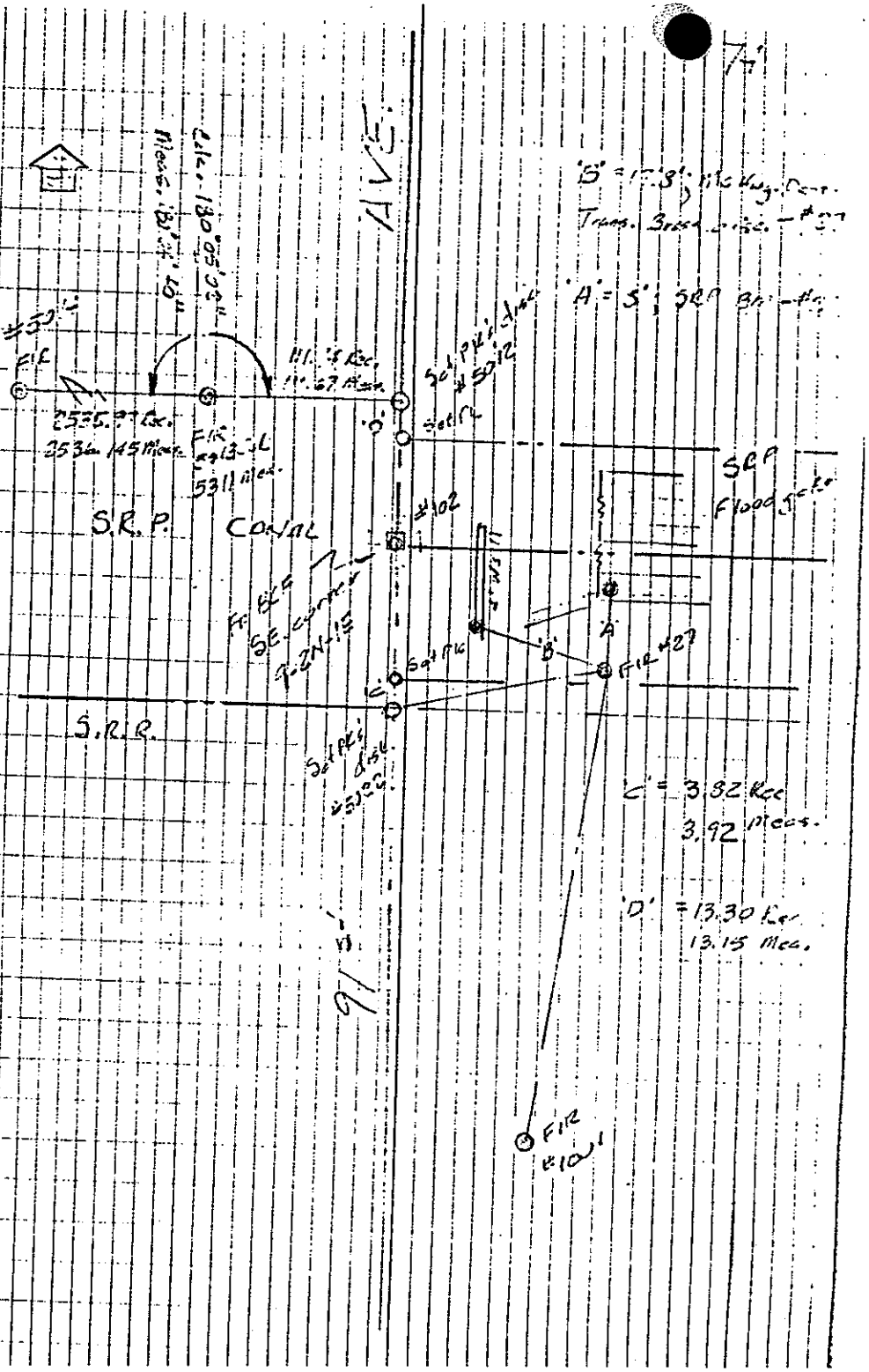
M. Collins
K. Herman

Section Home Defail
2/w Section

Section 7-CN-1E

DATA File 4144 Col. c-5





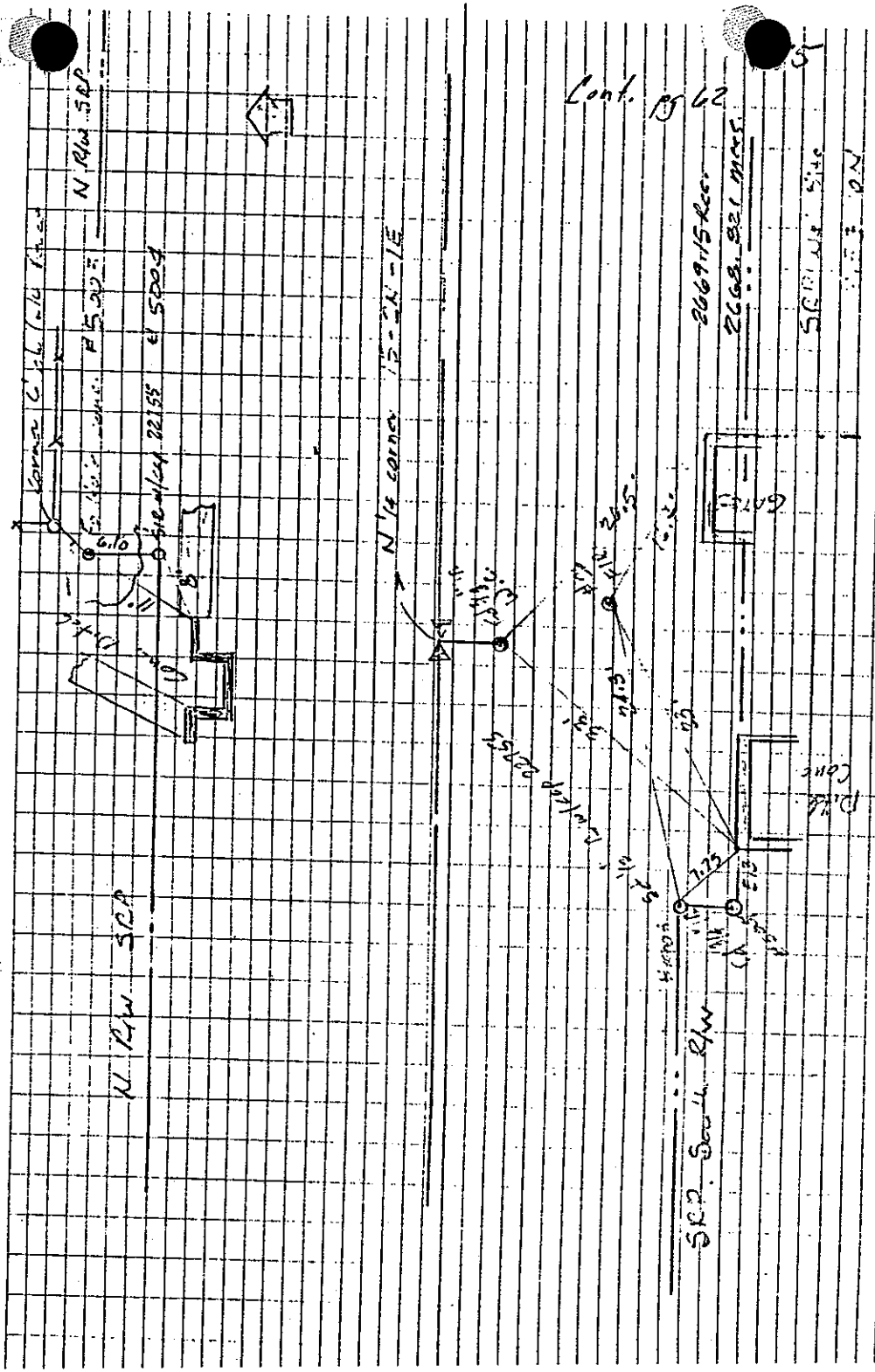
Cont. from pre. pg.

10/18/99

4144 RW1.ex5

Cont. on pg. 62
10/19/99

Cont. pg 62



BETHANY
HOME RD.
B.M.
#41144
FCD No. 78-96

NATIONAL
415
LEVEL BOOK

① FAR - LEVEL LOOP 83RD TO 99TH AVE.

C. HANSON π (P.E.)
B. HOFFMAN φ

② 06/22/99

STA	+	H.I.	-	ELEV.
BM 93				1088.7506
	1.47			
	1.36	90.1094		
	1.245			
			4.88	
M.C			4.28	1085.8294
			3.68	
	~~5.00~~	5.27		
	~~4.80~~	4.61		
	~~3.80~~	3.96		
			~~1.59~~ 1.81	
BM 93			1.48 1.69	
			1.36 1.57	

③ VERTICAL CONTROL D. HAUGHT, P.C. 7-14-99

5TH Ave TO 91ST Ave (Bethany Home Rd.

STA.	+	H.I.	-	ELEV.	STA.	+	H.I.	-	ELEV.
									SKP (1085.8336)
4.0E BM 93 10.0N				1088.7506	MC MCHD 1087.4				1085.8294
	1.47	90.1094				1.36	86.8994		1085.8291 adj
	1.36					1.07			
	1.245			SKP (1085.8336)		0.78			
M.C. MCHD 1087.4			4.88	1085.8294	P/P #11 TP 1			4.44	1082.9869
			4.28	1085.8281 adj.				3.91	1082.9911
			3.68					3.39	
	5.27	90.4419				3.95			
	4.61					2.73	85.7194		
	3.96					1.52			
BM93			1.81	1088.7519	P/P 9			4.42	
			1.69					3.34	1082.3794
			1.57					2.26	1082.3858
						3.70			
						2.49	84.8719		
						1.29			

⑤ VERTICAL CONTROL D. HAUGHT, P.C. 7-14-98 ⑥

75th AVE TO 91ST AVE BETHANY Home Rd.

STA.	+	H.I.	-	ELEV.		STA.	+	H.I.	-	ELEV.	
P/P #1		84.8719				P/P 2					
							4.34				
P/P 6			7.47				3.81	80.1394			
			5.22	1079.	6544		3.28				
			2.96	1079.	6629	P/P 7107KL CONC. BASE N. SIDE SCRIBE "X"			5.37		
	3.60								4.755	1075.	3844
	2.42	82.0719							4.14	1075.	4014
	1.23						3.94				
P/P 4			5.00				3.59	78.9744			
			3.88	1078.	1919		3.24				
			2.76	1078.	2025 adj	CP #26			5.68		
	3.71								5.31	1073.	6619
	2.52	80.7119							4.95	1073.	6789 adj
	1.33						~~4.87~~				
P/P 2			5.50				4.63	78.2919			
			4.38	1076.	3294		~~3.39~~				
			3.27	1076.	3421 adj						

VERTICAL CONTROL — D. HAUGHT, P.C. — 7-14-99

7TH AVE TO 91ST AVE BETHANY HOME ROAD

STA.	+	H.I.	−	ELEV.		STA.	+	H.I.	−	ELEV.	
P/P 115			3.80		on P/P 1074.74	P/P 111		75.3569			
			3.55	1074.	7444						
			3.29	1074.	7614 adj	P/P 109			5.49		1071.10
	4.44								4.25	1071.	1044
	3.17	77.9119							3.02	1071.	1278 adj.
	1.89						4.71				
P/P 113			4.90		1074.20		3.445	74.5494			
			3.71	1074.	1994		2.18				
			2.53	1074.	2185	P/P 107			5.11		1070.74
	3.60								3.875	1070.	6744
	2.34	76.5369							2.64	1070.	6999 adj.
	1.07						5.215				
P/P 111			4.91				3.93	74.6069			
			3.67	1072.	8669		2.655				
			2.43	1072.	8881 adj.				6.80	S.R.P. (1069.	0532)
	3.76					@ 91ST SRP GATE 2*22			5.58	1069.	0269
	2.49	75.3569							4.36		
	1.22						-0.0276/13 TURNS =		-0.0021		

(9) VERTICAL CONTROL D. HAUGHT, P.C. 7-15-99 (10)

ST AVE TO 99TH AVE (GRAND CANAL)

STA	+	H.I.	−	ELEV		STA.	+	H.I.	−	ELEV	
@ 91ST S.R.P. GATE 2*22	3.53			EL'N 1069.	0532	@ 91ST S.R.P. GATE 2*22		71.8557		1069.	0532
	2.97	72.0232							7.24		
	2.41					P/P #103			5.74	1066.	1157
			2.46	(S.R.P 1070.	0452)				4.24	1066.	1225 adj.
@ 91ST MC 1071.7 MCHP.			1.98	1070.	0432		4.23				
			1.50	1070.	0450 adj.		2.31	68.4282			
	2.565						0.40				
	2.08	72.1270							5.26		
	1.61					P/P #101			3.35	1065.	0782
			3.64						1.44	1065.	0918 adj.
@ 91ST S.R.P GATE 2*22			3.08	1069.	0470		4.045				
			2.52				2.15	67.2295			
	3.31						0.26				
	2.80	71.8557							6.08		
	2.30					P/P #99			4.155	1063.	0745
									2.23	1063.	1017 adj.

VERTICAL CONTROL — D. HAUGHT, P.C. — 7-15-99 — (12)

1st AVE TO 99th AVE (GRAND CANAL)

STA.	+	H.I.	−	ELEV.		STA.	+	H.I.	−	ELEV.	
						P/P # 95		64.7520			
									3.695		
P/P # 99	4.14			1063.	0745	P/P # 94			2.82	1061.	9320
	2.23	65.3045		1063.	1017 adj				1.945	1061.	9796 adj.
	0.32						4.52				
			5.39				3.12	65.0545			
P/P # 96			3.155	1061.	8470		1.73				
			1.53	1061.	8810 adj	P/P # 92			4.405		
	4.39								3.06	1061.	9957
	3.37	65.2195							1.71	1062.	0501 adj
	2.36						4.44				
			4.58				2.98	64.9757			
P/P # 95			3.70	1061.	5207		1.52				
			2.815	1061.	0561 5 adj				4.645		
	4.235					P/P # 89			3.34	1061.	6370
	3.23	64.7520							2.03	1061.	6982 adj.
	2.23						5.59				
							4.61	66.2470			
							3.63				

VERTICAL CONTROL — D. HAUGHT, P.C. — 7-15-99 — (14)

91ST AVE TO 99TH AVE (GRAND CANAL)

STA.	+	H.I.	−	ELEV.	
P/P #89		66.2470			
			5.81		
P/P #87			4.76	1061.	4870
			3.71	1061.	5546 adj
	4.23				
	3.42	64.9082			
	2.615				
			3.65	(SRP 1062 .1758)	
@ 99TH M.C. 1062.1			2.80	1062.	1082
MCHD 1062.1			1.95		
	−0.0676 / 10 =		−0.0068		

83RD AVE. TO 75TH AVE

STA.	+	H.I	−	ELEV.	
	7.82			1088.	7506
SRP BM 93 4.0 E 10.0 N	5.455	94.2031			
	3.08				
			5.74		
P/P 18			3.795	1090.	4081
			1.85	1090.	4053 adj
	4.18				
	2.895	93.3031			
	1.61				
			4.37		
P/P 20			3.17	1090.	1306
			1.98	1090.	1250 adj
	4.83				
	3.61	93.7406			
	2.39				
			4.71		
P/P 22			3.555	1090.	1856
			2.40	1090.	1772 adj

VERTICAL CONTROL — D. HAUGHT, P.C. — 7-20-99 — (16)

	83RD AVE	TO	75TH AV	(GRAND CANAL)						
STA.	+	H.I.	−	ELEV.		STA.	+	H.I.	−	ELEV.
P/P 22				1090.	1856	P/P 26		94.1294		
	5.02			1090.	1772 adj				3.905	
	3.62	93.8056				P/P 28			2.64	1091. 4894
	2.22								1.375	1091. 4726 adj
			3.98				5.68			
P/P 24			2.705	1091.	1019		4.58	96.0694		
			1.425	1091.	0907 adj		3.48			
	4.54								3.705	
	3.10	94.1994				P/P 27			2.82	1093. 2494
	1.65								1.935	1093. 2298 adj
			3.765				2.968			
P/P 26			2.53	1091.	6681		2.893 ~~2.983~~	96.1421		
			1.30	1091.	6541 adj		2.817			
	3.915								5.157	
	2.46	94.1294				C/P 4			5.108	1091. 0348
	1.01								5.057 ~~5.507~~	1091. 0122 adj
							5.263			
							5.216	96.2504		
							5.168			

VERTICAL CONTROL

D. HAUGHT, P.C.

7-20-9

(18)

83 RD AVE TO 75 TH AVE (GRAND CANAL)

STA.	+	H.I.	−	ELEV.
			3.075 ~~2.967~~	
P/P			3.002 ~~2.893~~	1093. 2486
NO S.E. OF P/P = 27 ABOVE F.S.NE CANAL			2.928 ~~2.816~~	1093. 2233 adj
	5.37			
	4.06	97.3086		
	2.75			
			7.84	
B.C.F	@ 77TH MISSOURI	LANE & AVE	6.70	1090. 6061
			5.57	1090. 5780 adj
	9.075			
	7.79	98.3974		
	6.51			
			8.535	
B.C.F.	@ 77TH DENTON	LANE & LANE	7.635	1090. 7624
			6.735	1090. 7315 adj
	8.445			
	7.56	98.3224		
	6.675			

STA.	+	H.I.	−	ELEV.
BCF	@ 77TH & DENTON	98.3224		
			8.32	
BCF	@ 77TH LANE & VERMONT AVE		7.47	1090. 8524
			6.62	1090. 8187 adj
	7.235			
	6.24	97.0924		
	5.245			
			7.39	
B.C.F	@ 77TH LANE & GEORGIA AVE		6.18	1090. 9124
			4.97	1090. 8759 adj.
	8.045			
	6.275	97.1861		
	4.500			
			7.95	
B.C.F	@ P.C. & 5351 77TH LANE		6.19	1090. 9986
			4.42	1090. 2593 adj.
	9.755			
	8.415	99.4136		
	7.075			

VERTICAL CONTROL — D. HAUGHT, P.C. — 7-20-9

(20)

33RD AVE. TO 75TH AVE (GRAND CANAL)

STA.	+	H.I.	−	ELEV.
B.C.F.	@ P.C. & 77TH LANE	99.4136		
			6.51	
NAIL TP			4.765	1094.6486
			3.02	1094.6065 adj
	9.18			
	7.81	102.4611		
	6.45			
"BACK" TRIG STATION			7.64	SRP (1096.3632)
			6.235	1096.2274
			4.825	1096.1825 adj
	6.375			
	4.925	101.1611		
	3.47			
	@ 75TH AVE & CAMEL BACK		4.465	SRP (1097.0622)
050090 SRP B.M.			4.04	1097.1099
			3.62	
	+0.0477/17 =		0.0028	

75TH AVE TO 67TH AVE (GRAND CANAL)

STA.	+	H.I.	−	ELEV.
	7.63			
050090 SRP	6.085	103.1485		(SRP) 1097.0622
	4.545			
			8.57	
P/P # 4			7.225	1095.9235
			5.88	1095.9222 adj.
	9.13			
	7.31	103.2335		
	5.49			
			6.55	
COR CON TP	IRR. GATE			
			4.91	1098.3260
			3.26	1098.3236 adj.
	6.32			
	4.59	102.9160		
	2.86			
			6.98	
NAIL TP			5.67	1097.2460
			4.36	1097.2424 adj.

VERTICAL CONTROL D. HAUGHT, P.C. 7-21-9

(22)

75TH AVE TO 67TH AVE (GRAND CANAL)

STA	+	H.I.	-	ELEV.		STA.	+	H.I.	-	ELEV.	
	6.08			1097.	2460	P/P #14				1095.	1135
NAIL				1097.	2424 adj.						
TP	4.785	102.0322					8.16			1095.	1062 adj.
ON ROAD											
@ P/P 9	3.495						7.34	102.4535			
			6.93				6.52				
P/P # 11			5.61	1096.	4210				4.755		
			4.295	1096.	4162 adj.	P/P # 775			7.67	1098.	7810
	6.58								2.595	1098.	7725 adj.
	5.945	102.3660					5.47				
	5.31						4.205	102.9860			
			8.33				2.94				
P/P # P12											
TOP OF			7.64	1094.	7260				7.20		
ANCHOR							paint spot on				
BOLT			6.95	1094.	7200 adj.	T.P.	top conc. canal		6.075	1096.	.9097 ~~5722~~
							131' FROM N.E.				
	9.18						COR. SCHOOL FNC.		4.955	1096.	9000 adj.
	7.82	102.5485					7.61				
	6.47						6.37	103.2785 ~~102.9410~~			
			8.82				5.125				
P/P # 14			7.435	1095.	1135						
			6.05	1095.	1062 adj.						

VERTICAL CONTROL.

D. HAUGHT, P.C.

7-22-99

(24)

75TH AVE TO 67TH AVE (GRAND CANAL)

STA	+	H.I.	−	ELEV.
		~~102.9410~~ 103.2785	7.49	
ON CONC. TOP CANAL TP BY CHURCH			5 ~~4.975~~	1097.3047 ~~1096.9672~~
			4.455	1097.2938 adj.
	6.98			
	5.76	103.0660 ~~102.7285~~		
	4.545			
			7.625	
ON CONC. TOP CANAL TP NEAR CANAL BEND			6.000	1097.0647 ~~1096.7272~~
			4.38	1097.0526 adj
	8.15			
	6.87	.9347 ~~103.5972~~		
	5.59			
			7.925	
ON CONC. TOP CANAL TP 500' WEST 67th			6.61	1097.3260 ~~1096.9985~~
			5.29	1097.3127 adj
	8.19			
	6.865	104.1910 ~~103.8535~~		
	5.54			

67TH AVE TO INDIAN SCHOOL (GRAND CANAL)

STA	+	H.I.	−	ELEV.
500' W. OF 67th T.P.		104.1910 ~~103.8535~~		
			6.30	
TOP WING WALL "Z-19" TP. IRR. GATE VALVE			4.465	1099.7247 ~~3872~~
			2.635	1099.7102 adj.
	4.53			
	4.02	.7422 ~~103.4047~~		
	3.50			
6.0E. 8.3N CITY OF Phoenix B.C.F. B.M ON T/C			4.62	SRP (1099.4127)
	BRIDGE 69310 ON 67th		4.315	1099.4272 ✓ ~~1099.0897~~
			4.01	
	2.82			0.0145 / 12 = 0.0012
	2.46	~~.5497~~ ~~101.8727~~ ✓ .8727		
	2.10			
			4.89	
200± E. OF 67th TP N. SIDE CANAL TOP			4.32	1097.~~2272~~ ~~5502~~ .5502
			3.76	

VERTICAL CONTROL — D. HAUGHT, P.C. — 7-21-9?

(26)

67TH AVE TO INDIAN SCHOOL (GRAND CANAL)

STA	+	H.I	−	ELEV.
				1097. ~~.2272~~ ~~.5503~~ .5502
	6.90			
TP	5.58	~~102.8060~~ ~~103.1290~~ 103.1290		
	4.255			
ACROSS SRP MAINTENANCE FACILITY			7.17	
TP			5.755	1097. ~~.0510~~ ~~.3740~~ .3740
			4.34	
	8.145			
	6.87	~~103.9222~~ ~~104.2452~~ 104.2452		
	5.60			
			8.475	
@ BEND OF CANAL TP			7.03	~~1096. 8935~~ ~~1097. 2165~~ 1097. 2164
			5.58	
	7.59			
	6.295	~~.7897~~ ~~103.5127~~ .5127		
	5.005			

INDIAN SCHOOL TO 63RD AVE (GRAND AVE)

STA.	+	H.I.	−	ELEV.
T.P. City of Phoenix on Wing Wall		~~.7897~~ ~~103.5127~~ .5127		
			6.52	SRP (1098.8759)
B.C.F. B.M. Bridge # 9202	C.O.P. 6.3E		4.635	1098. ~~.8765~~ 1098.8764
			2.755	
	6.10			
	5.205	104.0809 ~~103.7630~~		
	4.31			
2ND P/P SO. OF Indian School East side of Canal			6.55	
P/P #			5 ~~4.87~~	1098.2109 ~~1097.8930~~
			5.19	1098.2065 adj.
	6.37			
	5.05	103.2609 ~~102.9430~~		
	3.73			
			5.94	
P/P # 6411			5.12	1098.1409 ~~1097.8230~~
			4.30	1098.1320 adj.

VERTICAL CONTROL

D. HAUGHT, P.C.

7-22-

(28)

INDIAN SCHOOL TO 63RD AVE (GRAND CANAL)

STA	+	H.I.	−	ELEV.
	6.00			1098.1409 ~~1097.9330~~
P/P #6411	5.33	.4734 103.~~1555~~		1098.1320 adj.
	4.67			
			6.36	
P/P #6343			5.67	1097.~~8034~~ ~~4855~~
			4.98	1097.7901 adj.
	6.875			
	6.20	104.0046 ~~103.6868~~		
	5.53			
			5.975	
P/P #6321			5.285	1098.~~7209~~ ~~4030~~
			4.59	1098.7032 adj.
	6.055			
	5.24 3	.9509 103.~~6330~~		
	4.41			
			6.09	
NAIL TP UNDER SHADE TREE			5.02	1098.~~9309~~ ~~6130~~
			4.95 3	1098.9087 adj.

STA.	+	H.I.	−	ELEV.
	5.83			
NAIL TP UNDER SHADE TREE	5.43	.3596 104.~~0418~~		1098.9309
	5.025			1098.9043 adj.
6.5E 7.8N			6.36	(1098.5580 5 RP)
SRP. B.C.			5.775	~~1098.2669~~
TOP HEADWALL SOUTH SIDE Canal @ 63RD AVE			5.19	1098.5846
	0.0266/6 = 0.0044			

VERTICAL CONTROL — D. HAUGHT, P.C. — 7-2?-99

(30)

BENCHMARK CHECK						LEVEL LOOP CHECK					
STA.	+	H.I.	−	ELEV.		STA.	+	H.I.	−	ELEV.	
	3.93					77"S" P/P	2.38			1098.	7810
BM COP 6.3E	3.29	102.1634		1098.8759			1.99	100.7735			
	2.64						1.61				
			4.07	(1098.3179)					7.40	(1093.	5705)
BM 6.3E 8.0N.			3.835	1098.3284		BM 055085			7.20	1093,	5735
			3.60						7.00		
	4.16						7.46				
	3.925	102.253					7.26	100.8360			
	3.69						7.07				
			4.03						2.44		
BM C.O.P. 6.3E			3.38	1098.8734		77"S" P/P			2.06	1098.	7785
			2.73						1.67		

VERTICAL CONTROL

D. HAUGHT, P.C.

7-23

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75TH AVE TO 67TH (CAMEL BACK)

STA	+	H.I.	−	ELEV.
@ 75TH SRP BM# 050090				1097.0622
	4.64			
	4.44	101.5034		
	4.245			
			6.885	
75th & CAMELBACK B.C. HH.			6.245	1095.2584
			5.605	
	6.79			
	6.15	101.4084		
	5.51			
			4.545	SRP (1097.0622)
BM# 050090			4.35	1097.0597
			4.15	
	4.625			
	3.71	100.7709		
	2.79			

75TH AVE. TO 59TH AVE (CAMELBACK)

STA	+	H.I.	−	ELEV.
			5.91	
TP 1			3.62	1097.1597
			1.315	1097.1613 adj.
	7.08			
	5.845	103.0047		
	4.61			
			5.94	
T.P. 2 T/C N. SIDE C.B @ 73RD AVE.			4.55	1098.4522
			3.17	1098.4555 adj
	6.73			
	5.50	103.9547		
	4.28			
			6.08	
T.P.3			4.51	1099.4472
			2.93	1099.4521 adj

VERTICAL CONTROL — D.HAUGHT, P.C. — 7-23

(34)

75TH AVE TO 67TH AVE (CAMEL BACK)

STA.	+	H.I.	−	ELEV.	
	6.745				
T.P. 3	5.57	105.0172		1099.	4472
T/C N.C.B.	4.395			1099.	4521 adj
			6.24		
T.P. 4			4.59	1100.	4272
T/C N.C.B. NEAR 71ST DR.			2.94	1100.	4337 adj.
	5.59				
	5.22	105.6472			
	4.85				
			5.425		
CP #25			4.97	1100.	6760
			4.52	1100.	6842 adj
	7.165				
	5.75	106.4247			
	4.33				
			6.04		
T.P. 5			4.76	1101.	6672
			3.47	1101.	6770 adj.

STA.	+	H.I.	−	ELEV.	
T.P. 5				1101.6672	
				1101.6770 adj.	
	7.22				
	5.915	107.5822			
	4.61				
			5.76		
TP 6			4.77	1102.	8135
			3.775	1102.	8249 adj.
	7.38				
	6.08	108.8935			
	4.78				
			6.23		
TP 7			4.61	1104.	2822
T/C N. SIDE CAMEL BACK 68TH DR.			2.995	1104.	2953 adj.
	7.265				
	6.03	110.3110			
	4.79				

VERTICAL CONTROL — D. HAUGHT, P.C. — 7-23-5

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75TH AVE TO 67TH AVE (CAMEL BACK RD)

STA.	+	H.I.	−	ELEV.	
TP 7		110.3110			
	~~5.85~~		5.85		
	~~4.675~~		4.675	1105.	6360
	~~3.50~~		3.50	1105.	6507 adj.
	7.435		~~7.435~~		
	6.205	111.8435	~~6.205~~		
	4.985		~~4.985~~		
			6.00		
# V C.P. 24			3.93	1107.	9160
			1.85	1107.	9323 adj.
	5.89				
	5.18	113.0960			
	4.47				
			5.70		
67th & C.B. H.H			5.32	1107.	7760
			4.94	1107.	7940 adj.
	5.755				
	5.38	113.1535			
	4 ~~1~~.995				

67TH AVE TO 63RD AVE (CAMEL BACK RD)

STA.	+	H.I.	−	ELEV.	
67th & C.B. H.H.		113.1535			
			6.03		
T/C N. SIDE C.B. T.P. 8 NEAR 2nd F.H. E. OF 67th			4.505	1108.	6460
			2.99	1108.	6656 adj.
	6.795				
	5.59	114.2360			
	4.385				
			5.78		
T/C N. SIDE C.B. T.P. 9 ACROSS FROM FAITH CHAPEL			4.275	1109.9610	
			2.77	1109.	9822 adj.
	6.56				
	4.895	114.8560			
	3.23				
			4.96		
T.P 9			3.69	1111.	1635
			2.43	1111.	1865 adj.
	6.31				
	4.955	116.1185			
	3.60				

VERTICAL CONTROL — D. HAUGHT, P.C. — 7-23-

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67TH AVE TO 63RD AVE (CAMEL BACK RD)

STA.	+	H.I.	−	ELEV.
T.P 9		116.1185		
			5.18	
T/C. N. side C.B.				
T.P. 10			3.95	1112.1710
@ 63rd Lane				
			2.71	1112.1955 adj.
	6.20			
	4.915	117.0860		
	3.63			
			5.53	
CP #16			3.98	1113.1035
				1113.1296 adj.
			2.44	
	6.10			
	5.43	118.5335		
	4.76			
			4.95	
63rd AVE & C.B.				
B.C.F.			4.555	1113.9785
			4.16	1114.0062 adj.
	6.17			
	4.88	118.8610		
	3.60			

63RD AVE TO 59TH AVE (CAMEL BACK RD)

STA.	+	H.I.	−	ELEV.
63rd AVE & C.B.				
B.C.F.		118.8610		
			5.55	
T/C N. C.B.				
T.P. 11			4.04	1114.8210
@ 62nd Dr.				
			2.53	1114.8504 adj.
	6.46			
	5.16	119.9810		
	3.86			
			5.09	
T.P. 12			3.64	1116.3410
			2.19	1116.3720 adj.
	6.86			
	5.67	122.0110		
	4.48			
			5.53	
T/C N. C.B.				
T.P. 13			3.84	1118.1710
@ 60th Dr.				
			2.15	1118.2036 adj.
	6.83			
	5.35	123.5185		
	3.86			

VERTICAL CONTROL — D.HAUGHT, P.C.

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63RD AVE TO 59TH AVE (CAMEL BACK RD)						CAMELBACK TO MISSOURI (59TH AVE)					
STA.	+	H.I.	−	ELEV.		STA.	+	H.I.	−	ELEV.	
T.P. 13		123.5185				CP #17		126.1773			
			4.83			T/C N.W. COR	59TH & MEDLOCK Dr.		6.315		
T/C S.C.B. T.P. 14			3.305	1120.	2160	TP #15			4.26	1121.	9186
			1.77	1120.	2503 adj.				2.20	1121.	9578 adj.
	5.77						7.255				
	4.53	124.7480					5.885	127.8023			
	3.29						4.51				
59th AVE & Camel back			5.075						4.98		
B.C. H.H			3.91	1120.	8373	CP #18 ✓			3.09	1124.	7123
			2.74	1120.	8716 adj.				1.20	1124.	7531 adj.
	5.71						6.63				
	5.33	126.1673					5.37	130.0836			
	4.95						4.115				
CP #17 ✓			5.25								
			5.12	1121.	0473				6.205		
			4.99	1121.	0848 adj.	TP #16 N. BCR @ 5322 59TH AVE			3.76 S	1126.	3348
	6.325								1.29	1126.	3772 adj.
	5.13	126.1773									
	3.935										

VERTICAL CONTROL

D. HAUGHT, P.C.

CAMELBACK TO MISSOURI (59TH AVE)

STA.	+	H.I.	−	ELEV.
TP #16				1126.3348
				1126.3772 adj.
	7.075			
	5.97	132.3026		
	4.86		6.185	
STONE IN H.H. 59TH & MISSOURI			4.595	1127.7098
			3.00	1127.7539 adj.
	6.295			
	5.89	133.5986		
	5.48			
			5.362	
CP #19			5.268	1128.3306
				1128.3763 adj.
			5.174	
	5.417			
	5.323	133.6536		
	5.229			
7.0E 9.5N BM 070095 @ S.W. COR MISSOURI & 59th			5.503	(1128.2986)
			5.401	1128.2529
			5.298	

$-0.045 \frac{1}{10} = -0.004$

MISSOURI AVE (@59TH AVE) TO GRAND CANAL

STA	+	H.I.	−	ELEV.
070095 BM				1128.2986 ~~2529~~
	5.45			
	3.86	132.1611 ~~7154~~		
	2.28			
			7.99	
T/C S. MISSOURI T.P. 17 100± E.			6.40	1125.7611 ~~7154~~
Three Fountains entr.			4.81	1125.7650 adj.
	6.065			
	4.86	130.6223 ~~5766~~		
	3.66			
			7.33	
B/W N.E. COR T.P. 18			6.045	1124.5773 ~~5316~~
MISSOURI & Trailer Park emergency entr.			4.76	1124.5852 adj.
	6.735			
	5.18	129.7585 ~~7129~~		
	3.63			

VERTICAL CONTROL — D. HAUGHT, P.C. — 7-24-99

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MISSOURI AVE. (59TH AVE to GRAND Canal)

STA.	+	H.I.	−	ELEV.		STA.	+	H.I.	−	ELEV.	
TP 18		.7585 ~~129.7129~~					5.65				
			7.575			CP #20	5.105	.8490 125.8034		1120. ~~.6984~~	.7440
T/C BCR (S.W.) TP 19			6.32	1123. ~~.3944~~	.4398		4.56			1120.	.7637 adj.
MISSOURI & 61ST LANE			5.06	1123.	.4516 adj.				5.729		
	5.62					MISSOURI & 63rd B.C.F.			5.432	1120. ~~.2744~~	.4168
	4.36	.8023 ~~127.7566~~							5.136	1120.	.4404 adj.
	3.11						5.83				
			7.81				4.61	125.0268 ~~124.9844~~			
TP 20			6.31	1121. ~~.4494~~	.4948		3.39				
			4.80	1121.	.5105 adj.				6.775		
	3.923					T/C BCR T.P. 21 S.E. COR MISSOURI & 64th			5.60	1119. ~~.3844~~	.4268
	3.331	.8256 ~~124.7799~~							4.425	1119.	.4544 adj.
	2.738						5.98				
			4.75				4.67	.0968 ~~124.0544~~			
C.P. #20			4.082	1120. ~~.6984~~	.7440		3.36				
			3.412	1120.	.7637 adj.				7.005		
						WEST T/C BCR TP 22 @ O'NEIL PARK ENTR.			5.75	1118. ~~.2999~~	.3455
									4.50	1118.	.3770 adj.

VERTICAL CONTROL — D. HAUGHT, P.C. — 7-24-

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MISSOURI AVE (59TH AVE TO GRAND CANAL)

STA.	+	H.I.	−	ELEV.	
TP 22	6.02			1118.	.3455 ~~2999~~
	4.81	.1556 123.~~1077~~		1118.	3770 adj.
	3.60				
			7.495		
T/C EAST SIDE TP 23			5.98	1117.	.1755 ~~1239~~
OF EXIT OF JACK ELEM. Sch.			4.465	1117.	2109 adj.
	5.815				
	4.50	.6768 121.~~6211~~			
	3.19				
			7.84		
T/C BCR S.E. COR. TP 24			6.10	1115.	.5768 ~~5311~~
@ MISSOURI & 66th Dr.			4.36	1115.	6162 adj.
	5.69				
	4.41	.9868 119.~~9411~~			
	3.13				
			4.966		
MISSOURI & 67TH B.C. HH			4.588	1115.	.3985 ~~3529~~
			4.211	1115.	4418 adj.

STA	+	H.I.	−	ELEV.	
MISSOURI & 67TH	5.211			1115.	.3985 ~~3529~~
H.H. B.C.	4.861	.2598 120.~~3141~~		1115.	4418 adj.
	4.512				
			5.982		
C.P. 21			5.704	1114.	.5553 ~~5096~~
			5.428	1114.	6025 adj.
	5.62				
	4.535	.0903 119.~~0410~~			
	3.45				
			9.19		
T/C @ END CURE T.P. 25			7.34	1111.	.7528 ~~7071~~
100± EAST 68TH AVE N. SIDE MISSOURI			5.48	1111.	8040 adj.
	6.07				
	4.76	.5128 116.~~4871~~			
	3.45				
			8.04		
T/C B/CR NE COR T.P. 26			6.22	1110.	.2928 ~~2471~~
MISSOURI & 69TH AVE			4.40	1110.	3479 adj.

VERTICAL CONTROL — D. HAUGHT, P.C. — 7-24-99

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MISSOURI AVE (59TH AVE TO GRAND CANAL)

STA	+	H.I	-	ELEV		STA	+	H.I.	-	ELEV	
	5.995						6.03				
TP 26	4.66	.9515 114.~~9059~~		1110.	.2928 ~~2471~~	¼ COR. B.C.F.	4.885	.7237 111.~~6819~~		1106.	.8387 ~~7969~~
	3.32			1110.	3479		3.74			1106.	9056 adj.
			7.87						7.595		
T.P. 27			6.19	1108.	.7628 ~~7171~~	CP#22			6.385	1105.	.3387 ~~2969~~
			4.505	1108.	8219 adj.				5.175	1105.	4096 adj.
	5.85						19 6.~~225~~				
	4.60	.3590 113.~~3171~~					5.12 ~~4.81~~	.4587 110.~~4169~~			
	3.35						4.05 ~~3.365~~				
BCF @ TP 28	71 ST AVE		7.87						6.93		
			5.95	1107.	.4115 ~~3696~~	T/C WEST OF DRIVE TP.29 7232 W. MISSOURI			5.69	1104.	.7687 ~~7269~~
			4.02	1107.	4745 adj.				4.45	1104.	8435 adj.
	5.448						5.92				
	5.032	.4440 112.~~4021~~					4.83	.5987 109.~~5569~~			
	4.618						3.74				
			5.947						9.225		
¼ COR BCF on MISSOURI			5.605	1106.	.8387 ~~7969~~	B.C.R. EAST SIDE T.P.30 73RD DR.			7.305	1102.	.2937 ~~3519~~
			5.~~624~~ 264	1106.	9056 adj				5.~~835~~ .385	1102.	3724 adj.

VERTICAL CONTROL — D. HAUGHT, P.C. — 7-24-99

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MISSOURI AVE (59TH AVE) TO (GRAND CANAL)

STA	+	H.I.	−	ELEV.		STA	+	H.I.	−	ELEV.	
T.P. 30	5.485						5.822				
	4.335	.6287 106.~~5859~~		1102.	.2937 ~~2519~~	M. & 75th B.C. H.H	5.485	.8577 103.~~8159~~		1098.	.3730 ~~3314~~
	3.185			1102.	3724 adj.		5.147			1098.	4636 adj.
			6.85						5.681		
T/C T.P. 31			5.803	1100.	.8272 ~~7854~~	CP #23			5.318	1098.	.5405 ~~4986~~
			4.75	1100.	9099 adj.				4.952	1098.	6350 adj.
	5.927						5.74				
	5.012	.8380 105.~~7964~~					4.59	.1330 103.~~0944~~			
	4.092						3.45				
			7.105						7.788		
TP 32			5.948	1099.	.8905 ~~8486~~	EAST BCR TP 33			6.764 7.	1096.	.3685 ~~3366~~
			4.789	1099.	9771 adj.				5.742	1096.	4669 adj.
	5.689						4.662				
	4.698	.5882 104.~~5464~~					3.470	.8377 99.~~7959~~			
	3.706						2.275				
			6.578						7.65		
MISSOURI & 75TH BC HH			6.215	1098.	.3730 ~~3314~~	TP 34			6.30	1093.	.5352 ~~4934~~
			5.853	1098.	4636 adj.				4.96	1093.	6376 adj.

VERTICAL CONTROL — D. HAUGHT, P.C. — 7-25-

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MISSOURI AVE (59TH AVE TO GRAND CANAL)

STA	+	H.I.	−	ELEV.	
	5.902				
TP 34	797 ~~4.97~~	.3330 ~~98.2711~~		1093.	.5352 ~~4939~~
	3.695			1093.	6376 adj.
			6.75		
BCR NW. COR. TP 35			5.28	1093.	.0530 ~~0111~~
MISSOURI & 76th DR			3.81	1093.	1593 adj.
	5.45				
	4.02	.0717 ~~97.0299~~			
	2.585				
			8.21	1090. (1090.	5780 adj. 6061)
MISSOURI & 77TH AVE BCF			6.60	1090.	.4717 ~~4239~~
			4.99		
	−0.1063 /27 TURNS		= 0.0039 /turn error		
	add				

BM CHECK (63RD AVE TO 59TH AVE)

STA.	+	H.I	−	ELEV.	
	5.165				
6.5E 7.5N BM	4.01	.5692 ~~102.7877~~		1098.	5580
	2.86				
			4.57		
NAIL NEAR T.P			2.80	1099.	.7667 ~~9872~~
OLEANDERS N. Canal			1.04		
	4.855				
	3.62	.3855 ~~103.6060~~			
	2.38				
			6.315		
ON CONC. C.ANAL T.P N. SIDE			4.80	1098.	5842 ~~8047~~
			3.29		
	6.55				
	5.41	103.9942 ~~104.2147~~			
	4.27				
			3.215		
P/P #6041			2.275	1101.	.7180 ~~9385~~
			1.34		

VERTICAL CONTROL — D. HAUGHT, P.C. — 7-25-99

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BENCHMARK CHECK (63rd AVE TO 59TH AVE)

STA	+	H.I.	−	ELEV.		STA.	+	H.I.	−	ELEV.	
	3.54						5.49				
P/P 6041	2.67	.3880 104.~~6035~~		1101.	.7180 ~~9385~~	P/P	4.565	105.7890 ~~105.8125~~			
	1.80						3.645				
			4.40						6.143	SKP (1100.	2413)
P/P			3.56	1100. ~~1101.~~	8267 ~~0472~~	070080 BM. 7.0 E 8.0 N			5.553	1100.	.2350 ~~1570~~
P/P 15			2.725						4.965		
EE SIDE T.P.	4.82						5.96				
	3.935	.7617 104.~~9372~~					5.368	.6030 105.~~8350~~			
	3.05						4.776				
			4.23						5.83		
P/P			3.395	1101.	.3667 ~~5872~~	T/C B.C.R. T.P. S.W. COR. Clarendon & 59TH AVE			5.17	1100.	.4330 ~~6550~~
			2.56						4.51		
	4.955										
	4.068	.4352 105.~~6555~~									
	3.182										
			5.07								
P/P			4.21	1101.	.2227 ~~4442~~						
			3.355								

VERTICAL CONTROL D. HAUGHT, P.C. 7-26-99

STA	+	H.I.	−	ELEV.		STA	+	H.I.	−	ELEV	
@ 99 ξ MCC BM	2.066					P/P # 96	3.434				
GRAND CANAL	1.956	64.1320		1062.	1758		3.214	65.0952		1061.	8810
	1.847						2.995				
			5.044 4.947						5.663		
CP # 29 ✓			4.848	1059.	1856	CP # 28 ✓			5.443	1059.	6517
	4.928								5.225		
	4.829	64.0143					5.77				
	4.729						5.552	65.2037			
			1.949	(1062.	1758)		5.334				
@ 99TH ξ GRAND CANAL			1.838	1062.	1760				3.543	(1061.	8810)
M.C. BM.			1.728			P/P 96			3.322	1061.	8817
									3.101		
							3.427				
							3.205	65.0860			
							2 983				
									7 329		
						TP 1			6.115	1058.	9710
						TOP IRR. CANAL			4.901	1058.	9713 adj.

VERTICAL CONTROL D. HAUGHT, P.C. 7-26-99

STA	+	H.I	−	ELEV.		STA	+	H.I.	−	ELEV.	
	4.853						5.751				
TP1	3.697	62.6692		1058.9710		T.P.2	4.569	62.6495			
	2.542			1058.9713 adj.			3.389				
			5.811						4.878		
TP 2			4.588	1058.0807		TP1			3.679	1058.9692	
TOP IRR. CHNAL			3.367	1058.0813					2.485	1058.9707	
	4.642						7.119				
	3.778	61.8585					5.951	64.9200			
	2.913						4.782				
			6.024						3.233	(1061.8810)	
CP 30			5.488	1056.3700		P/P 96			3.041	1061.8795	
			4.954	~~1056.0009~~ adj.					2.847		
	6.091										
	5.558	61.9270									
	5.021										
			4.712								
TP2			3.847	1058.0800							
			2.987	1058.0812							

VERTICAL CONTROL D. HAUGHT, P.C. 7-26-9.

(60)

STA.	+	H.I	−	ELEV.		STA.	+	H.I.	−	ELEV.	
BM SRP	3.994						4.45				
@ 91ST AVE & GRAND CANAL	3.869	72.9227		1069.	0532	CP 26	2.95	76.6289		1073.	6789
GATE ZX ZZ	3.743						1.45				
			4.940						7.22		
C.P. 27			4.852	1068.	0702	CP 32			5.54	1071.	0864
			4.766						3.87		
	5.021						7.315				
	4.934	73.0042					5.64	76.7289			
	4.847						3.975				
			4.074	(1069.	0532)				4.55	(1073.	6789)
BM SRP			3.951	1069.	0534	CP 26			3.04	1073.	6864
GATE ZXZZ			3.827						1.54		

VERTICAL CONTROL D. HAUGHT, P.C. 7-25-99

(62)

STA.	+	H.I.	−	ELEV.		STA.	+	H.I.	−	ELEV.	
BM #23	5.949					@ P.C. & 77TH LANE					
@ 85TH											
SN1 SEP	4.867	93.6186		1088.	7506	B.C.F.	7.568				
CANAL 4.0E 10.0N	3.789						7.091	98.0503		1090.	9593
			8.82				6.614				
TRIE STATION			7.855	1085.	7636				5.596		
			6.89			CP #5			5.129	1092.	9206
	9.313								4.165		
	8.872	94.6356					5.721				
	8.431						5.255	98.1756			
			5.883				4.789				
CP #3			5.549	1089.	0861				7.693		
			5.212			@ P.C. & 77TH Ln. B.C.F.			7.217	1090.	9595
	4.91								6.737		
	3.862	92.9483									
	2.815										
			3.429	(1090.	4053)						
P/P #18			2.532	1090.	4163						
			1.635								

VERTICAL CONTROL D. HAUGHT, P.C. 7-25-99

(64)

STA.	+	H.I.	-	ELEV.		STA.	+	H.I.	-	ELEV.	
9.0N 5.0E	4.814						5.701				
SKP BM 050090	4.707	101.7700		1097.	0622	NAIL TP. NEAR P/P 9	5.016	102.2579		1097.	2424
	4.603						4.329				
			5.707						5.764		
CP 6 ✓			5.586	1096.	1844	CP. #7 ✓			5.448	1096.	8099
			5.463						5.132		
	5.790						5.836				
	5.667	101.8569					5.521	102.3311			
	5.546						5.207				
5.0E 9.0N			4.898						5.778		
SKPBM #050090			4.792	1097.	0604	NAIL TP NEAR P/P 9			5.089	1097.	2414
			4.684						4.403		

STA.	+	H.I.	−	ELEV.		STA.	+	H.I.	−	ELEV.	
	4.797						7.122				
	~~4.885~~										
	4.636	.4090				ON TOP CANAL					
P/P 77"s"	~~4.747~~	1103.~~5195~~		1098.	7725	TP	6.386	1103.6984		1097.	3127
	4.477					500± West					
	~~4.604~~					OF 67TH AVE	5.649				
			5.511								
			~~5.636~~						5.372		
CP 8 ✓			5.420								
			~~5.529~~	1097.	9892	CP 9 ✓			4.639	1099.	0687
			5.328								
			~~5.434~~						3.889		
	5.713						5.199				
	5.615	1103.6045					4.454	1103.5227			
	5.518						3.709				
						ON TOP					
			4.973			CANAL			6.942		
P/P 77"s"			4.834	1098.	7702	TP			6.209	1097.	3144
						500± WEST					
			4.696			OF 67TH AVE			5.473		

STA	+	H.I.	−	ELEV.		STA.	+	H.I.	−	ELEV.	
8.3N 6.0E	4.860						5.543				
@ 67TH AVE BM COP	4.775	1104.1880		1099.	4127	@ INDIAN SCHOOL BM C.O.P.	5.087	1103.9621		1098.	8759
& GRAND CANAL	4.691					& GRAND CANAL	4.628				
			4.950						5.254		
CP 10 ✓			4.793	1099.	3949	C.P. 11 ✓			5.187	1098.	7751
			4.636						5.120		
	4.657						5.086				
	4.498	1103.8922					5.016	1103.7914			
	4.336						4.947				
8.3 N. 6.0 E.			4.567			@ INDIAN SCHOOL & GRAND CANAL			5.371		
@ 67THAVE & GRAND CANAL											
BM C.O.P.			4.479	1099.	4132	B.M. C.O.P.			4.914	1098.	8769
			4.391						4.459		

STA.	+	H.I.	−	ELEV.		STA.	+	H.I	−	ELEV.	
7.8 N 6.5 E	5.179					GATE Z*22	4.443				
BM SKP	5.013	1103.5710		1098.	5580	@ 91ST BM SKP	3.315	72.3689		1069.	0532
	4.847					& GRAND CANAL	2.19				
			5.502						7.105		
CP 12			5.443	1098.	1282	N.E. COR. T.P. 1	ON S.W.		5.480	1066.	8859
			5.383			@ 91ST AVE & ROVEY AVE			3.867		
	5.597						7.322				
	5.538	1103.6665					6.207	73.0942			
	5.480						5.097				
7.8 N 6.5 E.			5.275						6.127		
B.M. S.R.P			5.109	1098.	5570	W. edg. S.W. TP 2			4.867	1068.	2272
			4.945			100± SO. Church entr.			3.607		
							7.207				
							6.09	74.3189			
							4.98				
									6.260		
						W. edg. S.W. TP 3			5.01	1069.	3089
						120± SO. ROSE LN. & 91ST AVE			3.76		

STA.	+	H.I.	−	ELEV.		STA.	+	H.I.	−	ELEV	
	7.405						5.78				
TP 3	6.260	75.5689		1069.	3089	℄ @ 91ST B.C. H.H. Maryland	5.422	77.8109		1072.	3894
	5.115						5.062				
			6.027						5.965		
WEST EDG S/W TP 4 250± No. ROSE LN ON 91ST.			4.79	1070.	7747	TP 5			5.54	1072.	2722
			3.57						5.11		
	7.325						5.867				
	6.182	76.9569					4.690	76.9619			
	5.04						3.512				
			5.91						7.382		
W. EDG S/W TP 5 75± SO. Maryland Ave. & 91ST AVE			4.682	1072.	2742	TP 4			6.19	1070.	7709
			3.457						5.002		
	6.067						5.948				
	5.642	77.9149					4.724	75.4954			
	5.212						3.502				
			5.882						7.33		
℄ 91ST & B.C. H.H. MARYLAND AVE			5.525	1072.	3894	TP 3			6.19	1069.	3067
			5.17						5.045		

STA	+	H.I.	−	ELEV.		STA.					
	6.17					4DE 10.0N					
						BM93	3.76				
TP3	5.055	74.3609		1069.	3067	@ 83rd AVE					
						BM SRP	3.495	92.2406		1088.	7506
	3.937					GRAND					
						CANAL	3.21				
			7.385						7.60		
TP2			6.14	1068.	2222	P/P #1			6.18	1086.	0588
			4.89						4.767		
	6.122						7.17				
	4.945	73.1657					5.415	91.4738			
	3.762						3.66				
									4.45		
TP1			6.282	1066.	8837	P/P #3			2.695	1088.	7788
									0.94		
	6.507						5.225				
	5.202	72.0877					3.46	92.2388			
	3.905						1.695				
			4 5.48	(1069	0532)				4 5.235		
BM SRP			3.037	1069.	0504	P/P #5			3.485	1088.	7563
			1.595						1.715		

STA.	+	H.I.	-	ELEV.		STA	+	H.I.	-	ELEV.	
	5.395						5.747				
P/P 5	3.927	92.6841		1088.	7563	T.P. 1	4.195	92.4993		1088.	3046
	2.462						2.642				
			5.995						5.27		
ON S.W.											
TP 1			4.38	1088.	3041	P/P 5			3.735	1088.	7618
NEAR L.P.											
BASE											
W. 83rd			2.765						2.21		
200t SO.											
Maryland	5.622						242 5.~~52~~				
	.935 4.~~94~~	93.2383					.49 ~~50~~ 3.~~490~~	92.2536			
	4.245						1.745				
83rd AVE ℄			5.397						45 5.~~25~~		
B.C. H.H			4.515 ~~5.525~~	1088.	7228	P/P 3			.47 3.~~465~~	1088.	7836
maryland				1088.	7160 adj.						
AVC.			3.635						1.695		
	5.547						4.44				
	4.667	93.3906					2.685	91.4686			
	3.79						0.93				
			5.777						7.16		
T.P. 1			5.085	1088.	3046	P/P 1			5.405	1086.	0648
			4.397						3.645		

STA.	+	H.I	-	ELEV.	STA	+	HI	-	ELEV.
	7.39					8.14			
P/P 1	5.97	92.0361		1086.0648	75th & C.P. 23	6.505	105.1350		1098.6350
	4.555					4.86			
			3.547	(1088.7506)				4.052	
@ 83rd ave &					* PROSPI				
BM SRP			3.272	1088.7628	P/P			2.902	1102.2342
GRAND CANAL			3.002					1.747	
						4.60			
	+0.0122/9 = +0.0014								
						3.43	105.6660		
						.267 ~~2.17~~			
					CB2682			4.69	
					P/P			3.520	1102.1460
								2.35	
						5.855			
						4.68	106.8285		
						3.515			
								6.057	
					P/P 2			4.88	1101.9487
								3.707	

STA	+	H.I.	−	ELEV.
across [illegible]	6.515			
P/P	5.35	107.3012		1101.9487
5 pole south of Bethany on E. SIDE	4.195			
P/P 3rd pole SOUTH B.N. E. 75th			5.665	
			4.51	1102.7912
			3.355	
	5.487			
	4.225	107.0167		
	2.965			
TP 1 ~~CP#1~~			6.10 ~~6.545~~	
			5.092 ~~4.365~~	1101.9232
			4.09 ~~2.16~~	
	6.76			
	5.987	107.9129		
	5.225			

STA	+	H.I.	−	ELEV
TP 1		107.9129		
			8 ~~5.845~~	
CP#1			5.23	1102.6824
			4.577	
	5.725			
	5.07	107.7537		
	4.42			
			6.60	
TP 1			32 ~~5.835~~	1101.9214
			5.065	
	6.195			
	.172 ~~5.075~~	107.0964		
	4.155			
3rd pole P/P South of Bethany			5.55	
			4.305	1102.7927
			3.055	

STA.	+	H.I.	−	ELEV.
3rd, 4th	5.45			
P/P	4.32	107.1152		1102.7927
... OF BETHANY	3.[illegible]			
			6.35	
P/P # 2			5.16	1101.9527
			3.93	
	6.115			
	4.945	106.8977		
	3.715			
			5.235	
P/P			4.75	1102.1452
			3.[illegible]75	
	4 4.522			
	3.475	105.6219		
	2.315			
PR0501			4.56	
P/P			3.[illegible]7	1102.2319
			2.72	

STA	+	H.I.	−	ELEV.
PR0501	4.145			
P/P	2.902	105.1359		1102.2319
	1.667			
			8.05	(1098.6350)
CP #23			6.495	1098.6409
			4.2[illegible]	

STA.	+	H.I.	−	ELEV.
	4.43			
050090				
BM (SKE)	2.148	100.3102		1097.0622
25+75				
Sunset Ranch	1.866			
			8.632	
PRL 1609				
F/P 3			6.992	1093.2159
			5.361	
	4.335			
	2.979	96.1964		
	1.629			
			4.918	
PRL 1610				
P/P 5			3.542	1092.6527
3255				
			2.172	
	2.748			
	1.539	94.1924		
	0.333			
			5.023	
PRL 1531				
P/P 7			3.961	1090.2319
			2.897	

STA	+	H.I.	−	ELEV.
	3.609			
P/P 7	2.248	92.480		1090.2319
	0.888			
			5.915	
P/P 9			4.711	1087.7689
			3.508	
	4.498			
	3.058	90.8244		
	1.608			
			5.519	
P/P 11			4.492	1086.3319
			3.467	
	4.928			
	4.289	90.6214		
	3.652			
			7.062	
#114				
B.C. H.H.			6.173	1084.4792
			5.221	

STA.	+	H.I.	−	ELEV.
	6.938			
B.C H.H.	6.017	90.4952		1084.4792
	5.094			
			4.803	
P/P 11			4.163	1086.3322
			3.523	
	5.557			
	4.528	90.8512		
	3.503			
			4.529	
P/P 9			3.032	1087.7774
			1.642	
	5.155			
	4.683	92.4604		
	3.411			
			3.511	
P/P 7			2.219	1090.2429
			0.921	

STA.	+	H.I.	−	ELEV.
	5.148			
P/P 7	4.08	94.3219		1090.2429
	3.008			
			2.355	
P/P 5			1.655	1092.6652
			0.462	
	5.107			
	3.732	96.3992		
	2.565			
			4.53	
P/P 3			3.175	1093.2242
			1.82	
	8.390			
	7.06	100.2867		
	5.74			
			4.775	(1097.0622)
050090 BM (SRP)			3.222	1097.0657
			1.665	

STA	+	H.I.	−	ELEV.
	4.397			
P/P 77"S"	3.642	102.4157		1098.7725
	2.892			
T/C TP 1			11.35	
			11.26	1091.1577
			10.662	
	5.837			
	4.635	95.7950		
	3.442			
			6.687	
T/C TP 2 7146 SELLS DR.			5.595	1090.1995
			4.505	
	5.15			
	5.007	95.2055		
	3.36			
			6.92	
T/C TP 3 7232 Sells Dr.			5.857	1089.3482
			4.795	

STA.	+	H.I.	−	ELEV.
	6.207			
T/C TP 3	5.065	94.4130		1089.3482
	3.922			
			6.41	
T/C TP 4 7306 SELLS DR.			5.325	1089.0892
			4.235	
	6.855			
	5.555	94.6460		
	4.262			
			7.245	
T/C TP 5 7338 SELLS Dr.			6.162	1088.4825
			5.085	
	6.762			
	5.607	94.0895		
	4.452			
			6.085	
TP 8 7420 SELLS DR			5.85	1088.2395
			4.815	

STA.	+	H.I.	−	ELEV.
	5.642			
TP 6	5.105	93.3467		1088.2395
	4.577			
				7.09
BC H.H. 75TH AVE SLUG CK.				6.264 1087.0817
				5.442
	7.126			
	6.304	93.3832		
	5.472			
			5.68	
TP 6			5.145	1088.2382
			4.61	
	6.895			
	5.80	94.0700		
	4.712			
			6.665	
TP 5			5.556	1088.4787
			4.46	

STA	+	H.I.	−	ELEV.
	7.19			
TP 5	6.13	94.6100		1088.4787
	5.075			
			6.845	
TP 4			5.525	1089.0832
			4.212	
	6.322			
	5.237	94.3185		
	4.145			
			6.115	
TP 3			4.97	1089.3485
			3.825	
	6.882			
	5.84	95.1895		
	4.802			
			6.152	
TP 2			4.985	1090.2035
			3.817	

STA	+	H.I.	−	ELEV.		STA	+	H.I	−	ELEV.	
	6.92					63RD AVE & GRAND CANAL 6.5E 7.8N	3.428				
TP2	5.886	96.0905		1090.	2035	BM SRP	2.269	100.8282		1098.	5580
	4.852						1.115				
			6.20						5.904		
TP 1			4.945	1091.	1455	BCF 63RD AVE & Clarendon			5.713	1095.	1152
			3.69						5.522		
	11.75						5.986				
	11.16	102.3047					5.793	100.9087			
	10.567						5.602				
			4.317	(1098.7725)					3.506		
P/P 77'S			3.542	1098.	7632	BM SRP			2.319	1098.	5582
			2.765 ~~2.72~~						1.198		
						CLARENDON & 63RD AVE	5.542				
						B.C.F.	4.748	99.8627 ~~103.3057~~		1095.	1152
							3.952				
						@ BRITTON & 63 AVE			6.183		
						B.C.F.			5.271	~~1098.0350~~ 1094.	5918
									4.358		

STA	+	H.I.	−	ELEV	STA.	+	H.I.	−	ELEV
STA.									
ERLEDGE	5.091				OSBORN & 63 DR.	5.508			
		98.6680		1094.5918			96.0325		1091.2030
B.C.F.	4.076	~~102.1110~~		~~1098.0348~~	B.C.F	4.829	~~99.4755~~		~~1094.6460~~
	3.062					4.152			
			6.972		6339			6.992	
				1092.7008	OSBORN				
TP. 1			5.967	~~1096.1438~~	T/C TP2			6.082	1089.9490 ~~1093.3920~~
			4.963					5.178	
	5.383					5.669			
		97.2055					94.8780		
	4.505	~~100.6435~~				4.928	~~98.3210~~		
	3.626					4.189			
WEST FLANGE COL. F.H. N.W. CO.			4.538		6423 OSBORN T/C TP3			6.908	
				1093.5735					1089.0220
OSBORN & 63rd			3.631	~~1097.0165~~				5.857	~~1092.4650~~
			2.728					4.802	
	3.452					5.382			
		96.4395					93.8882		
	2.867	~~97.3825~~				4.866	~~97.3312~~		
	2.278					4.351			
OSBORN & 63 DR.			5.801		OSBORN & 64 PR			5.668	
				1091.2030					1088.6757
B.C.F.			5.238	~~1094.6460~~	B.C.F.			5.212	~~1092.1187~~
			4.669					4.758	

STA.	+	H.I.	−	ELEV.	STA	+	H.I.	−	ELEV.
64 DR & OSBORN	5.255					3.289			
		93.4797		1088.6757			90.7307		1088.1170
B.C.S.	4.804	~~98.9227~~		~~1092.1187~~	F.H.	2.614	~~94.1737~~		~~1091.5600~~
	4.353					1.938			
			5.658		6617 OSBORN			48 6.151	
WEST EDLT FH				1088.7677	TC				1085.2692
65TH AVE & OSBORN			4.712	~~1092.2187~~	TPS			5.462	~~1088.7122~~
			3.766					7 4.744	
	3.803					5.543			
		91.8497					90.2036		
	3.082	~~95.2927~~				4.934	~~93.6466~~		
	2.361					4.328			
6517 OSBORN			6.343		67TH AVE & OSBORN			6 4.718	
T.P. 4				1086.3837					1084.2606
			5.466	~~1087.8267~~	B.C. H.H.			5 4.943	~~1087.7036~~
			4.589					5.168	
	5.65					6.784			
		91.2940				6.012	~~93.7159~~		
	4.91	~~94.7370~~				5.241	90.2729		
	4.171							18 5.624	
6541 OSBORN			4.122		TPS			008 5.012	1085.2641
				1088.1170					~~1088.7071~~
F.H. N.W. BOLT			3.177	~~1091.5600~~				401 4.398	
			2.732						

STA	+	H.I.	−	ELEV.
	6.248			
TP5	5.478	90.7416 ~~94.1816~~		1085.2641 ~~1088.7071~~
	4.706			
			3.223	
F.H.			2.632	1088.1094 ~~1091.5524~~
			2.042	
	3.882			
	3.061	91.1706 ~~94.6136~~		
	2.241			
			5.685	
TP4			4.797	1086.3744 ~~1089.8174~~
			3.908	
	6.192			
	5.471	91.8449 ~~95.2879~~		
	4.748			
			3.889	
F.H.			3.088	1088.7569 ~~1092.1999~~
			2.287	

STA	+	H.I.	−	ELEV.
	5.404			
F.H.	4.788	93.5461 ~~96.9891~~		1088.7569 ~~1092.1999~~
	4.177			
64TH & OSBORN			5.589	
B.C.F			4.874	1088.6699 ~~1092.1129~~
			4.168	
	5.742			
	5.320	93.9894 ~~97.4324~~		
	4.896			
			5.419	
TP3	~~4.977~~		4.977	1089.0121 ~~1092.4551~~
			4.536	
	6.482			
	5.625	94.6381 ~~98.0811~~		
	4.772			
			5.542	
TP2			4.689	1089.9476 ~~1093.3906~~
			3.847	

STA.	+	H.I.	−	ELEV.
	6.462			
		95.5681		1089.9476
TPZ	5.621	~~99.0111~~		~~1093.3906~~
	4.778			
63 RD AVE & OSBORN			5.055	
				1091.2059
BCF			4.363	~~1094.6489~~
			3.668	
	5.585			
		96.1604		
	4.955	~~99.6034~~		
	4.323			
63 AVE & OSBORN			3.166	
				1093.5784
FH			2.582	~~1097.0314~~
			1.998	
	4.082			
		97.1116		
	3.532	~~100.5546~~		
	2.987			
63 RD AVE & CRITTENDEN			5.091	
				1092.6121
B.C.F.			4.499	~~1096.0551~~
			3.909	

STA.	+	H.I.	−	ELEV.
63 AVE & CRITTENDEN	5.961			
		97.8774		1092.6121
B.C.F.	5.265	~~101.3204~~		~~1096.0551~~
	4.570			
63 AVE & MITCHELL			4.993	
				1093.7360
B.C.F.			4.303	~~1097.0160~~
			3.616	
	5.752			
		98.7491		
	5.176	~~102.1921~~		
	4.598			
63 AVE & BRITTON			4.827	
				1094.6091
B.C.F.			4.142	~~1098.0521~~
			3.449	
	6.070			
		99.9434		
	5.334	~~103.3864~~		
	4.599			
63 AVE & CLARENDON			5.782	(1095.1152)
				1095.1374
B.C.F.			4.805	~~1099.5804~~
			3.832	

01-07-2000 BETHANY HOME RD

V.M B.M LOOP

W.R

STA	B.S+	HI	F.S-	EL	ADJ EL	DESCRIPTION
BM						3" ALUMINUM CAP LOCATED ON S.W. COR OF THE RADIAL GATE #2-21 FOR THE GRAND CANAL SITUATED ON THE EAST SIDE OF 83RD AVE STAMPED SALT RIVER PROJECT B.M 93" AND "4.0E 10.0N"
4.0E10.0N				1088.7506		
	0.38	1089.13				
			5.37	1083.76	*	2" B.C.S.M STAMPED MARICOPA COUNTY HWY DEPT. ± ℄ CANAL ' ± ℄ 83 AVE.
	5.26	1089.02				
BM			0.28	1088.74		"B.M" 4.0E 10.0N

* 1083.76 [illegible]

01-07-2000 BETHANY HOME RD

V.M BM. LOOP

W.R

STA	B.S. +	HI	F.S. -	EL	ADJ EL	DESCRIPTION
B.M						3" BRASS CAP S. END E. SIDE GUARD RAIL
						OF 99 AVE BRIDGE OVER THE GRAND CANAL
B.M				1062.18		M.C.M.D:
	2.12	1064.30				
			3.92	1060.38	*	B.C.S.M M.C.M.D: ± ℄ 99TH AVE 1' ± ℄
	3.85	1064.23				CANAL
BM			2.04	1062.19		B.M 3" BRASS CAP
					* 1062.50	/ ADJ

County

9

6000N

9100W

54HV
20V

1" = 1660' +/-

16

5000N

CAMELBACK

21

County

4100N

SCHOOL

8300W

7500W

6600W

GRAND

BETHANY HOME ROAD

Independence

Discovery Park

Challenger Mid.

Desert Mirage Golf Course

Desert Mirage Park

Grand Canal

Bloomfield Park

Pasadena Park

O'Neil Park

Bonsall Park North

Bonsall Park South

Holiday Park

Desert Sands Mid.

Maryvale Municipal Golf Course

Maryvale

54 HV
20 V
25 M

▲ = Horz. & Vert.

● = Vert.

75TH Ave.

,913004.9120,607482.9090,1095.26,*calc
,913100.1768,610051.8591,1100.606300,cp 25
3,912964.0171,607603.7577,1096.208200,FIP
4,913100.1771,610051.8633,1100.585000,CP 2
5,912915.5911,607463.3846,1094.409800,.TCB
6,912915.5965,607463.9939,1093.907200,.G
7,912915.9543,607458.4066,1094.478000,.SW
8,912934.82130200,607458.6736,1094.675200,.SW
9,912935.1274,607463.7090,1094.559100,.TCB
10,912935.2404,607464.2569,1094.063800,.G
11,912941.3633,607458.0322,1094.741900,.SW-
12,912947.3037,607455.9861,1094.754100,.SW
13,912949.1401,607460.8158,1094.704900,.TCB-
14,912949.3832,607461.34070100,1094.241300,.G-
15,912957.2282,607456.6220,1094.475900,.G-
16,912956.9062,607456.1705,1094.572800,.TCB-
17,912962.4919,607450.3334,1094.659200,.TCB-
18,912963.0147,607450.6455,1094.589600,.G-
19,912959.2518,607443.9933,1094.840400,.SW
20,912964.9982,607441.8236,1095.080600,.SW1
21,912962.5471,607440.7823,1095.092200,.SW1
22,912959.7679,607436.54060100,1095.107200,.SW1
23,912954.44500200,607439.1420,1095.129300,.SW
24,912970.50270200,607428.9599,1094.732300,.G
25,912969.8315,607428.9860,1095.215200,.TCB
26,912970.23310200,607399.3206,1094.629500,.G!
27,912969.5383,607399.3375,1095.125000,.TCB!
8,912958.5272,607399.7877,1095.219900,.SW1!
9,912953.6957,607400.0167,1095.278900,.SW!
30,912934.4992,607399.4817,1094.271500,NG
31,912949.2827,607421.9532,1095.041700,.HW
32,912948.2247,607423.4543,1095.028100,.HW
33,912944.7903,607424.3446,1095.057800,.HW
34,912943.8528,607423.7554,1095.073300,.HW!
35,912954.3675,607439.3210,1095.542700,.ICB
36,912958.4181,607443.4317,1095.499500,.ICB
37,912950.2523,607451.7770,1095.443600,.ICB
38,912946.24530200,607447.9807,1095.495000,.ICB+
39,912936.2083,607454.5645,1094.960700,TS
40,912961.9349,607439.2384,1095.149200,TS
41,912954.7127,607451.15080100,1094.617300,EBX FLUSH
42,913037.6846,607390.5159,1094.636400,.G
43,913038.34330200,607390.6535,1095.184000,.TCB
44,913048.2866,607391.0669,1095.132300,.SW
45,913054.0316,607390.8354,1095.241200,.SW1
46,913045.4925,607401.2222,1094.889200,PP LAMP
47,913044.9140,607406.7545,1094.994600,SSP ADOPTASTREET
48,913044.9723,607411.6675,1094.948300,FH
49,913046.4708,607421.5426,1095.142900,DG
50,913044.0465,607426.67170100,1095.156300,TPD
51,913048.69630200,607428.2640,1095.321900,.SW
52,913047.8497,607434.27930100,1095.426700,.SW-
53,913046.1140,607438.8759,1095.487500,.SW
54,913044.2804,607434.1714,1095.392000,.SW-
5,913043.5450,607428.3029,1095.326800,.SW
6,913038.6517,607428.4253,1095.193900,.SW!.TCB
57,913038.0252,607428.4841,1094.692800,.G

8,913043.6342,607431.1202,1095.327800,TS
9,913040.8438,607441.6764,1094.925600,.G-
60,913041.3056,607441.4551,1095.408600,.TCB-
61,913046.2450,607449.1812,1095.200600,.TCB-
62,913045.7249,607449.5283,1095.143800,.G-
63,913051.5123,607455.3678,1095.303400,.G-
64,913051.8225,607454.9243,1095.418700,.TCB-
65,913059.5355,607459.6117,1095.889700,.TCB-
66,913059.3540,607460.0823,1095.405700,.G-
67,913072.9309,607462.6979,1095.779100,.G!.EP
68,913054.5072,607427.8291,1095.410600,.SW1
69,913054.83110200,607434.8815,1095.559100,.SW1-
70,913058.3323,607447.2546,1095.824500,.SW1-
71,913061.5817,607455.2449,1096.004500,.SW1
72,913073.1691,607457.3778,1096.318500,.SW1
73,913072.85680200,607462.14210100,1096.174400,.SW1!.TCB!
74,913063.0116,607458.9234,1095.978500,GV
75,913064.7101,607453.5328,1096.000100,TS
76,913055.7328,607444.7940,1095.675400,EBX FLUSH
77,913076.5978,607419.4206,1094.641800,NG
78,913128.1757,607420.4420,1093.744600,.CT
79,913117.3728,607431.1970,1094.130500,.CT
80,913107.1522,607437.8360,1094.140900,.CT
81,913091.0227,607436.2648,1094.473100,.CT
82,913091.1046,607437.1990,1094.469100,.CT
83,913085.0671,607437.1290,1094.588900,.CT
84,913084.8093,607441.6035,1094.594600,.CT
5,913091.1009,607441.61640100,1094.409500,.CT
6,913091.1176,607442.62730100,1094.275900,.CT
87,913097.6560,607443.6904,1094.018800,.CT
88,913105.4131,607442.7307,1094.101300,.CT
89,913107.1523,607441.6082,1093.878200,.CT
90,913116.68150200,607441.5804,1094.144100,.CT
91,913116.9276,607439.0297,1094.042900,.CT
92,913128.0638,607433.71680100,1094.081500,.CT
93,913135.5890,607427.9920,1094.339200,.CT!
94,913117.3098,607430.6773,1094.131800,.C
95,913113.8773,607430.3974,1094.302100,.C
96,913106.1671,607433.9318,1094.311000,.C
97,913098.89490200,607433.3631,1094.386700,.C
98,913093.7519,607434.6664,1094.479200,.C!
99,913103.1999,607430.9233,1094.635800,.HW
100,913103.7592,607428.6530,1094.594400,.HW
101,913101.3798,607425.6560,1094.556000,.HW
102,913097.7920,607425.8911,1094.542700,.HW!
103,913101.4902,607427.3769,1091.946600,INV 12"PVC
104,913086.2079,607438.9602,1090.694800,INV 24"RCP
105,913094.8977,607441.9085,1091.090900,INV 24"RCP
106,913080.4850,607453.1860,1095.662700,WV
107,913079.9894,607463.9576,1096.012000,.EP
108,913104.0498,607463.7245,1096.132900,.EP
109,913129.0024,607463.60550100,1096.145800,.EP
110,913154.4061,607463.5612,1096.271600,.EP
111,913195.3125,607464.0320,1096.069000,.EP
12,913209.8472,607457.5843,1095.967900,.EP
13,913255.0143,607457.2947,1095.677100,.EP!
114,913246.2825,607402.9554,1088.052300,INV 30"RCP

15,913253.7481,607412.8556,1096.135400,.CT DIRT
16,913220.6740,607439.0741,1095.716600,.CT
117,913213.5967,607443.8372,1095.39,.CT
118,913212.9287,607444.2652,1094.782400,.CT
119,913196.23180200,607456.4050,1094.358200,.CT
120,913196.0107,607459.8527,1095.594600,.CT
121,913188.0011,607458.9016,1094.998500,.CT!
122,913196.0316,607449.1527,1089.722900,INV 24"RCP
123,913187.8398,607455.58090100,1093.018200,.TP 4"GAS
124,913185.3879,607456.3691,1094.890300,.TP 4"GAS
125,913187.0404,607457.1344,1095.206600,.TP1 8"WATER
126,913186.1800,607457.93130100,1096.589900,.HW
127,913145.8989,607458.5484,1096.665100,.HW!
128,913145.4617,607457.6546,1095.493500,.TP1!
129,913147.1866,607456.6459,1094.999600,.TP
130,913146.4460,607455.8094,1093.052000,.TP!
131,913146.1354,607456.80630100,1095.719100,.HW
132,913146.2212,607447.5740,1095.722900,.HW!
133,913154.8137,607457.6915,1088.677400,INV 2 BBL BOX
134,913145.8440,607444.1276,1094.816200,.TOP DIRT
135,913179.0624,607413.9652,1094.070400,.TOP!
136,913193.98920200,607461.0603,1095.745300,SSP DELINEATOR
137,913253.4896,607462.5893,1095.774800,SSP DELINEATOR
138,913255.0515,607455.7519,1095.587500,.G
139,913254.9523,607455.1093,1096.048300,.TCB
140,913254.9678,607448.2226,1096.059400,.SW
141,913255.4584,607442.2824,1096.103000,.SW1
142,913265.7792,607443.2322,1095.993500,.SW1-
143,913264.4843,607448.91410100,1095.963600,.SW-
144,913265.1652,607452.2588,1095.956400,FH
145,913274.6696,607446.6461,1095.756600,.SW1
146,913279.1145,607448.53910100,1095.693700,.SW1-
147,913282.1893,607449.1084,1095.745200,.SW1
148,913276.2986,607455.1222,1095.774100,.SW!
149,913283.7215,607442.8071,1096.971600,.ICB
150,913277.80170200,607442.7051,1097.037500,.ICB
151,913277.8328,607433.92020100,1097.115900,.ICB
152,913283.7036,607433.9953,1097.171100,.ICB+
153,913289.2171,607447.8116,1095.670700,LP
154,913294.2357,607448.6807,1095.627400,.SW1
155,913298.5503,607433.6306,1096.222400,.SW1!
156,913308.4486,607435.2288,1096.118800,.SW
157,913304.6538,607449.2175,1095.487200,.SW
158,913304.0881,607455.8507,1094.928900,.G
159,913304.1134,607455.2315,1095.415900,.TCB
160,913339.9292,607449.2008,1095.244200,.SW
161,913347.55540200,607448.5594,1095.118900,.SW-
162,913353.3603,607446.1885,1095.044900,.SW
163,913402.8864,607432.7469,1095.075700,.SW-
164,913437.1048,607438.6501,1094.898500,.SW
165,913446.0841,607441.5494,1094.799500,.SW-
166,913456.0784,607442.26600100,1094.701500,.SW!
167,913456.1062,607448.3656,1094.696500,.SW
168,913443.6252,607446.9967,1094.714100,.SW-
169,913434.9797,607444.1412,1094.765700,.SW
170,913403.6023,607438.6492,1094.956400,.SW-
171,913366.3192,607446.3214,1094.990300,.SW

72,913353.2751,607452.57830100,1094.933400,.SW
73,913351.5833,607453.5812,1094.925800,.SW-
174,913351.3042,607455.3068,1094.922300,.SW!.TCB
175,913351.3368,607455.8970,1094.459300,.G
176,913404.7171,607455.9918,1094.173300,.G!
177,913404.6522,607455.3003,1094.647000,.TCB!
178,913447.3511,607452.4950,1094.498400,TROL 4"
179,913423.2423,607450.3003,1094.280700,TROL 4"
180,913399.4497,607445.7742,1094.417300,TRPV 3"
181,913371.58830200,607451.1470,1094.581000,TROL 4"
182,913384.8574,607461.5604,1094.370900,SSP DELINEATOR
183,913423.9166,607460.8809,1094.205300,PK
184,913254.30890200,607490.6095,1096.315500,P
185,913204.1139,607492.7180,1096.81,P
186,913219.8766,607520.9936,1096.212700,WV
187,913204.6317,607532.1920,1094.081100,.SW
188,913204.2360,607527.2348,1096.533600,.TCB
189,913204.1708,607526.61380100,1096.106300,.G
190,913199.2407,607534.3537,1096.660700,SDMH
191,913200.2422,607527.3575,1096.174600,.TCB
192,913200.22570200,607526.7171,1096.139200,.G
193,913175.2222,607527.4179,1096.201600,.G
194,913175.3455,607528.0677,1096.386100,.TCB
195,913171.26730200,607528.0284,1096.770500,.TCB
196,913171.0645,607527.3393,1096.268000,.G
197,913171.2393,607533.0561,1096.778800,.SW.EP
198,913167.9362,607541.5967,1096.682600,.EP-
99,913166.6679,607544.3914,1096.739200,.EP!
00,913185.3184,607507.3796,1096.881700,SSMH
201,913193.8114,607477.2961,1096.592000,WV
202,913192.2665,607475.3056,1096.589800,WV
203,913154.4880,607492.4179,1097.112600,P
204,913129.8417,607492.8754,1097.083100,P
205,913105.7510,607491.9787,1097.007300,P
206,913079.79190200,607492.7548,1096.739100,P
207,913054.9361,607492.8626,1096.341900,P
208,913006.29540200,607493.9208,1095.609500,P
209,913030.48790200,607493.1920,1095.915900,P
210,913029.8117,607493.50730100,1095.912000,P
211,913026.2786,607507.6894,1095.956100,SSMH
212,913012.0012,607508.0048,1095.703000,SSMH
213,913011.2021,607477.48030100,1095.574000,SSMH
214,913003.8469,607443.6440,1095.538500,P
215,913003.2349,607415.5751,1095.407600,P
216,913035.4759,607451.7272,1095.155700,WV
217,913040.8743,607450.6662,1095.157000,WV
218,912941.0050,607475.3276,1094.384700,SSMH
219,912958.8476,607486.7942,1094.766100,SDMH
220,912951.6439,607507.0225,1094.798600,SSMH
221,912938.5681,607508.2261,1094.608400,SDMH
222,912991.6803,607493.0573,1095.398200,P
223,912963.6512,607492.8496,1094.941100,P
224,912937.0980,607492.7240,1094.619700,P
225,912914.56020200,607492.5892,1094.352100,P
26,912966.4811,607516.2993,1094.851300,GV
27,912979.4690,607514.0144,1095.255100,GV
228,912981.5620,607512.1210,1095.307900,GV

29,912985.7669,607522.3807,1095.406000,WV
30,912986.7297,607552.5572,1095.607700,WV
231,912933.2925,607526.67040100,1094.139100,WV
232,912897.1756,607525.2426,1093.595200,WV
233,912886.65820200,607537.2057,1094.016800,.SW1
234,912886.7004,607532.2733,1093.936100,.TCB1
235,912886.8577,607531.6306,1093.403400,.G1
236,912894.31150200,607531.6527,1093.513800,.G1
237,912894.4117,607532.2367,1093.572300,.TCB1
238,912926.8088,607532.3660,1093.938900,.TCB1
239,912926.8441,607531.78800100,1093.877700,.G1
240,912931.9812,607531.7479,1093.973600,.G1
241,912931.9586,607532.3784,1094.406400,.TCB1
242,912931.8829,607537.3593,1094.613700,.SW1.EP
243,912941.7224,607537.3191,1094.635300,.SW1
244,912942.0396,607532.3069,1094.600700,.TCB1
245,912942.0464,607531.8205,1094.113000,.G1
246,912959.2774,607539.0029,1094.784200,.G1-
247,912958.9432,607539.2892,1094.856400,.TCB1-
248,912964.2523,607544.56260100,1095.050500,.TCB1-
249,912964.4086,607543.9190,1094.986600,.G1-
250,912970.0350,607552.3571,1095.416900,.G1-
251,912969.53690200,607552.59920100,1095.837000,.TCB1-
252,912971.9614,607561.2617,1096.082600,.TCB1
253,912972.5746,607561.2424,1095.583700,.G1
254,912945.4140,607537.8209,1094.746400,.SW1-
255,912948.7778,607539.1097,1094.949300,.SW1
256,912966.17800200,607554.6441,1095.880800,.SW1
257,912967.4312,607558.1130,1095.993900,.SW1-
258,912967.9616,607561.1462,1096.123300,.SW1
259,912967.0582,607563.0734,1096.173600,.SW1
260,912967.2602,607567.7336,1096.142400,.SW1
261,912931.6394,607539.8229,1094.721400,.EP
262,912937.7435,607540.0048,1094.720900,.EP
263,912939.0330,607560.0596,1094.821300,.EP
264,912953.2613,607563.4294,1095.292600,.EP-
265,912964.2063,607567.9330,1096.173700,.SW1.EP!
266,912964.7240,607560.48790100,1096.045300,TS
267,912964.0624,607554.48400100,1095.745300,FH
268,912949.0748,607552.7330,1095.386400,.EBX
269,912953.1795,607548.2193,1095.35,.EBX
270,912956.4496,607551.1537,1095.697700,.EBX
271,912952.3368,607555.63100100,1095.434500,.EBX+
272,912947.7124,607539.7276,1095.011600,TS
273,912943.7408,607539.7962,1094.640300,TPD
274,912934.7578,607553.7313,1094.921000,SSP 7-ELEVEN
275,912950.0838,607579.9880,1095.061800,P
276,912933.6176,607578.7405,1094.772600,P
277,912913.86530200,607604.56020100,1094.778000,.EP
278,912927.53580200,607597.69110100,1094.880500,.EP
279,912944.4364,607598.7262,1095.316800,.EP
280,912965.7304,607601.34570100,1096.439700,.EP!
281,912965.9751,607607.7603,1096.668700,.SW1
282,912967.6234,607607.7230,1096.68,.SW1-
283,912968.8118,607610.11030100,1096.670700,.SW1
284,912972.8134,607567.28930100,1095.648500,.G1
285,912972.2384,607567.3012,1096.087600,.TCB1

86,912972.4247,607572.3736,1095.672700,.TCB1
87,912972.9239,607572.3800,1095.597400,.G1
288,912974.1171,607596.01470100,1095.576600,.G1
289,912973.5421,607596.0826,1095.728300,.TCB1
290,912973.9631,607610.1368,1096.722300,.TCB1
291,912974.66820200,607610.1260,1095.651300,.G1
292,912975.7352,607633.8648,1095.753700,.G1
293,912975.0032,607633.9691,1001.653700,.TCB1
294,912969.35200200,607633.8257,1096.845100,.SW1
295,912970.0492,607668.0361,1096.869100,.SW1
296,912969.96330200,607669.6258,1096.799500,.SW1-
297,912968.3945,607670.3940,1096.777800,.SW1
298,912976.8552,607667.6671,1095.821500,.G1
299,912976.13510200,607667.6690,1096.753700,.TCB1
300,912976.68040200,607680.24990100,1095.948300,.TCB1
301,912977.2727,607680.18980100,1095.823800,.G1
302,912977.8881,607704.5451,1095.846900,.G1
303,912977.2852,607704.4628,1095.966400,.TCB1
304,912969.4872,607709.4049,1096.474600,.SW1
305,912977.4370,607709.3687,1096.302800,.SW1!.TCB1
306,912978.0202,607709.4084,1095.852800,.G1
307,912963.4224,607688.3703,1096.490900,.CV
308,912960.0161,607692.0578,1096.481600,.CV
309,912956.3916,607688.5974,1096.489500,.CV
310,912959.7023,607684.9608,1096.463600,.CV+
311,912946.5543,607691.9966,1097.624700,.CV
312,912944.4069,607689.6294,1097.605500,.CV
313,912939.3174,607694.2690,1097.573500,.CV
314,912941.4970,607696.6481,1097.650200,.CV+
315,912938.8895,607696.8312,1096.910500,NT UNKNOWN PED
316,912936.1725,607700.0879,1097.200900,NT UNKNOWN PED
317,912931.5449,607699.8310,1091.509800,.CT
318,912956.6249,607677.3140,1096.546000,.CT
319,912955.8240,607676.1679,1097.035700,.CT
320,912954.2302,607674.5910,1097.032900,.CT
321,912965.1840,607664.3723,1097.082200,.CT
322,912966.7017,607665.9345,1097.095300,.CT!
323,912961.6934,607674.1173,1096.795700,.F 4'C/L
324,912968.1541,607667.2050,1096.678500,.F!
325,912968.7199,607668.0958,1097.600900,.TP 8"WATER
326,912969.6758,607666.0026,1099.283300,.HW
327,912968.3636,607612.2090,1099.125200,.HW!
328,912967.3792,607610.18500100,1097.512900,.TP!
329,912967.0490,607616.56130100,1095.619500,.CT
330,912955.8025,607617.1059,1095.656700,.CT
331,912937.0327,607632.4932,1095.872400,.CT!
332,912971.1107,607673.0244,1096.676500,GV
333,912951.2720,607734.4616,1096.496600,NG
334,912978.02360200,607734.8178,1096.310600,.G1
335,912978.5892,607734.5855,1095.794100,.TCB1
336,912976.0714,607749.8537,1096.309600,SSP SPEED 40
337,912979.6613,607782.7687,1095.716200,.G1
338,912978.9764,607782.8372,1096.169200,.TCB1
339,912980.2446,607832.4700,1096.123000,.TCB1
340,912980.8309,607832.5623,1095.633300,.G1
341,912981.66690200,607874.0397,1095.585300,.G1
342,912981.0346,607874.0276,1096.018800,.TCB1!.CB

43,912976.0575,607874.4004,1096.136700,.CB
44,912976.7217,607899.6696,1096.156100,.CB
345,912981.66190200,607899.5351,1096.026600,.CB!.TCB1
346,912981.7491,607876.9275,1095.347800,.G1
347,912982.1613,607897.5999,1095.331600,.G1
348,912982.2916,607899.70960100,1095.508600,.G1
349,912982.9838,607931.8604,1095.682500,.G1
350,912982.3329,607931.92150100,1096.160400,.TCB1
351,912980.7229,607969.2900,1095.780300,SSP SPEED 40
352,912983.3969,607982.31370100,1096.261900,.TCB1
353,912983.9544,607982.4161,1095.802200,.G1
354,912984.9634,608032.0231,1095.934600,.G1!
355,912984.4040,608032.0747,1096.433500,.TCB1!
356,913017.0484,608031.7123,1096.996500,P
357,913015.8195,607981.6476,1096.850900,P
358,913034.72200200,607953.01360100,1096.426200,SSMH
359,913015.1248,607931.7862,1096.750500,P
360,913013.2903,607882.1712,1096.674200,P
361,913011.8434,607832.3000,1096.52,P
362,913010.8680,607782.4476,1096.387200,P
363,913010.1045,607732.1603,1096.217600,P
364,913008.7173,607682.5241,1096.151300,P
365,912991.8086,607692.6061,1095.901300,WV
366,912980.5622,607682.7820,1095.870300,SDMH
367,913028.8741,607667.1901,1095.838100,SDMH
368,913007.5985,607632.7039,1096.010100,P
369,913007.1226,607608.4848,1095.974700,P
370,913033.7201,607626.57000100,1095.690200,WV
371,913006.4233,607582.6403,1095.905300,P
372,913006.9027,607557.5352,1095.703400,P
373,913005.0730,607533.0666,1095.748900,P
374,912979.8636,607583.12880100,1095.674200,SSMH
375,913029.2330,607547.0606,1095.841300,MH UNKNOWN
376,913156.28080200,607527.8180,1096.30,.G
377,913156.3062,607528.37860100,1096.771000,.TCB
378,913156.2055,607533.47920100,1096.839800,.SW
379,913152.4329,607537.6520,1096.671800,SSP GLENDALE
380,913130.3266,607552.6380,1097.012700,NG
381,913130.5752,607534.12250100,1096.928200,.SW
382,913130.4538,607529.0838,1096.859900,.TCB
383,913130.42060200,607528.5261,1096.346500,.G
384,913106.2377,607529.3360,1096.389200,.G
385,913106.2694,607529.8895,1096.840400,.TCB
386,913106.4627,607534.8880,1096.984300,.SW
387,913106.5139,607536.9396,1096.830200,PP NS
388,913074.3173,607536.0182,1097.120800,.SW
389,913073.83240200,607531.0570,1097.000500,.TCB
390,913073.8169,607530.4608,1096.501900,.G
391,913061.3844,607533.3472,1096.31,.G-
392,913061.6283,607533.8890,1096.770100,.TCB-
393,913069.83110200,607536.7065,1097.004000,.SW-
394,913064.54670200,607538.36880100,1096.991000,TS
395,913063.1426,607538.7061,1096.987700,.SW
396,913053.6237,607538.0819,1096.118500,.G-
397,913054.0076,607538.5620,1096.247700,.TCB-
398,913048.3959,607544.2960,1096.124700,.TCB-
399,913047.8957,607543.8906,1096.045700,.G-

00,913047.10180200,607553.4837,1096.709600,.SW
01,913042.8499,607551.4802,1095.773800,.G-
402,913043.3341,607551.8099,1096.364600,.TCB-
403,913048.1052,607554.2203,1096.809000,TS
404,913045.2306,607560.1098,1096.458800,.SW-
405,913044.4728,607567.2236,1096.314600,.SW
406,913040.4098,607566.7410,1096.218600,.TCB
407,913039.9888,607566.8403,1095.741900,.G
408,913110.6583,607559.3286,1096.655900,TRM 12"
409,913082.8991,607562.6425,1096.230700,TRM 4"
410,913069.5253,607555.7981,1096.700300,NG
411,913066.3959,607573.6474,1096.508800,.W 11'
412,913066.61160200,607589.4402,1096.394800,.W
413,913061.3611,607589.7686,1096.557800,.W
414,913045.3382,607583.2179,1096.282100,.SW
415,913041.2353,607583.63970100,1096.264900,.TCB
416,913040.8313,607583.68130100,1095.706600,.G
417,913046.44260200,607589.2031,1096.288000,.SW
418,913046.8524,607605.7579,1096.206000,.SW
419,913041.8140,607605.8476,1096.141700,.TCB
420,913041.2100,607605.9737,1095.644300,.G
421,913061.7195,607610.1280,1096.591000,.W
422,913052.6990,607613.2654,1096.315300,TRU 12"
423,913058.6356,607620.9384,1096.467100,TRU 4"
424,913062.1127,607631.2335,1096.522400,.W
425,913047.4839,607631.7617,1096.175200,.SW
426,913042.5291,607632.0021,1096.113600,.TCB
27,913041.8833,607631.9789,1095.591800,.G
28,913051.8773,607660.1327,1096.351000,PP NSEW
429,913062.8983,607665.7254,1096.666300,.W
430,913054.4012,607665.9284,1096.530100,.W
431,913054.6212,607680.1509,1096.464700,.W
432,913048.71460200,607682.0358,1096.124400,.SW
433,913043.7256,607681.9502,1096.034400,.TCB
434,913043.1095,607681.8819,1095.552200,.G
435,913052.35920200,607701.23270100,1096.241200,DG
436,913052.2917,607708.0520,1096.223400,DG
437,913055.7339,607732.1025,1096.478700,.W
438,913049.8062,607732.2982,1096.003700,.SW
439,913043.8873,607719.1046,1095.231100,.G CURBINLET
440,913044.27360200,607733.15580100,1095.253500,.G CURBINLET
441,913044.2765,607734.3305,1095.370400,.G
442,913044.94020200,607734.3294,1095.888700,.TCB
443,913056.0309,607744.0868,1096.521600,.W!
444,913053.0285,607761.4587,1095.928100,PP NSEW
445,913061.4506,607764.5334,1096.564000,TRU 12"
446,913057.0352,607778.1272,1096.365500,EBX
447,913062.2525,607794.1526,1096.320800,TRU 8"
448,913050.9368,607783.15930100,1096.014600,.SW!
449,913045.9035,607781.9046,1095.949800,.TCB!
450,913045.2500,607781.86900100,1095.467000,.G!
451,913059.7985,607910.5934,1096.328100,40D
452,912964.01860200,607603.7572,1096.202700,CP 3
453,913403.5949,607455.51600100,1094.603200,.TCB
54,913403.6072,607456.11640100,1094.118200,.G
55,913456.0788,607448.66540100,1094.605600,.SW
456,913456.1771,607442.7339,1094.697600,.SW1

457,913454.4738,607423.6173,1091.873900,NG
458,913463.4708,607448.6242,1094.574900,.SW
459,913463.2687,607455.5797,1094.418600,.SW!.TCB
460,913463.26010200,607456.22810100,1093.950800,.G
461,913472.2983,607456.1228,1093.904400,.G
462,913472.2626,607455.6241,1093.976000,.TCB
463,913485.2838,607452.0832,1094.390400,.SW
464,913485.2378,607448.6184,1094.505400,.SW
465,913505.1826,607448.5623,1094.446200,.SW
466,913504.9507,607442.7139,1094.574500,.SW1
467,913530.9528,607442.2908,1094.650200,.SW1-
468,913531.8869,607448.1441,1094.561300,.SW-
469,913549.0311,607443.5815,1094.766900,.SW
470,913547.1871,607438.0030,1094.868600,.SW1
471,913558.0122,607434.7274,1094.984200,.SW1-
472,913559.8503,607440.3362,1094.913600,.SW-
473,913570.8452,607439.67890100,1094.943500,.SW
474,913570.67910200,607433.93740100,1095.010700,.SW1
475,913604.9061,607433.95720100,1095.117300,.SW1
476,913605.0233,607439.81020100,1095.035700,.SW
477,913655.7142,607439.8986,1095.126500,.SW
478,913655.4809,607434.0194,1095.196600,.SW1
479,913705.35790200,607434.0424,1095.268100,.SW1
480,913705.5060,607439.9273,1095.168600,.SW
481,913748.5427,607439.82460100,1095.303200,.SW
482,913748.5657,607433.9834,1095.219200,.SW1
483,913754.1069,607434.4911,1095.252000,.SW1-
484,913753.1959,607440.5966,1095.220800,.SW-
485,913758.4553,607441.5259,1095.211800,.SW
486,913759.3765,607435.73880100,1095.241600,.SW1
487,913779.4811,607441.1568,1094.984800,.SW1
488,913778.10680200,607446.7234,1095.019300,.SW
489,913786.8234,607448.4716,1094.972800,.SW-
490,913787.59220200,607442.7225,1094.993500,.SW1-
491,913793.3845,607443.0976,1095.004000,.SW1
492,913793.3999,607448.9640,1094.909900,.SW
493,913835.5890,607449.0816,1094.991900,.SW
494,913835.3591,607443.19610100,1095.051400,.SW1
495,913802.7513,607428.3287,1094.475000,NG
496,913754.1252,607419.83200100,1092.995400,NG
497,913753.5268,607449.9621,1094.802300,LP
498,913824.4401,607451.8883,1094.672200,TROL 3"
499,913795.3744,607452.2706,1094.821300,TROL 3"
500,913767.36790200,607451.5202,1094.772700,TROL 3"
501,913728.39360200,607450.3513,1094.647700,TROL 3"
502,913701.1062,607418.8220,1092.598500,NG
503,913654.7890,607426.06740100,1093.859000,NG
504,913604.0170,607420.2015,1092.151700,NG
505,913588.0355,607449.0445,1094.445000,TROL 3"
506,913596.2308,607447.9831,1094.489200,TSP FLUSH
507,913554.3428,607424.6218,1092.984100,NG
508,913527.8043,607451.5786,1094.249700,TROL 3"
509,913511.2362,607449.5486,1094.664000,LP
510,913507.6622,607451.1623,1093.784000,SSP SIGNAL
511,913476.3569,607455.6158,1093.977900,.TCB
512,913476.3340,607456.16170100,1093.925100,.G
513,913485.5552,607456.2552,1093.829800,.G

514,913485.5352,607455.61030100,1094.330200,.TCB
515,913487.7830,607456.2811,1093.649100,.G
516,913508.4031,607456.2929,1093.715600,.G
517,913510.6478,607456.3059,1093.790600,.G
518,913485.5238,607455.5120,1094.339200,.CB
519,913485.5437,607452.1557,1094.337900,.CB
520,913510.3853,607452.2077,1094.278900,.CB
521,913510.4164,607455.6365,1094.279700,.CB!.TCB
522,913517.5999,607453.9555,1094.421800,SDMH
523,913532.7419,607460.3162,1094.023200,SSP DELINEATOR
524,913555.0488,607455.6394,1094.419500,.TCB
525,913555.0575,607456.3585,1093.986900,.G
526,913605.8697,607456.4338,1094.090700,.G
527,913605.8656,607455.8337,1094.576000,.TCB
528,913654.9223,607455.8736,1094.641900,.TCB
529,913654.9172,607456.5235,1094.171500,.G
530,913681.8882,607460.48030100,1094.341300,SSP DELINEATOR
531,913705.2274,607456.5704,1094.241500,.G
532,913705.2512,607455.9971,1094.691700,.TCB
533,913755.6347,607456.0715,1094.719200,.TCB
534,913755.7081,607456.6979,1094.236600,.G
535,913804.4381,607456.7478,1094.321600,.G
536,913804.4519,607456.1387,1094.801300,.TCB
537,913830.6439,607459.1450,1094.484200,SSP DELINEATOR
538,913835.8124,607456.8064,1094.423700,.G
539,913835.74050200,607456.1681,1094.843000,.TCB
540,913844.9420,607456.0628,1094.482400,.TCB
541,913844.9652,607456.7363,1094.421200,.G
542,913849.0594,607456.8403,1094.42,.G
543,913848.9263,607456.2439,1094.523100,.TCB
544,913835.8941,607456.04650100,1094.863100,.SW!
545,913857.96350200,607456.8188,1094.375500,.G
546,913857.88490200,607456.1672,1094.859500,.TCB.SW
547,913858.00380200,607449.1552,1095.018400,.SW
548,913857.98550200,607443.2776,1095.126800,.SW1
549,913865.0240,607442.8422,1095.164400,.SW1-
550,913866.1235,607448.6570,1095.072600,.SW-
551,913875.6024,607447.1676,1095.147100,.SW
552,913874.3135,607441.4342,1095.216400,.SW1
553,913891.5421,607438.14580100,1095.285200,.SW1!
554,913893.5080,607443.8434,1095.268100,.SW!
555,913904.2693,607456.2690,1094.940700,.TCB!
556,913904.2759,607456.8744,1094.451600,.G!
557,913904.5786,607491.93980100,1095.268700,P
558,913854.1443,607491.5936,1095.129300,P
559,913836.6601,607520.09200100,1094.503100,WV
560,913805.8018,607491.4756,1094.951600,SDMH
561,913788.0515,607478.1233,1094.825500,WV
562,913754.3993,607491.34440100,1094.912300,P
563,913704.4286,607491.3401,1094.801500,P
564,913654.3821,607491.6767,1094.755300,P
565,913604.2907,607491.82960100,1094.656000,P
566,913554.5804,607492.6056,1094.579500,P
567,913516.6825,607487.6319,1094.465300,SDMH
568,913492.3020,607499.9135,1094.334000,SSMH
569,913499.0245,607483.82370100,1094.414500,BCS
570,913454.7892,607491.9125,1094.552800,P

71,913404.4410,607490.5893,1094.801800,P
72,913354.5168,607491.8000,1095.125800,P
573,913304.2879,607490.78800100,1095.718100,P
574,913265.1543,607474.8952,1095.962300,WV
575,913166.6833,607544.37880100,1096.783600,.EP
576,913145.4151,607565.7482,1096.893600,.EP-
577,913096.2848,607569.5527,1096.701300,.W 11'
578,913126.2571,607569.4168,1096.800100,.W 11'
579,913128.1536,607573.2641,1096.797000,.W!.EP!
580,913136.43170200,607591.17280100,1096.791500,.W 11'
581,913138.6111,607595.3220,1096.575700,.W 11'
582,913203.9630,607595.65450100,1096.302300,.W!
583,913222.0913,607578.6480,1096.240500,.EP
584,913208.82630200,607555.3118,1096.420300,.EP-
585,913204.3138,607532.1993,1096.656800,.EP!.SW
586,913204.3861,607527.1267,1096.575600,.TCB
587,913204.35440200,607526.5443,1096.096600,.G
588,913234.5550,607525.8271,1095.724900,.G
589,913239.2828,607525.8105,1095.651000,.G
590,913234.3857,607526.4608,1096.223000,.TCB
591,913239.38380200,607526.3587,1095.755900,.TCB
592,913234.3854,607529.1790,1096.289200,EMH
593,913234.6148,607531.4597,1096.333300,.SW
594,913284.6866,607530.2903,1095.785000,.SW
595,913279.5341,607524.8125,1095.206500,.G
596,913284.5483,607524.64820100,1095.149800,.G
97,913279.5623,607525.3868,1095.284100,.TCB
98,913284.4925,607525.2632,1095.605200,.TCB
599,913304.0688,607524.7844,1095.403000,.TCB
600,913304.0048,607524.1927,1094.915100,.G
601,913304.1052,607529.7913,1095.445000,.SW
602,913334.4655,607529.0932,1095.063800,.SW
603,913334.4951,607524.0455,1094.904300,.TCB
604,913334.4739,607523.4192,1094.443000,.G
605,913353.8644,607523.4539,1094.229000,.G
606,913353.8983,607524.0059,1094.70,.TCB
607,913353.5576,607528.96460100,1094.710900,.SW
608,913351.9939,607532.0270,1094.828700,TMH
609,913350.3154,607547.9936,1094.223000,.W 5'
610,913351.2594,607587.9479,1094.806900,.W!
611,913370.0415,607529.6799,1094.702800,PP LAMP NS
612,913367.6872,607530.5324,1094.889100,TPD
613,913364.2158,607532.5646,1094.699700,SSP 40MPH
614,913405.04560200,607523.4507,1093.992100,.G
615,913405.1011,607524.04150100,1094.499600,.TCB
616,913405.1940,607529.0211,1094.598600,.SW
617,913406.2285,607555.5495,1094.471800,NG
618,913453.9527,607554.4475,1094.388600,NG
619,913454.0746,607529.3118,1094.455800,.SW
620,913454.6605,607524.3596,1094.359400,.TCB
621,913454.6856,607523.7652,1093.836200,.G
622,913459.6030,607523.2698,1093.773000,GRT
623,913477.4544,607523.1242,1093.405800,GRT
624,913462.9588,607523.7404,1093.851400,.G
625,913462.9796,607524.3767,1094.306500,.TCB
626,913462.7928,607529.3539,1094.452000,.SW
627,913466.2510,607529.6346,1094.443500,.SW-

28,913468.9972,607530.6537,1094.450600,.SW
29,913476.3673,607537.2921,1094.243300,.SW
630,913478.2786,607543.7001,1094.040100,.SW!
631,913470.6010,607525.1166,1093.906500,.G-
632,913470.3718,607525.65580100,1094.424300,.TCB-
633,913474.9033,607528.2566,1094.001200,.TCB-
634,913475.30280200,607527.9225,1093.898500,.G-
635,913478.6174,607531.2948,1093.848000,.G-
636,913478.2280,607531.6962,1093.952700,.TCB-
637,913480.4075,607535.3722,1094.245600,.TCB-
638,913480.9321,607535.13250100,1093.739000,.G-
639,913482.7819,607543.4830,1093.599200,.G!
640,913482.1812,607543.7914,1093.981800,.TCB!
641,913477.2153,607544.0793,1094.070800,LP
642,913481.8068,607523.97070100,1093.405100,VG
643,913517.2565,607523.9183,1093.546400,VG
644,913500.3245,607545.51710100,1093.780500,P
645,913514.88880200,607545.1300,1093.589500,WV
646,913523.4497,607545.2909,1094.047600,FH
647,913522.3334,607545.8234,1093.936200,.SW
648,913518.3386,607546.12270100,1093.914800,.TCB
649,913517.6732,607545.9934,1093.419200,.G
650,913523.9740,607541.18520100,1094.122200,SSP STOP
651,913522.6391,607541.1978,1094.051000,.SW-
652,913524.2512,607540.84940100,1094.147100,.RWL 2'
653,913524.1884,607536.6851,1094.275000,.RWL 2'
54,913523.35310200,607537.1810,1094.18,.SW
55,913522.3794,607531.4381,1093.774200,.TCB-
56,913524.3394,607529.3132,1093.859400,.TCB-
657,913521.9603,607531.2098,1093.706600,.G-
658,913523.8937,607528.9669,1093.767200,.G-
659,913528.1003,607525.9959,1093.869500,.G-
660,913528.4276,607526.4615,1094.250400,.TCB-
661,913530.39860200,607529.5841,1094.335000,.RWL.SW
662,913537.1417,607523.7932,1093.756700,.G
663,913537.1360,607524.4237,1094.199300,.TCB
664,913538.3511,607530.4048,1095.446400,PP NS
665,913538.6690,607531.5996,1095.620100,TPD
666,913561.25030200,607529.5440,1094.287900,.RWL
667,913561.0488,607531.89580100,1094.393000,.RWL!.W 5'
668,913563.5170,607530.4998,1094.188400,TPD
669,913603.4726,607530.7663,1094.491400,PP NS
670,913605.41430200,607529.5534,1094.464900,.SW
671,913605.8533,607524.5741,1094.510800,.TCB
672,913605.8630,607523.9543,1094.051800,.G
673,913620.3965,607531.1661,1094.539400,DG
674,913626.0378,607531.0909,1094.631900,DG
675,913655.8478,607531.7521,1094.540300,.W
676,913655.7504,607537.20330100,1094.680700,.W!
677,913644.6818,607523.5127,1094.176000,GRT
678,913655.0278,607526.3389,1094.268800,GRT
679,913647.6793,607523.9882,1094.226100,.G
680,913647.6675,607524.7115,1094.678300,.TCB
681,913647.8430,607529.7574,1094.781200,.SW
682,913653.62030200,607529.6614,1094.289700,.SW
683,913656.4026,607529.7338,1094.257800,.SW
684,913661.5444,607529.7179,1094.872400,.SW

85,913653.3154,607524.2350,1094.233400,.G
686,913656.5980,607524.1713,1094.250600,.G
687,913661.3455,607524.0678,1094.334900,.G!
688,913653.4056,607524.79910100,1094.292500,.TCB
689,913656.5754,607524.7471,1094.251300,.TCB
690,913661.5129,607524.8159,1094.778300,.TCB!.SW!
691,913658.8100,607532.8192,1094.870700,TPD
692,913662.0650,607530.2068,1094.696900,TPD
693,913662.0474,607536.96680100,1094.710800,.F 4'C/L
694,913661.9989,607532.3338,1094.616400,.F 4'C/L
695,913665.2365,607524.8027,1094.756800,.F!.W 5'
696,913667.9148,607537.8129,1094.814300,.W!
697,913665.0357,607533.2325,1094.772000,TRU 24"
698,913680.1217,607533.9430,1094.711000,.W 5'
699,913680.1257,607524.7078,1094.605600,.W 5'
700,913681.6675,607523.4884,1094.471700,MB
701,913666.4292,607524.9048,1094.741000,.C
702,913679.7583,607524.6822,1094.718300,.C!.EP
703,913673.1862,607538.65190100,1094.701100,C
704,913680.8712,607519.0889,1094.384800,.EP-
705,913689.1213,607515.86880100,1094.346500,.EP
706,913696.1709,607522.8878,1094.390100,WM
707,913704.97810200,607524.4209,1094.897600,.W
708,913704.9055,607515.5699,1094.357300,.EP
709,913754.4340,607515.43260100,1094.355300,.EP
710,913755.0256,607524.7751,1095.329300,.W
711,913775.9774,607524.5962,1095.024100,.W!.F 4'C/L
712,913776.2417,607544.2927,1094.978900,.F!
713,913777.1345,607514.8952,1094.397800,.EP
714,913789.7581,607517.69720100,1094.396700,.EP-
715,913801.01490200,607522.7452,1094.406600,.EP!.C
716,913800.9577,607528.9094,1094.447600,.C
717,913806.8488,607528.9952,1094.470500,.C
718,913806.9930,607525.7301,1094.299300,.C
719,913840.6695,607525.7902,1094.415900,.C
720,913840.9289,607545.8066,1094.965700,.C!
721,913863.8234,607523.0313,1094.430300,.C
722,913841.5709,607524.2517,1094.356800,VG
723,913807.3560,607524.3010,1094.243200,VG
724,913801.0326,607522.8044,1094.406700,.C!
725,913803.3366,607527.1566,1094.212800,GRT
726,913806.5298,607536.3121,1094.928300,SSMH
727,913807.5581,607544.82000100,1094.942300,.G
728,913806.9575,607544.7859,1095.452600,.TCB.SW
729,913803.0224,607544.9260,1095.559900,.SW
730,913803.1733,607555.1662,1095.595700,.SW!
731,913807.1886,607555.1983,1095.526600,.TCB!
732,913807.84700200,607555.1629,1095.051500,.G!
733,913824.3995,607554.4440,1095.136800,P
734,913842.3935,607553.5905,1094.938700,.G
735,913843.0396,607553.6483,1095.441200,.TCB
736,913847.0762,607553.6383,1095.464200,.SW
737,913848.2369,607554.02210100,1095.471300,WM
738,913850.50400200,607554.1513,1095.759600,ICV
739,913847.5596,607546.0238,1095.353000,SSP STOP
740,913846.8806,607545.7380,1095.516300,.SW
741,913842.90340200,607545.7222,1095.493000,.TCB

742,913842.24900200,607545.75860100,1094.951100,.G
743,913845.5385,607533.70700100,1094.727700,.G-
744,913851.5277,607527.8423,1094.475700,.G-
745,913846.0178,607533.9584,1094.688300,.TCB-
746,913851.7049,607528.3376,1094.497600,.TCB-
747,913863.9565,607524.9662,1094.819700,.TCB.SW1
748,913863.78950200,607524.33220100,1094.366100,.G
749,913865.5090,607528.3657,1094.763300,LP
750,913863.8627,607532.1578,1094.910400,.SW1
751,913853.2877,607537.96440100,1095.312700,.SW-
752,913863.8613,607536.8938,1095.022000,.SW
753,913852.2127,607556.4195,1095.816100,.W 6'
754,913855.6036,607546.7481,1095.398000,.W-
755,913878.1450,607541.1319,1095.270100,.W
756,913881.24050200,607539.3030,1095.059000,EBX
757,913887.70850200,607538.9778,1095.042300,TRU 8"
758,913891.9281,607539.6417,1094.992400,TPD
759,913903.9249,607540.6080,1095.044400,.W
760,913904.2672,607537.7004,1095.043800,TRU 8"
761,913904.42060200,607537.0084,1095.091200,.SW
762,913904.6403,607532.1054,1095.041800,.SW1
763,913904.7998,607525.0199,1094.967600,.TCB
764,913904.7610,607524.4454,1094.449800,.G
765,913954.2079,607524.5829,1094.473600,.G
766,913954.1438,607525.1489,1095.017400,.TCB
767,913949.2927,607529.1922,1094.846500,TRPN 10"
768,913953.1172,607532.22180100,1095.094600,.SW1
769,913953.22440200,607537.1021,1095.097800,.SW
770,913953.1260,607540.4956,1094.865900,.W
771,913947.9536,607539.3538,1095.000900,TRU 4"
772,913994.5740,607538.9658,1095.097000,TRU 6"
773,914009.0019,607528.8929,1094.803300,TRU 6"
774,914021.9307,607539.6395,1095.111500,TRU 6"
775,914010.1478,607540.6625,1095.069800,.W!
776,914003.8710,607537.2038,1095.357600,.SW
777,914006.2741,607532.2699,1095.137300,.SW1
778,914005.9497,607525.2798,1095.104700,.TCB
779,914190.2942,607455.7894,1095.369500,40D
780,913423.9067,607460.88100100,1094.184300,CP 183
781,914047.3405,607528.6719,1094.979200,LP
782,914053.1149,607524.68370100,1094.689500,.G
783,914053.1746,607525.31260100,1095.202000,.TCB
784,914052.3350,607532.4279,1095.299600,.SW1
785,914054.4882,607537.3095,1095.420500,.SW
786,914053.5900,607540.6968,1095.413600,.W
787,914067.5269,607529.1916,1094.990500,TRPN 8"
788,914104.0126,607540.6359,1095.381000,.W
789,914103.6906,607537.4325,1095.388700,.SW
790,914103.5026,607532.55390100,1095.322200,.SW1
791,914103.6869,607525.4237,1095.263000,.TCB
792,914103.6562,607524.8075,1094.738600,.G
793,914142.5132,607529.4207,1095.105400,TRU 8"
794,914175.7377,607528.4550,1095.106400,TRU 8"
795,914199.16690200,607537.7214,1095.462600,TRU 8"
796,914216.91820200,607528.7066,1095.142600,TRU 8"
797,914154.9874,607540.5973,1095.631900,.W
798,914153.3962,607537.45700100,1095.463500,.SW

799,914153.0314,607532.5863,1095.386600,.SW1
800,914153.0742,607525.4478,1095.237500,.TCB
801,914153.0742,607524.81850100,1094.743600,.G
802,914203.8400,607524.9388,1094.767100,.G
803,914203.9563,607525.5325,1095.271200,.TCB
804,914203.8232,607532.6464,1095.392300,.SW1
805,914203.30410200,607537.4942,1095.461100,.SW
806,914203.8700,607540.5449,1095.421500,.W
807,914224.1048,607528.93390100,1095.135200,LP
808,914253.6762,607540.55630100,1095.660400,.W
809,914253.8138,607537.6126,1095.584100,.SW
810,914254.3732,607532.72180100,1095.539500,.SW1
811,914254.1698,607525.6058,1095.373100,.TCB
812,914254.2668,607525.0078,1094.908800,.G
813,914267.9174,607539.1836,1095.552000,TRU 6"
814,914298.0282,607530.0636,1095.311100,TRPN 8"
815,914302.6885,607537.8069,1095.688500,.SW
816,914306.81870200,607537.3299,1095.740100,.SW-
817,914312.7558,607534.9457,1095.694900,.SW
818,914318.5337,607531.8901,1095.568500,.SW-
819,914323.3255,607530.71440100,1095.561800,.SW
820,914302.0984,607532.9737,1095.593500,.SW1
821,914305.3255,607532.6828,1095.588800,.SW1-
822,914310.93040200,607530.3683,1095.582200,.SW1
823,914316.7863,607527.42780100,1095.505100,.SW1
824,914317.5322,607526.6655,1095.511500,.SW1-
825,914317.6529,607525.7489,1095.47,.SW1!
826,914303.6999,607525.6933,1095.437000,.TCB
827,914303.8262,607525.1271,1094.953900,.G
828,914304.5281,607540.6009,1095.781800,.W
829,914304.6311,607550.9195,1096.298500,.W
830,914323.2494,607550.1009,1096.602000,.W
831,914323.0683,607540.3574,1095.944900,.W
832,914319.6415,607540.6557,1096.313000,.EBX
833,914319.6295,607546.8092,1096.432900,.EBX
834,914315.6523,607546.8392,1096.419000,.EBX
835,914315.6358,607540.5543,1096.308000,.EBX+
836,914313.2200,607540.7395,1096.107800,.EBX
837,914313.3566,607545.2174,1096.288900,.EBX
838,914307.9958,607545.1744,1096.285500,.EBX
839,914308.3519,607540.7611,1096.135000,.EBX+
840,914352.7349,607540.6809,1096.214600,.W
841,914353.5327,607531.0814,1095.627700,.SW
842,914354.0921,607526.1152,1095.486500,.TCB
843,914354.1058,607525.4542,1094.958300,.G
844,914375.1472,607534.4343,1095.779900,DG
845,914395.0139,607534.5558,1096.037600,EBX
846,914396.98920200,607534.3739,1095.773400,PP LAMP N
847,914393.7176,607540.5470,1096.494700,.W END6' BEG2'
848,914409.9619,607531.82000100,1095.716200,.SW
849,914410.1994,607526.7929,1095.617900,.TCB
850,914410.1771,607526.1976,1095.090600,.G
851,914420.0849,607528.6461,1095.232900,.G-
852,914423.5120,607530.8916,1095.249000,.G-
853,914426.2132,607533.4820,1095.335000,.G-
854,914428.7005,607537.1426,1095.350500,.G-
855,914431.2103,607545.6907,1095.373400,.G!

856,914419.6668,607529.2362,1095.664100,.TCB-
857,914423.16820200,607531.4044,1095.319600,.TCB-
858,914425.8597,607533.88490100,1095.406300,.TCB-
859,914428.2891,607537.55650100,1095.764200,.TCB-
860,914430.6590,607545.4983,1095.719100,.TCB!
861,914421.7730,607535.9708,1095.747700,.SW-
862,914425.17410200,607540.4281,1095.776400,.W
863,914426.6064,607544.7044,1095.793700,.SW!.W!
864,914430.1392,607526.7963,1095.197200,VG
865,914465.77580200,607527.1615,1095.314000,VG
866,914446.93390200,607551.8135,1095.792600,P
867,914456.3736,607549.7948,1095.715500,WV
868,914470.9125,607553.3732,1095.908300,SSP STOP
869,914471.4915,607549.6489,1095.933400,FH
870,914474.0562,607556.9250,1096.413400,.RWL 3'
871,914465.6572,607549.3365,1095.506600,.G
872,914466.2458,607549.3425,1095.862200,.TCB
873,914470.2406,607549.1861,1095.940100,.SW
874,914481.1063,607542.86770100,1096.415400,.RWL-
875,914475.3640,607536.8736,1095.933000,.SW-
876,914468.1788,607538.0288,1095.446000,.G-
877,914470.37510200,607534.8238,1095.465100,.G-
878,914473.4593,607532.0307,1095.474400,.G-
879,914477.0086,607529.7159,1095.414600,.G-
880,914468.5757,607538.3811,1095.926500,.TCB-
881,914470.8371,607535.1305,1095.467300,.TCB-
882,914473.8031,607532.4034,1095.476200,.TCB-
883,914477.30040200,607530.2216,1095.833000,.TCB-
884,914485.8281,607527.46810100,1095.313400,.G
885,914485.8351,607528.0313,1095.771200,.TCB
886,914485.6689,607533.0035,1095.954100,.SW
887,914487.5866,607541.0673,1096.396200,.RWL
888,914503.6051,607540.57110100,1096.502500,.RWL!
889,914503.4567,607533.2887,1095.941300,.SW!
890,914503.6579,607528.2626,1095.827100,.TCB!
891,914503.6938,607527.67890100,1095.343300,.G!
892,914503.04800200,607496.4702,1096.117500,P
893,914453.0815,607494.0344,1096.066800,P
894,914440.8972,607510.7984,1095.781300,SSMH
895,914453.6850,607522.6817,1095.476800,WV
896,914412.3010,607510.2963,1095.747300,SSMH
897,914403.4433,607493.6181,1096.003700,P
898,914353.1181,607491.79520100,1095.940300,P
899,914303.0998,607492.1157,1095.841900,P
900,914330.80280200,607519.7074,1095.245800,WV
901,914268.9385,607517.5712,1095.186000,WV
902,914271.8981,607479.59180100,1095.651500,WV
903,914266.0942,607479.2935,1095.604600,WV
904,914269.1337,607476.8036,1095.587300,WV
905,914203.6762,607491.9601,1095.643600,P
906,914153.8535,607490.4645,1095.633100,P
907,914103.1115,607490.0146,1095.548900,P
908,914054.1320,607489.9351,1095.393800,P
909,914004.04300200,607489.8612,1095.306400,P
910,913954.2119,607489.57610100,1095.291800,P
911,913893.70370200,607443.6759,1095.256800,.SW
912,913891.9838,607438.1105,1095.424600,.SW1

913,913909.6531,607435.0167,1095.367600,.SW1-
914,913909.7983,607440.6533,1095.294400,.SW-
915,913913.3933,607450.0433,1095.271000,LP
916,913930.7378,607434.32370100,1095.469300,.SW1
917,913930.8141,607440.1592,1095.433300,.SW
918,913951.6604,607440.3580,1095.472700,.SW
919,913952.7438,607434.3684,1095.521700,.SW1
920,914002.5077,607434.4587,1095.614100,.SW1
921,914002.2168,607440.5747,1095.376300,.SW
922,914053.7725,607440.3623,1095.535200,.SW
923,914053.8487,607434.5448,1095.650300,.SW1
924,914096.8235,607429.9898,1096.075300,.W 8'
925,914105.1074,607434.6334,1095.743400,.SW1
926,914147.1151,607440.6542,1095.739100,.SW
927,914147.2559,607434.8267,1095.824500,.SW1
928,914146.6444,607430.26840100,1096.146700,.W
929,914160.2837,607436.3748,1095.763400,.SW1-
930,914158.9576,607442.1115,1095.694200,.SW-
931,914174.1814,607448.1213,1095.611200,.SW
932,914176.4904,607442.72310100,1095.677700,.SW1
933,914183.65450200,607452.1199,1095.528700,.SW-
934,914188.9114,607454.0718,1095.461700,.SW!
935,914200.7245,607450.5574,1095.541600,.SW1-
936,914216.4603,607448.4782,1095.657700,.SW1
937,914232.9181,607434.58940100,1095.803900,.SW1
938,914234.8290,607428.5132,1095.753800,.SW1-
939,914235.4604,607421.7301,1095.669100,.SW1
940,914217.7594,607430.4600,1096.465900,.W
941,914232.6326,607416.3426,1095.880900,.W!
942,914233.8775,607428.9592,1095.666400,SSP STOP
943,913904.1973,607456.3308,1094.894600,.TCB
944,913904.26120200,607456.9686,1094.423300,.G
945,913954.54800200,607457.0241,1094.559600,.G
946,913954.5185,607456.3842,1094.982400,.TCB
947,914004.9179,607456.4547,1095.095800,.TCB
948,914004.8963,607457.1200,1094.583300,.G
949,914053.8719,607457.2249,1094.666400,.G
950,914053.9901,607456.5363,1095.143300,.TCB
951,914104.2587,607456.6571,1095.245300,.TCB
952,914104.2238,607457.30020100,1094.806700,.G
953,914113.35940200,607450.5484,1095.397800,LP
954,914122.6469,607450.7591,1095.416600,TRM 3"
955,914161.2698,607450.2804,1095.525300,TROL 3"
956,914153.9552,607457.4484,1094.872800,.G
957,914153.9178,607456.8108,1095.361300,.TCB
958,914205.1120,607456.8176,1095.444500,.TCB
959,914204.9772,607457.4983,1094.958100,.G
960,914219.1494,607454.39210100,1095.127200,.G-
961,914226.2280,607450.1319,1095.211500,.G-
962,914232.3599,607444.0905,1095.276400,.G-
963,914237.2101,607436.2628,1095.320300,.G-
964,914240.1432,607421.8695,1095.151400,.G!
965,914218.8022,607453.9000,1095.564700,.TCB-
966,914225.86420200,607449.8299,1095.236200,.TCB-
967,914231.9580,607443.8009,1095.286700,.TCB-
968,914236.66060200,607436.0841,1095.767000,.TCB-
969,914239.4612,607421.87120100,1095.566300,.TCB!.SW1!

970,914258.2866,607419.7722,1095.424900,P
971,914274.8708,607422.2982,1095.285700,.G
972,914275.4582,607422.2374,1095.739200,.TCB
973,914279.6880,607422.24270100,1095.882600,.SW
974,914282.6590,607415.60660100,1095.698800,.W 3'
975,914296.8877,607430.5315,1096.769100,.W END3' BEG7'
976,914280.3484,607429.4081,1096.004900,.SW-
977,914281.93520200,607434.3091,1096.046400,.SW
978,914298.6528,607448.8136,1096.024000,.SW
979,914305.0195,607450.59070100,1095.828000,.SW-
980,914312.64100200,607450.9881,1095.767200,.SW
981,914312.6411,607449.76970100,1095.725600,LP
982,914240.1613,607457.4000,1095.083200,VG
983,914274.5986,607457.4693,1095.159300,VG
984,914277.5910,607435.88470100,1095.507200,.G-
985,914282.5245,607444.1515,1095.593300,.G-
986,914287.8355,607449.4720,1095.580100,.G-
987,914296.1453,607454.8501,1095.465300,.G-
988,914311.1920,607457.7177,1095.187900,.G
989,914278.19130200,607435.6626,1095.959500,.TCB-
990,914282.95370200,607443.75490100,1095.623700,.TCB-
991,914288.1425,607449.0852,1095.617200,.TCB-
992,914296.29190200,607454.2423,1095.932500,.TCB-
993,914311.3745,607457.04540100,1095.633100,.TCB
994,914325.3595,607456.9089,1095.719400,.SW1
995,914325.62270200,607455.4480,1095.719200,.SW1-
996,914326.9173,607454.5240,1095.717900,.SW1
997,914326.9039,607455.8488,1095.565600,SSP RIGHT TURN
998,914319.5425,607450.3658,1095.825300,.SW-
999,914329.8902,607447.0541,1095.823300,.SW
1000,914340.8346,607443.5521,1095.916400,.SW-
1001,914341.6286,607449.4757,1095.857800,.SW1-
1002,914355.64600200,607449.8062,1095.810500,TSP FLUSH
1003,914355.2425,607457.1486,1095.698600,.TCB
1004,914355.1229,607457.7870,1095.219200,.G
1005,914364.38380200,607447.6892,1095.926700,.SW1-
1006,914363.9968,607441.6777,1096.028100,.SW-
1007,914393.7614,607442.4828,1096.068300,.SW
1008,914393.3556,607448.3136,1096.018300,.SW1
1009,914395.2978,607436.0093,1096.829400,TPD
1010,914352.3113,607430.7075,1097.559500,.W
1011,914409.8399,607443.7067,1096.053500,.SW-
1012,914409.6809,607449.5971,1096.015800,.SW1-
1013,914428.9641,607450.3034,1096.108900,.SW1
1014,914431.5899,607444.4801,1096.152200,.SW
1015,914459.7298,607444.4308,1096.122500,.SW
1016,914481.2524,607444.4419,1096.151600,.SW!
1017,914459.5907,607450.2786,1095.970100,.SW1
1018,914449.16690200,607453.0780,1095.793800,TROL 3"
1019,914424.8635,607453.4462,1095.665400,TROL 3"
1020,914399.2656,607452.3340,1095.632000,TROL 3"
1021,914402.3966,607457.8354,1095.295600,.G
1022,914402.3870,607457.26970100,1095.768700,.TCB
1023,914459.6555,607457.3822,1095.851500,.TCB.SW1!
1024,914459.6261,607457.9566,1095.420600,.G
1025,914468.64120200,607457.9886,1095.406300,.G
1026,914472.7819,607458.0350,1095.399700,.G

1027,914482.0044,607458.0093,1095.385000,.G
1028,914501.6615,607458.0834,1095.429300,.G!
1029,914468.7136,607457.3547,1095.527600,.TCB
1030,914472.7494,607457.3911,1095.481900,.TCB
1031,914481.9556,607457.4292,1095.88,.TCB
1032,914501.6725,607457.4947,1095.867100,.TCB!
1033,914456.1194,607430.7391,1098.168600,.W
1034,914501.8304,607431.0729,1097.800900,.W!
1035,912964.0128,607603.7441,1096.188600,CP 3
1036,913056.1576,607744.1183,1096.581400,.W 11'
1037,913071.9498,607743.7925,1096.725700,.W 11'
1038,913045.3219,607781.9282,1095.447400,.G
1039,913045.9423,607782.1770,1095.938900,.TCB
1040,913050.9203,607781.83810100,1095.977000,.SW
1041,913051.6405,607816.1899,1096.134300,.SW.EP
1042,913073.7017,607821.7236,1096.841200,.EP!.W!
1043,913070.2152,607817.8463,1096.912400,EMH
1044,913074.1847,607842.8787,1096.766800,.EP.W 11'
1045,913074.5391,607857.1588,1096.865100,.W!
1046,913075.2365,607862.7802,1096.898600,.W 4'
1047,913068.2670,607862.8097,1096.940700,.W 4'
1048,913046.65080200,607846.3697,1095.587100,.G
1049,913047.3072,607846.2655,1095.698800,.TCB
1050,913047.3983,607850.2740,1096.063100,.TCB
1051,913046.8043,607850.5077,1095.623000,.G
1052,913053.3472,607863.2253,1096.307600,PP NEW LAMP
1053,913068.06150200,607872.0860,1096.289000,TRM 18"
1054,913053.71700200,607887.4214,1095.955700,DG
1055,913061.0684,607890.28170100,1096.133400,SSP 75TH AVE
1056,913047.2487,607872.39210100,1095.518100,.G.GRT
1057,913045.2746,607872.3816,1095.738600,.GRT
1058,913045.60550200,607882.7182,1095.769200,.GRT
1059,913047.5368,607882.76710100,1095.561700,.G.GRT!
1060,913055.7528,607901.0031,1096.393700,EBX FLUSH
1061,913048.0534,607909.1120,1095.693600,.G
1062,913048.68780200,607909.0534,1096.191000,.TCB
1063,913053.6507,607908.5072,1096.280600,.SW
1064,913058.66190200,607915.9240,1096.465300,.SW
1065,913064.2507,607915.9166,1096.506300,.SW
1066,913069.59810200,607919.02820100,1096.611600,.W!
1067,913048.2938,607920.1298,1095.778200,VG
1068,913050.64970200,607916.4125,1095.947100,.G-
1069,913051.0307,607916.17020100,1096.339200,.TCB-
1070,913058.4862,607919.4894,1096.429200,.TCB!
1071,913058.4167,607919.9604,1096.466400,.G!
1072,913070.0649,607948.5178,1096.333800,.W 5'
1073,913064.9956,607944.24010100,1096.543100,.SW
1074,913079.3918,607933.2836,1096.666800,P
1075,913059.0097,607944.9158,1096.492000,.TCB
1076,913058.9644,607944.3874,1096.462200,.G
1077,913051.4755,607949.0440,1096.068200,.G-
1078,913051.9118,607949.2716,1096.420200,.TCB-
1079,913049.3191,607946.2123,1095.802400,VG
1080,913049.1292,607958.3692,1095.838000,.G
1081,913049.7267,607958.1590,1096.275200,.TCB
1082,913057.2840,607971.3644,1096.333300,DG
1083,913059.1489,607945.03670100,1096.489600,.SW1

1084,913059.8711,607981.8463,1096.596800,.SW1
1085,913050.23290200,607981.7325,1096.363000,.TCB
1086,913049.5769,607981.52690100,1095.859700,.G
1087,913049.9735,607997.2380,1095.946100,.G
1088,913050.5651,607997.0734,1096.382300,.TCB
1089,913056.3283,608001.9672,1096.189200,PP NSEW LAMP
1090,913050.2431,608008.2927,1095.981100,VG
1091,913052.5924,608005.50990100,1096.173300,.G-
1092,913052.96700200,608005.1919,1096.510900,.TCB-
1093,913060.3315,608008.7270,1096.633100,.TCB!.SW1!
1094,913060.3390,608009.23290100,1096.632800,.G!
1095,913065.7430,607982.3845,1096.679200,.SW
1096,913070.9896,607983.1389,1096.483800,.W
1097,913071.3146,608003.2321,1096.631600,.W
1098,913079.3999,608003.2297,1096.660900,.W!
1099,913069.7669,608002.1871,1096.578200,TPD
1100,913071.4418,608005.3432,1096.617600,.EP
1101,913068.9660,608007.57350100,1096.687400,.EP-
1102,913066.3826,608008.9261,1096.774100,.EP!.SW
1103,913081.9276,608020.8369,1096.836500,P
1104,913083.9967,608038.48790100,1097.310600,.TCB1
1105,913072.0165,608038.78300100,1097.150300,.TCB1
1106,913066.8988,608039.0401,1096.817100,.TCB1!.SW
1107,913071.2610,608043.23790100,1096.791600,WM
1108,913060.9809,608039.6130,1096.727900,.TCB.SW1
1109,913061.0200,608039.1196,1096.696600,.G
1110,913053.92040200,608042.2987,1096.281300,.G-
1111,913053.7549,608043.2628,1096.632400,.TCB-
1112,913050.8921,608041.0531,1096.024700,VG
1113,913051.1490,608049.6903,1096.041800,.G
1114,913051.8171,608049.4882,1096.481300,.TCB
1115,913052.4321,608080.8321,1096.616200,.TCB
1116,913051.85570200,608080.9566,1096.178000,.G
1117,913062.0561,608081.1345,1096.798100,.SW1
1118,913067.8719,608081.0816,1096.882400,.SW
1119,913084.9601,608080.8142,1097.162000,NG
1120,913092.5468,608132.9588,1097.029000,NG
1121,913073.1598,608143.4930,1097.057600,TPD
1122,913068.9185,608129.9600,1096.974300,.SW
1123,913063.1827,608130.0611,1096.930700,.SW1
1124,913053.53950200,608130.4784,1096.723000,.TCB
1125,913052.98660200,608130.4175,1096.243200,.G
1126,913054.0240,608181.2716,1096.350200,.G
1127,913054.6021,608181.2465,1096.849000,.TCB
1128,913064.23290200,608181.1528,1097.098200,.SW1
1129,913070.0116,608181.2243,1097.190400,.SW
1130,913099.1477,608182.1623,1096.970900,NG
1131,913063.7321,608194.24010100,1096.925500,DG
1132,913060.0188,608194.0673,1096.636700,PP SEW LAMP
1133,913055.0220,608230.4807,1096.459400,.G
1134,913055.6430,608230.4434,1096.924700,.TCB
1135,913065.3162,608230.2284,1097.219100,.SW1
1136,913071.1434,608230.1255,1097.296600,.SW
1137,913106.6411,608228.9820,1096.848100,NG
1138,913071.5350,608250.4452,1097.335300,.SW
1139,913055.3267,608241.2111,1096.499900,.G
1140,913055.9042,608241.1844,1096.964700,.TCB

1141,913055.5891,608251.1124,1096.494300,VG
1142,913058.3771,608247.7174,1096.806700,.G-
1143,913058.6726,608247.3153,1097.067800,.TCB-
1144,913065.6978,608250.4188,1097.252600,.TCB!.SW1!
1145,913065.6069,608250.8864,1097.253400,.G!
1146,913055.8490,608282.6135,1096.620700,VG
1147,913072.2975,608280.85290100,1097.393300,.SW
1148,913066.3056,608281.2887,1097.357900,.SW1.TCB
1149,913066.2078,608280.83440100,1097.321200,.G
1150,913058.5475,608284.7363,1096.765400,.G-
1151,913058.9275,608285.1141,1097.146800,.TCB-
1152,913056.9057,608290.7142,1097.098400,.TCB
1153,913056.2970,608290.7683,1096.582400,.G
1154,913057.2145,608330.3695,1096.673300,.G
1155,913057.8253,608330.3165,1097.182000,.TCB
1156,913067.4020,608329.8499,1097.384800,.SW1
1157,913073.2559,608329.73160100,1097.506800,.SW
1158,913091.8547,608329.04890100,1097.344700,NG
1159,913073.6972,608350.1200,1097.504100,.SW
1160,913057.3329,608338.0703,1096.693800,.G
1161,913057.9338,608338.1061,1097.191200,.TCB
1162,913057.7960,608350.16190100,1096.757900,VG
1163,913061.6885,608348.4492,1097.033600,.G-
1164,913062.0048,608348.0374,1097.330200,.TCB-
1165,913067.8554,608350.1520,1097.397300,.TCB!.SW1!
1166,913067.7367,608350.6603,1097.398100,.G!
1167,913074.2804,608374.97790100,1097.550400,.SW
1168,913068.3770,608374.9236,1097.459900,.SW1.TCB
1169,913068.2346,608374.5231,1097.436800,.G
1170,913066.4827,608381.0581,1097.561400,WV
1171,913062.1536,608377.5310,1097.373600,.TCB-
1172,913061.8345,608377.0309,1096.943200,.G-
1173,913058.10440200,608376.6954,1096.762300,VG
1174,913058.48050200,608387.7966,1096.764100,.G
1175,913059.0126,608387.80150100,1097.249900,.TCB
1176,913064.34220200,608386.2434,1097.248100,PP EW LAMP
1177,913095.4166,608429.3402,1097.628300,NG
1178,913075.4896,608429.9126,1097.627500,.SW
1179,913069.5540,608430.4430,1097.628200,.SW1
1180,913061.5052,608496.9923,1097.578400,.TCB
1181,913061.16430200,608497.0817,1097.038300,.G
1182,913063.2656,608506.36900100,1097.361600,.G-
1183,913063.6967,608506.0437,1097.736600,.TCB-
1184,913071.4751,608509.5925,1097.859200,.TCB!.SW1!
1185,913071.4872,608510.2124,1097.831300,.G!
1186,913077.2534,608509.4468,1097.917300,.SW!
1187,913027.5876,608530.4072,1098.172300,P
1188,913026.0379,608480.7311,1098.053500,P
1189,913025.40450200,608430.72070100,1098.060200,P
1190,913024.5545,608380.8580,1097.929200,P
1191,913023.5553,608330.9655,1097.798300,P
1192,913023.0074,608281.0155,1097.667400,P
1193,913021.7600,608231.3175,1097.537700,P
1194,913020.2206,608181.25010100,1097.407700,P
1195,913039.7774,608167.8604,1096.954100,SSMH
1196,913019.26600200,608131.43980100,1097.344200,P
1197,913018.7185,608081.1224,1097.200900,P

198,913017.52470200,608031.5157,1096.976000,P
1199,912967.17060200,607619.9157,1088.715700,INV #2BBL BOX
1200,912969.4447,607709.6783,1096.466700,.SW
1201,912977.9933,607740.2352,1096.287600,.SW1
1202,912975.3678,607740.2609,1096.368200,.SW1
1203,912972.7757,607741.4074,1096.367900,.SW1-
1204,912972.3262,607743.35400100,1096.425400,.SW1
1205,912967.4456,607742.9324,1096.495900,.SW
1206,912951.3357,607737.0923,1096.442900,NG
1207,912965.1477,607781.5852,1096.574200,.SW
1208,912970.01620200,607781.7876,1096.500200,.SW1
1209,912952.9499,607789.6581,1095.751700,NG
1210,912956.9792,607832.7616,1095.933800,NG
1211,912966.2232,607832.4528,1096.595700,.SW
1212,912971.1318,607832.3853,1096.518300,.SW1
1213,912940.3585,607857.3392,1095.371600,.F 5'C/L
1214,912967.26970200,607882.9216,1096.690200,.SW
1215,912972.1891,607882.6526,1096.641100,.SW1
1216,912973.1530,607932.8001,1096.776900,.SW1
1217,912968.3319,607933.4365,1096.863900,.SW
1218,912942.5576,607927.4709,1095.547500,.F
1219,912944.3551,607980.7690,1095.668600,.F
1220,912969.2602,607982.1892,1096.869300,.SW1
1221,912970.3345,608032.8060,1097.028200,.SW1
1222,912946.1358,608033.6731,1095.456000,.F
1223,912947.7639,608081.2044,1095.661700,.F
1224,912971.4086,608080.9335,1097.128000,.SW
1225,912972.5002,608132.6243,1097.234800,.SW FORM ONLY
1226,912949.5063,608133.9444,1095.809700,.F
1227,912950.3461,608164.8760,1095.711800,.F
1228,912936.0777,608199.6052,1097.073100,.F!
1229,912955.8946,608174.1078,1096.087400,TPD
1230,912959.1284,608189.5800,1096.591200,PP N
1231,912973.5840,608183.0190,1097.356600,.SW FORM ONLY
1232,912974.7272,608233.2739,1097.420300,.SW! END FORM
1233,912954.3106,608233.5480,1096.560600,NG
1234,912974.3971,607982.5649,1096.852700,.SW1
1235,912975.3745,608032.3031,1096.920300,.SW1
1236,912984.4539,608031.99400100,1096.406400,.TCB
1237,912985.0420,608032.0297,1095.916100,.G
1238,912986.1145,608081.6865,1096.139800,.G
1239,912985.5281,608081.9493,1096.609200,.TCB
1240,912976.4826,608082.51580100,1097.042700,.SW1
1241,912977.52470200,608131.3959,1097.125200,.SW1 FORM ONLY
1242,912986.56390200,608131.85550100,1096.770200,.TCB
1243,912987.1765,608132.2359,1096.272700,.G
1244,912988.2719,608181.8981,1096.474000,.G
1245,912987.6977,608181.9934,1096.950300,.TCB
1246,912978.6254,608182.6920,1097.242300,.SW1 FORM ONLY
1247,912986.5217,608215.4247,1096.433600,SSP NO PARK
1248,912979.6537,608231.57460100,1097.317800,.SW1! END FORM
1249,912988.6964,608231.6113,1097.090700,.TCB
1250,912989.34330200,608231.78690100,1096.628500,.G
1251,912990.2936,608274.3791,1096.764600,.G
1252,912990.3859,608279.8164,1096.838600,.G
1253,912990.8977,608303.3567,1096.886600,.G
1254,912991.0265,608308.7446,1096.889200,.G

1255,912989.6694,608274.5817,1097.249900,.TCB.SW
1256,912984.7136,608274.9465,1097.414300,.SW
1257,912985.3990,608308.6809,1097.537600,.SW
1258,912989.7958,608279.7996,1096.948000,.TCB
1259,912990.2833,608303.3895,1096.964000,.TCB
1260,912990.3626,608308.5608,1097.359300,.TCB.SW!
1261,912965.03560200,608292.7999,1096.979500,P
1262,912938.1707,608283.8802,1096.655100,.F 6'C/L
1263,912951.8077,608319.7262,1096.488500,.F 6'C/L
1264,912990.9040,608331.9516,1097.438900,.TCB
1265,912991.5551,608332.0743,1096.962800,.G
1266,912970.9151,608338.7532,1097.478300,NG
1267,912966.75400200,608383.5141,1098.143500,NG
1268,912976.3232,608382.8048,1097.182900,NG
1269,912992.05280200,608382.3411,1097.572700,.TCB
1270,912992.6149,608382.32720100,1097.087400,.G
1271,912993.6894,608431.2679,1097.357200,.G
1272,912993.0895,608431.3449,1097.790100,.TCB
1273,912975.8599,608432.0545,1097.387100,NG
1274,912955.1452,608441.0248,1097.849300,.F
1275,912994.7493,608481.77690100,1097.393600,.G
1276,912994.1733,608481.9074,1097.895600,.TCB
1277,913064.4624,608551.77100100,1097.475600,40D
1278,913059.7984,607910.5765,1096.288400,CP 451
1279,912995.8338,608531.3084,1097.510300,.G
1280,912995.2143,608531.2918,1098.004700,.TCB
1281,912991.0562,608533.53690100,1097.829100,ICV
1282,912991.1337,608534.9018,1097.829200,ICV
1283,912991.2824,608536.3311,1097.814700,ICV
1284,912991.3800,608537.6242,1097.850900,ICV
1285,912990.9895,608540.8306,1097.933700,BFP
1286,912992.0926,608541.81480100,1097.560300,SSP .PED
1287,912991.7803,608544.6588,1098.35,WM
1288,912957.3132,608541.2861,1097.897700,.F
1289,912940.0468,608541.3176,1097.749500,.F!
1290,912953.7025,608561.3911,1097.689300,.W 6'
1291,912967.0987,608561.3511,1097.66,.W.SW
1292,912971.3648,608558.6441,1097.718000,.TCB1
1293,912972.9177,608558.5875,1097.439600,.G1
1294,912989.1660,608559.2093,1097.697100,.G2
1295,912989.7459,608559.0825,1098.149500,.TCB2
1296,912996.9784,608581.5468,1097.779300,.G
1297,912996.4438,608581.6253,1098.229100,.TCB
1298,912990.1331,608582.9612,1098.215300,.TCB2
1299,912989.5572,608583.1516,1097.694500,.G2
1300,912987.4248,608582.9920,1097.594300,WV
1301,912973.3369,608583.66300100,1097.414300,.G1
1302,912971.6805,608583.3567,1097.716700,.TCB1
1303,912967.7897,608583.19240100,1097.776100,.SW.W
1304,912968.73440200,608633.21810100,1097.822000,.SW.W END6'BEG2'
1305,912972.64840200,608632.3530,1097.638900,.TCB1
1306,912974.2297,608632.29910100,1097.336000,.G1
1307,912990.5776,608632.0188,1097.850800,.G2
1308,912991.1794,608631.99510100,1098.346000,.TCB2
1309,912997.5013,608631.90320100,1098.341400,.TCB
1310,912998.1033,608632.0410,1097.855400,.G
1311,912998.6157,608657.1253,1097.852400,.G

1312,912998.0359,608657.1415,1098.347600,.TCB
1313,912997.5388,608658.6753,1098.305000,.TCB-
1314,912997.9085,608659.0305,1097.846400,.G-
1315,912995.8024,608659.7422,1097.827900,.G!
1316,912995.82500200,608659.2114,1098.279200,.TCB!
1317,912993.9869,608656.74880100,1098.275600,ICV
1318,912991.6134,608657.1860,1098.399400,.TCB2!
1319,912991.0019,608657.2269,1097.908900,.G2!
1320,912978.4070,608647.1500,1097.609900,WV
1321,912974.3969,608642.9085,1097.374400,.G1
1322,912973.6480,608647.8048,1097.359800,.G1
1323,912973.0727,608647.8238,1097.711800,.TCB1
1324,912969.3837,608648.5804,1097.708800,.SW.W
1325,912963.2610,608657.2826,1097.698700,.W-
1326,912953.2040,608661.1683,1097.545500,.W!
1327,912965.0562,608659.3816,1097.691300,.SW-
1328,912954.4568,608663.4861,1097.597300,.SW!
1329,912972.7286,608655.1945,1097.438300,.G1-
1330,912969.8326,608660.7051,1097.420700,.G1-
1331,912966.0596,608664.1870,1097.405900,.G1-
1332,912960.3779,608666.9527,1097.306100,.G1-
1333,912954.28930200,608668.0388,1097.242600,.G1!
1334,912972.1960,608655.1068,1097.699400,.TCB1-
1335,912969.3844,608660.4950,1097.434300,.TCB1-
1336,912965.6816,608663.8271,1097.420400,.TCB1-
1337,912960.22570200,608666.4488,1097.637600,.TCB1-
1338,912954.5171,608667.5283,1097.546400,.TCB1!
1339,912955.2028,608684.91780100,1097.105800,P
1340,912982.2871,608681.8436,1097.721100,P
1341,912998.9908,608681.3363,1098.058600,P
1342,912955.2104,608699.71680100,1097.216500,.G
1343,912965.0880,608657.2351,1097.552400,LP
1344,912955.2421,608700.23050100,1097.492200,.TCB
1345,912955.3228,608704.2161,1097.622600,.SW
1346,912966.9763,608708.8474,1097.733100,.SW-
1347,912971.0207,608719.2709,1098.073200,.SW
1348,912962.6480,608700.9325,1097.289100,.G-
1349,912968.1533,608703.8888,1097.386800,.G-
1350,912971.8239,608707.6893,1097.471400,.G-
1351,912974.5415,608713.25380100,1097.616700,.G-
1352,912975.4011,608719.05630100,1097.702900,.G
1353,912976.1259,608722.5547,1097.700900,.G
1354,912962.3748,608701.4575,1097.603500,.TCB-
1355,912967.7053,608704.2526,1097.420400,.TCB-
1356,912971.3480,608707.8692,1097.514600,.TCB-
1357,912974.0267,608713.3295,1097.912500,.TCB-
1358,912974.9130,608719.0530,1098.015500,.TCB
1359,912993.0072,608713.1885,1098.414000,.TCB1.TCB2
1360,912992.4419,608713.2162,1097.952100,.G1.G2
1361,912996.1785,608709.54540100,1097.940600,.G2-
1362,912996.1404,608710.0965,1098.434200,.TCB2-
1363,912996.56150200,608711.8441,1098.405400,ICV
1364,912996.8508,608713.5344,1098.180600,SSP STOP
1365,912999.9015,608713.1856,1097.882800,.G2
1366,912999.3277,608713.30130100,1098.372600,.TCB2
1367,912999.7208,608730.2400,1098.420600,.TCB2
1368,913000.30300200,608730.2800,1097.923500,.G2

1369,912993.4539,608730.8903,1098.476000,.TCB1
1370,912992.7646,608730.9031,1097.999800,.G1
1371,912983.5738,608731.2449,1097.974400,P
1372,912976.6060,608731.72680100,1097.685500,.G
1373,912974.95240200,608731.6721,1097.977200,.TCB
1374,912971.1156,608732.3699,1098.087300,.SW
1375,912998.1353,608750.6756,1097.871400,SSP ADOPTASTREET
1376,912971.0087,608771.04780100,1098.060700,TVPD
1377,912972.1724,608780.3572,1098.068300,.SW
1378,912976.1056,608780.6879,1097.960200,.TCB
1379,912984.8162,608781.3805,1097.911900,P
1380,912993.95610200,608781.67020100,1098.109300,.G1
1381,912994.5804,608781.70090100,1098.563500,.TCB1
1382,913001.0272,608781.8110,1098.465900,.TCB2
1383,913001.6163,608781.6304,1097.968200,.G2
1384,913002.5459,608829.4671,1097.979600,.G2
1385,913001.8678,608829.5899,1098.545800,.TCB2
1386,912995.5866,608830.0292,1098.689400,.TCB1
1387,912994.9550,608830.0917,1098.175500,.G1
1388,912985.4752,608830.4950,1097.996200,P
1389,912978.83830200,608831.1096,1097.728400,.G
1390,912977.1470,608831.1555,1098.026200,.TCB
1391,912973.3421,608831.4274,1098.155500,.SW
1392,912974.3535,608881.2812,1098.173600,.SW
1393,912978.3436,608881.9290,1098.074000,.TCB
1394,912979.8373,608882.0973,1097.842400,.G
1395,912987.9140,608882.2441,1098.138400,P
1396,912996.10940200,608881.99880100,1098.267400,.G1
1397,912996.7487,608881.8927,1098.724600,.TCB1
1398,913003.1084,608881.6499,1098.671900,.TCB2
1399,913003.7447,608881.60790100,1098.086200,.G2
1400,913004.7239,608929.8980,1098.177100,.G2
1401,913004.0949,608929.9531,1098.734200,.TCB2
1402,912997.7749,608930.1928,1098.737200,.TCB1
1403,912997.1827,608930.1182,1098.346100,.G1
1404,912987.5583,608930.6160,1098.161700,P
1405,912981.0144,608930.9665,1097.918400,.G
1406,912979.4588,608930.9353,1098.144500,.TCB
1407,912975.5744,608931.2463,1098.221000,.SW
1408,912976.6529,608977.9751,1098.392400,.SW!
1409,912980.45370200,608974.1147,1098.261300,.TCB!
1410,912981.9959,608974.0601,1097.989800,.G!
1411,912989.24530200,608981.2742,1098.309000,P
1412,912998.3340,608980.45110100,1098.411600,.G1!
1413,912998.85200200,608980.2637,1098.894700,.TCB1!
1414,913005.2535,608979.8434,1098.849500,.TCB2
1415,913005.8526,608979.9470,1098.283800,.G2!
1416,913038.0135,608978.7809,1099.046800,P
1417,913036.9451,608928.9972,1098.906500,P
1418,913035.8216,608879.1422,1098.766300,P
1419,913033.9862,608829.3054,1098.694400,P
1420,913055.1335,608858.58570100,1098.392600,SSMH
1421,913054.23290200,608810.8578,1098.256200,SSMH
1422,913052.6204,608788.0359,1098.322800,SSMH
1423,913033.5860,608805.78690100,1098.684900,BCF
1424,913032.1757,608779.50230100,1098.610500,P
1425,913031.8145,608729.51120100,1098.515300,P

1426,913030.5616,608679.6291,1098.334200,P
1427,913008.5023,608671.0829,1098.223700,GV
1428,913008.2165,608666.1902,1098.192700,GV
1429,913029.6561,608629.9270,1098.412600,P
1430,913028.3847,608580.1048,1098.284900,P
1431,913049.9865,608627.9579,1097.900300,SSMH
1432,913077.2721,608509.4543,1097.844300,.SW
1433,913077.8101,608534.8816,1097.864000,.SW
1434,913071.9410,608534.9495,1097.838200,.SW1.TCB
1435,913071.7973,608534.4185,1097.83,.G
1436,913064.1477,608538.2531,1097.457100,.G-
1437,913064.6210,608538.5782,1097.753600,.TCB-
1438,913061.5934,608535.3796,1097.147400,VG
1439,913061.9623,608547.5296,1097.091300,.G
1440,913062.5768,608547.4298,1097.583000,.TCB
1441,913063.2837,608579.4455,1097.700400,.TCB
1442,913062.6538,608579.4887,1097.202900,.G
1443,913068.39840200,608578.1244,1097.493800,PP EW LAMP
1444,913072.9244,608580.8236,1097.909000,.SW1
1445,913078.7644,608580.6735,1098.016700,.SW
1446,913097.8781,608580.3864,1098.371200,NG
1447,913084.2406,608588.49880100,1098.285000,.W 3'
1448,913084.7069,608612.3142,1098.143400,.W!
1449,913092.0820,608631.17020100,1098.561500,NG
1450,913079.8132,608630.7638,1098.093700,.SW
1451,913073.9998,608630.6473,1097.986500,.SW1
1452,913064.3750,608630.2919,1097.779200,.TCB
1453,913063.7434,608630.2498,1097.292200,.G
1454,913064.53450200,608665.8421,1097.408900,.G
1455,913065.1766,608665.9347,1097.862400,.TCB
1456,913065.1395,608676.43150100,1097.441400,VG
1457,913067.1178,608672.3856,1097.641400,.G-
1458,913067.4302,608672.0052,1098.021100,.TCB-
1459,913074.9701,608675.8194,1098.148100,.TCB!.SW1!
1460,913074.8458,608676.29040100,1098.149300,.G!
1461,913082.3430,608667.4567,1098.458900,WM
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PANEL DATA SHEET

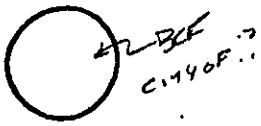
Panel Number: 326

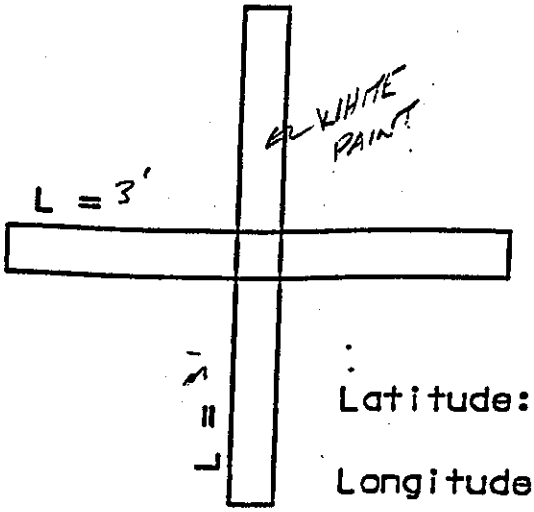
USGS Quad: _____ Year Monumented: ?

Described By: _____ Year Recovered: 07/27/97

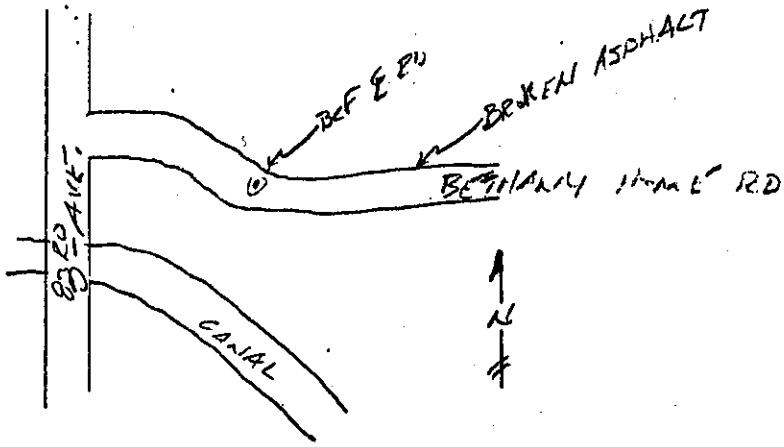
State / County: MARICOPA

Stamped





Location Sketch



Latitude: 33°31'24" N

Longitude: 112°14'10" W

To Reach: _____

Entry Permit Required: Y ___ N X

Monument Description: _____

_____

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

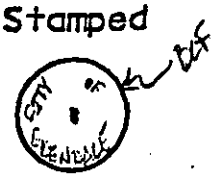
Panel Number: 325

USGS Quad: _____ Year Monumented: _____

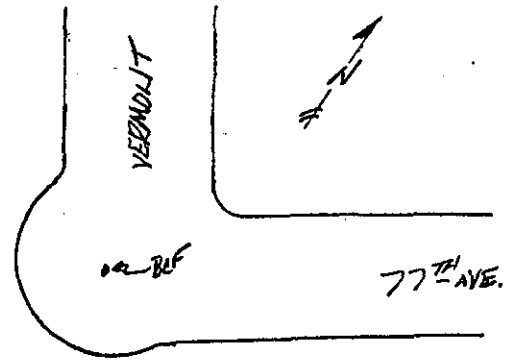
Described By: _____ Year Recovered: 07/28/99

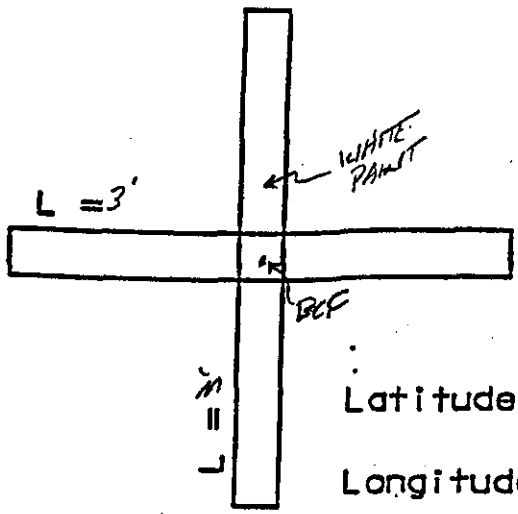
State / County: MARICOPA

Stamped



Location Sketch





Latitude: 33° 30' 52" N

Longitude: 112° 13' 32" W

To Reach: _____

Entry Permit Required: Y ___ N X

Monument Description: CITY OF GLENDALE BRASS CAP - FLUSH @ INTER. OF 77TH AVE & VERMONT

_____
Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

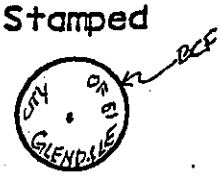
Panel Number: 322

USGS Quad: _____ Year Monumented: _____

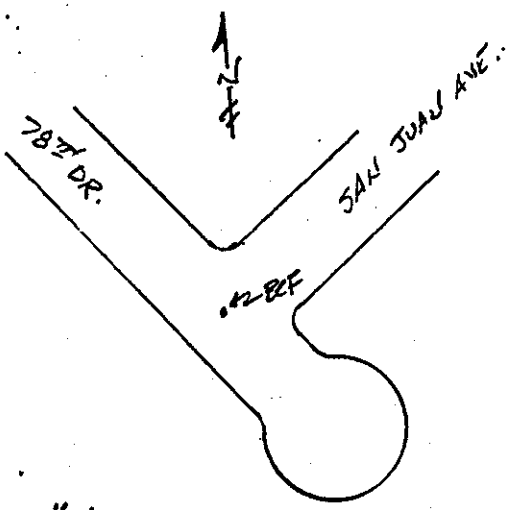
Described By: _____ Year Recovered: 07/28/97

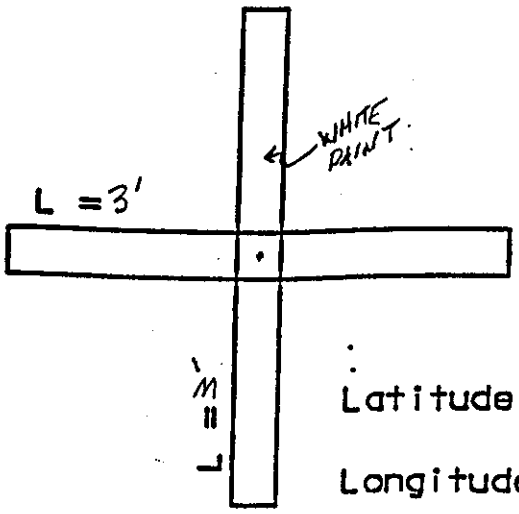
State / County: MARICOPA

Stamped



Location Sketch





Latitude: 33°31' 01" N

Longitude: 112° 13' 40" W

To Reach: _____

Entry Permit Required: Y ___ N X

Monument Description: CITY OF GLENDALE BRASS CAP - FLUSH @ INTER. OF 78TH DR. & SAN JUAN AVE.

_____

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

Panel Number: 323

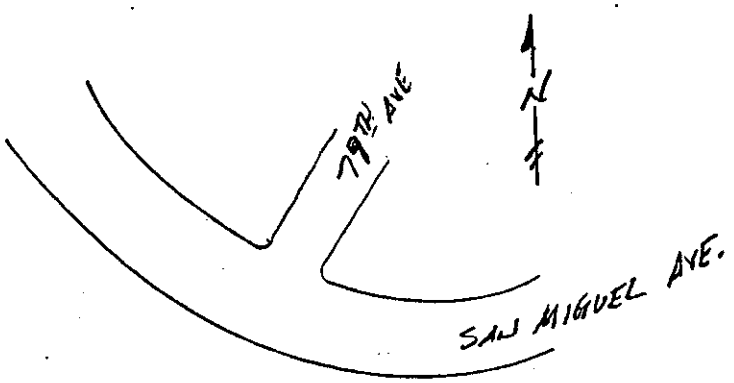
USGS Quad: _____ Year Monumented: _____

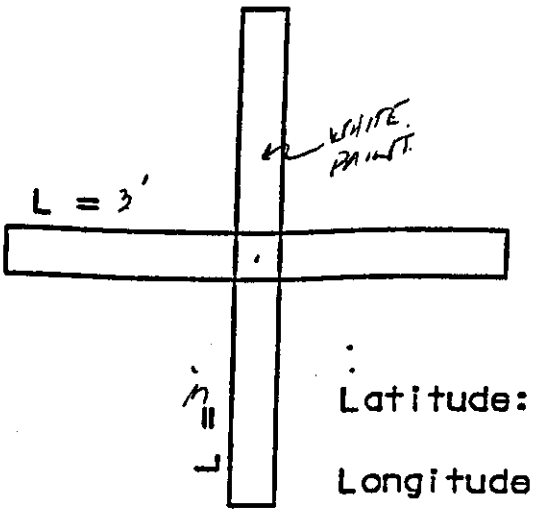
Described By: _____ Year Recovered: 07/28/79

State / County: MARICOPA

Stamped

Location Sketch





Latitude: 33°31'09" N

Longitude: 112°13'48" W

To Reach: _____

Entry Permit Required: Y ___ N X

Monument Description: CITY OF GLENDALE BRASS CAP-FLUSH @ INTER. OF 79TH AVE & SAN MIGUEL AVE.

_____

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

Panel Number: 325.

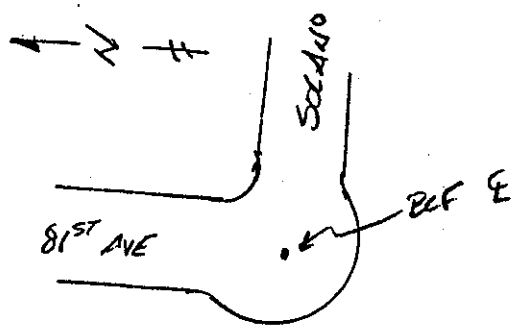
USGS Quad: _____ Year Monumented: ?

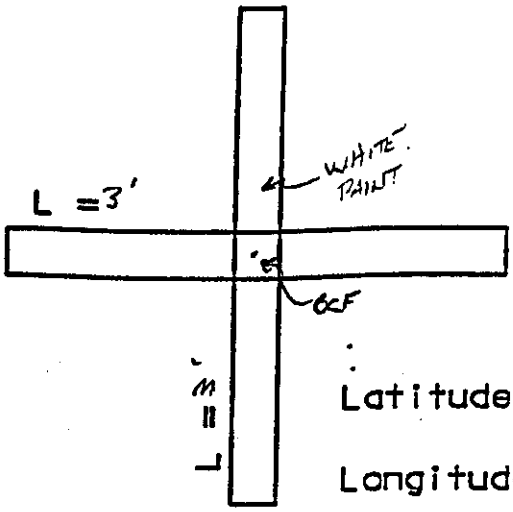
Described By: CAH Year Recovered: 07/28/99

State / County: MARICOPA

Stamped

Location Sketch





Latitude: 33°31'18"N

Longitude: 112°13'58"W

To Reach: _____

Entry Permit Required: Y ___ N X

Monument Description: CITY OF GLENDALE BRASS CAP FLUSH @ ℄ INTER. OF 81ST AVE & SOLANO DR. NORTH.

_____
Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

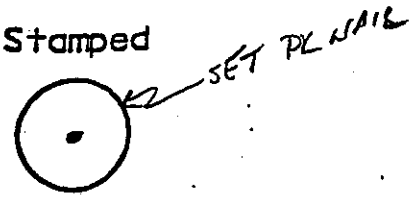
Panel Number: 358

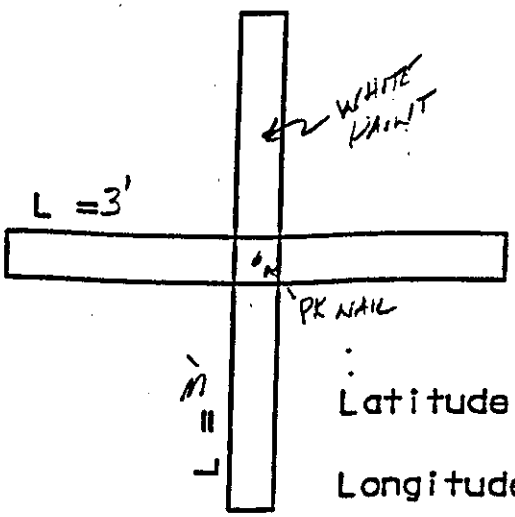
USGS Quad: _____ Year Monumented: _____

Described By: _____ Year Recovered: 07/22/93

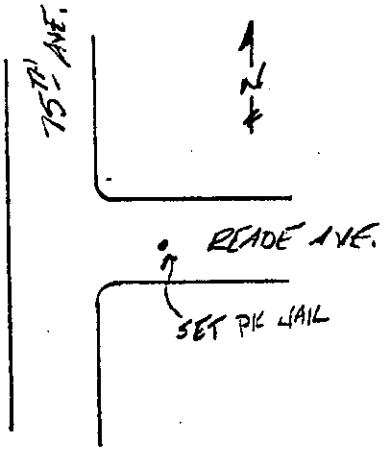
State / County: MARICOPA

Stamped





Location Sketch



Latitude: 32°30'39"N

Longitude: 112°13'13"W

To Reach: _____

Entry Permit Required: Y ___ N X

Monument Description: SET PK NAIL ON ℄ OF READE AVE. ABOUT 100 FT. EAST OF 75TH AVE. ℄

_____

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

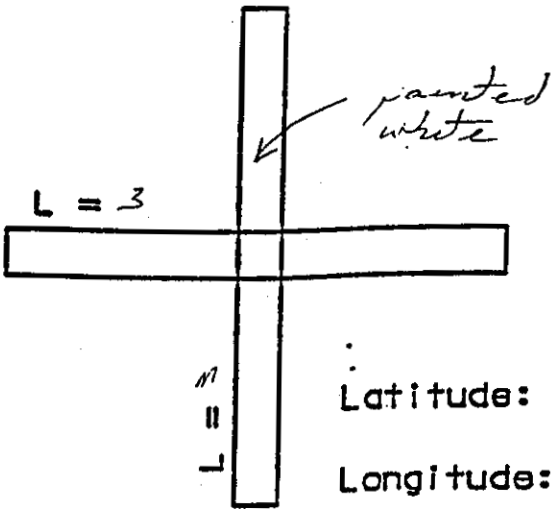
Panel Number: 319

USGS Quad: _____ Year Monumented: _____

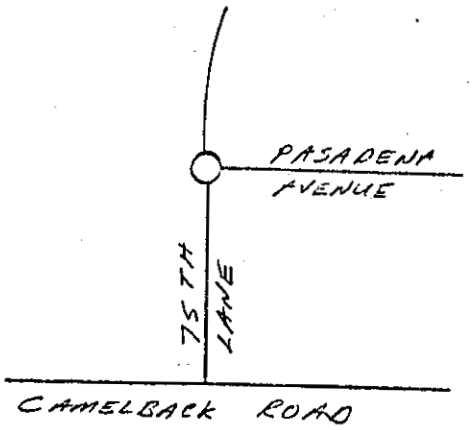
Described By: _____ Year Recovered: 7-29-99

State / County: Arizona Maricopa

Stamped



Location Sketch



Latitude: 33° 30' 35" N

Longitude: 112° 13' 22" W

To Reach: Coming West on Camelback to 75TH Lane turn right (north) on 75TH Lane go to Pasadena Ave.

Entry Permit Required: Y ___ N ✓

Monument Description: Brass Cap Flush, City of Glendale

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

Panel Number: 359

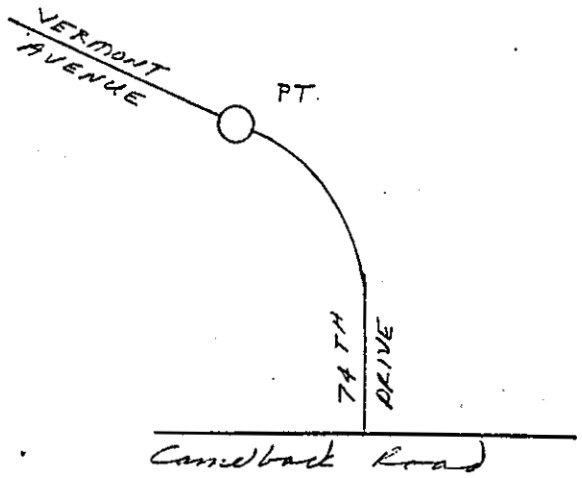
USGS Quad: _____ Year Monumented: _____

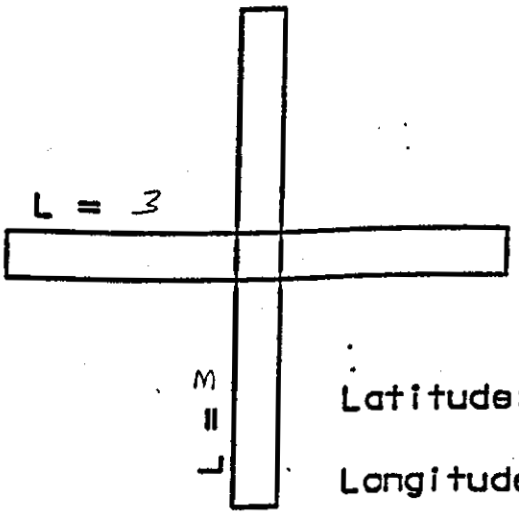
Described By: _____ Year Recovered: 7-29-99

State / County: Arizona Maricopa

Stamped

Location Sketch





Latitude: 33° 30' 51" N

Longitude: 112° 13' 36" W

To Reach: Go west on Camelback turn right (north) onto 74TH Drive, then go north to Vermont Ave to the ℄ PT.

Entry Permit Required: Y ___ N ✓

Monument Description: Brass Cap Flush
Maricopa County Highway Dept.

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

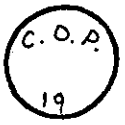
Panel Number: _____

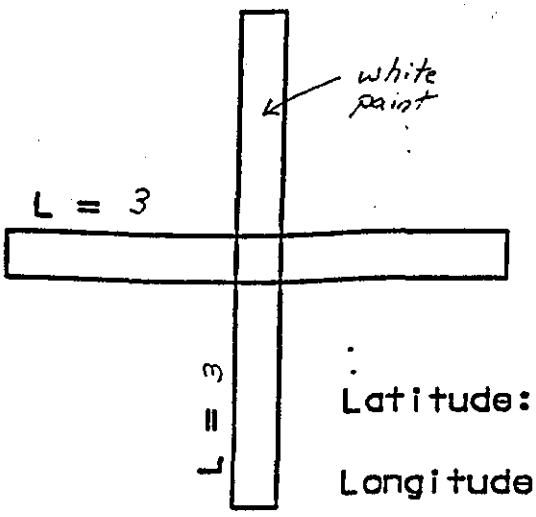
USGS Quad: _____ Year Monumented: _____

Described By: _____ Year Recovered: 7-28-99

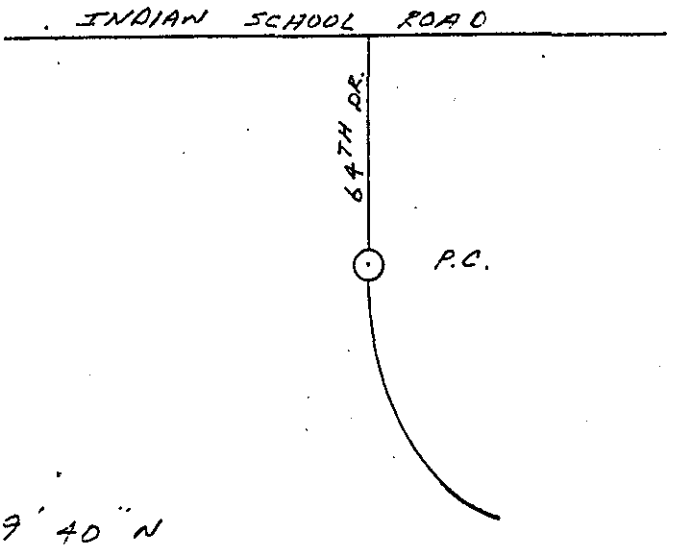
State / County: Maricopa / Arizona

Stamped





Location Sketch



Latitude: 33° 29' 40" N

Longitude: 112° 11' 58" W

To Reach: From Indian School Road, cross cut turn right (south) onto 64 drive and go approximately 100 ± ft.

Entry Permit Required: Y ___ N ✓

Monument Description: Brass Cap Flush
City of Phoenix

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

Panel Number: 344

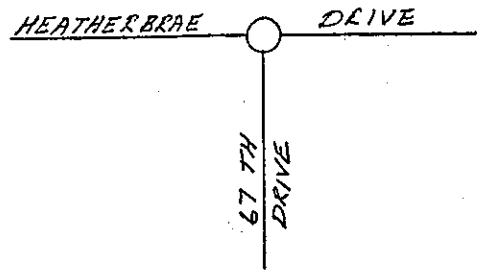
USGS Quad: _____ Year Monumented: _____

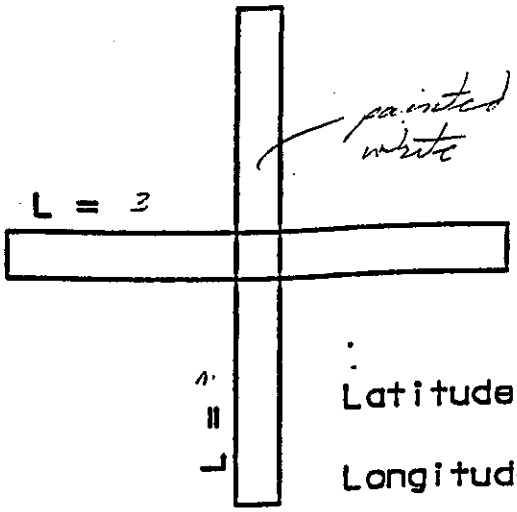
Described By: _____ Year Recovered: _____

State / County: Arizona / Maricopa

Stamped

Location Sketch





Latitude: 33° 29′ 54″ N

Longitude: 112° 12′ 14″ W

To Reach: Going North on 67TH Avenue to Heatherbrae Dr. turn left (west) & go to 67th drive

Entry Permit Required: Y ___ N ✓

Monument Description: Brass Cap Flush, City of Phoenix

Signature _____ Date _____

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

Panel Number: 343

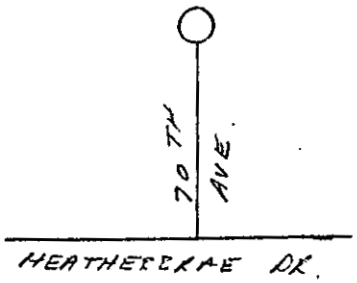
USGS Quad: _____ Year Monumented: _____

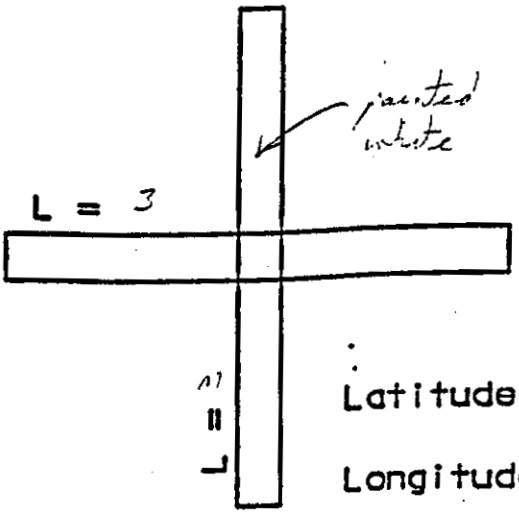
Described By: _____ Year Recovered: 7-29-99

State / County: Arizona Maricopa

Stamped

Location Sketch





Latitude: 33° 30' 02" N

Longitude: 112° 12' 33" W

To Reach: Go North on 67th avenue turn left (west) onto Heatherbrae Dr. turn right (north) onto 70th avenue and go to end of cul de sac.

Entry Permit Required: Y ___ N ✓

Monument Description: brass cap flush, otherwise

Signature _____ Date _____

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

Panel Number: 342

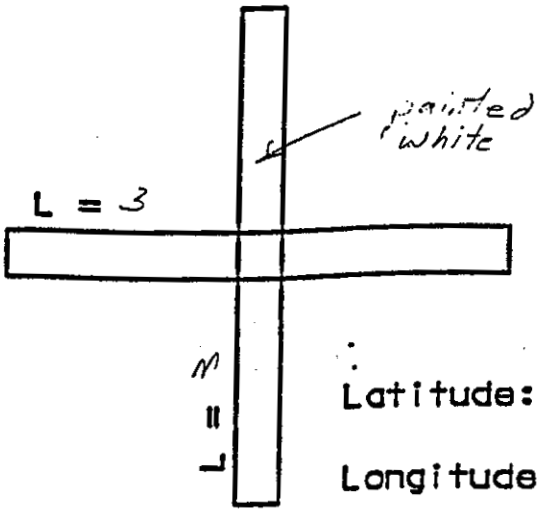
USGS Quad: _____ Year Monumented: _____

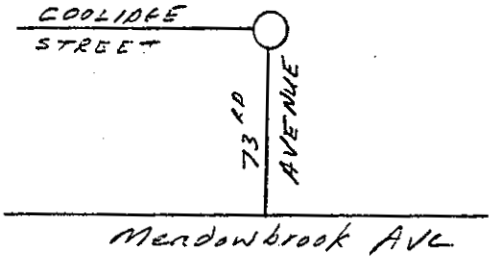
Described By: _____ Year Recovered: 7-29-99

State / County: Arizona Maricopa

Stamped

Location Sketch





Latitude: 33° 30' 14" N

Longitude: 112° 12' 55" W

To Reach: Coming south on 75th avenue, turn left (east) onto Meadowbrook Ave., going east turn left (north) onto 73rd avenue, go north to Coolidge Street

Entry Permit Required: Y___ N ✓

Monument Description: Brass cap flush City of Phoenix

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

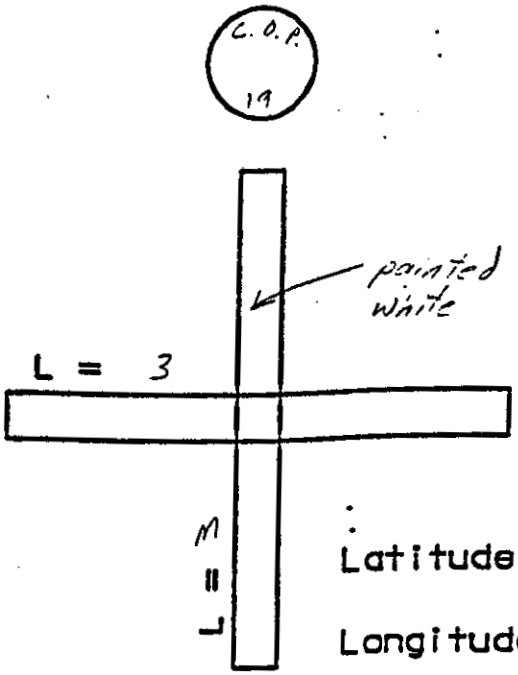
Panel Number: 338

USGS Quad: _____ Year Monumented: _____

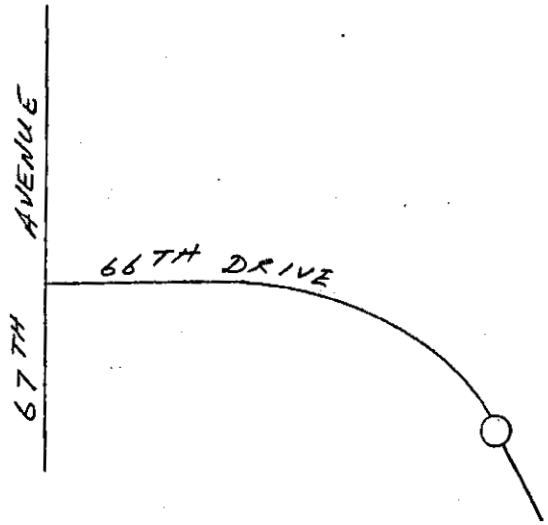
Described By: _____ Year Recovered: 7-29-99

State / County: Arizona Maricopa

Stamped



Location Sketch



Latitude: 33° 29′ 58″

Longitude: 112° 12′ 08″

To Reach: Going North on 67TH avenue, turn left (east) into 66TH Drive and go to the E P.C. monument

Entry Permit Required: Y____ N____

Monument Description: Brass Cap Flush, City of Phoenix

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

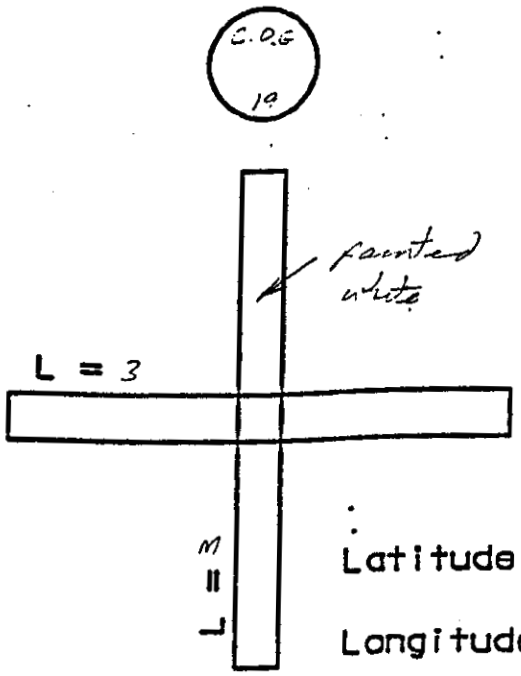
Panel Number: 317

USGS Quad: _____ Year Monumented: _____

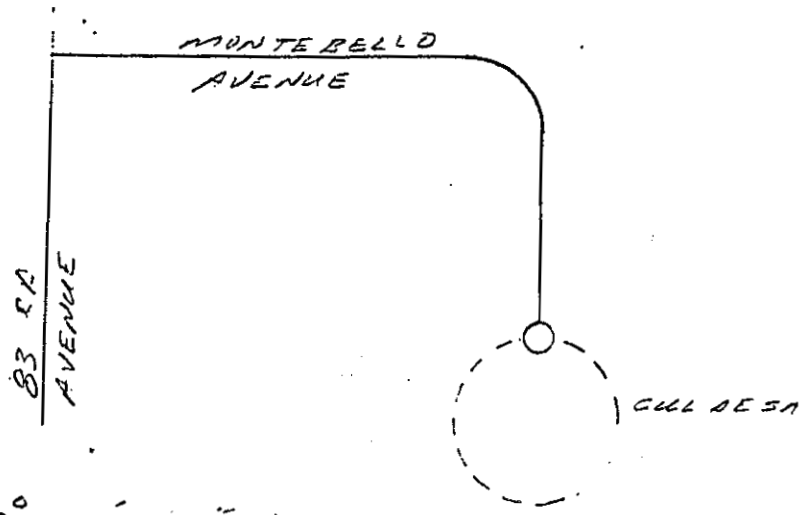
Described By: _____ Year Recovered: 7-29-99

State / County: Arizona Maricopa

Stamped



Location Sketch



Latitude: 33° 31' 09" N

Longitude: 112° 13' 56" W

To Reach: Go North on 83rd Avenue, turn right (east) on Montebello Avenue, 1st pole east, then south to cul de sac.

Entry Permit Required: Y ___ N ✓

Monument Description: Brass cap flush, Cutler-Hammer

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

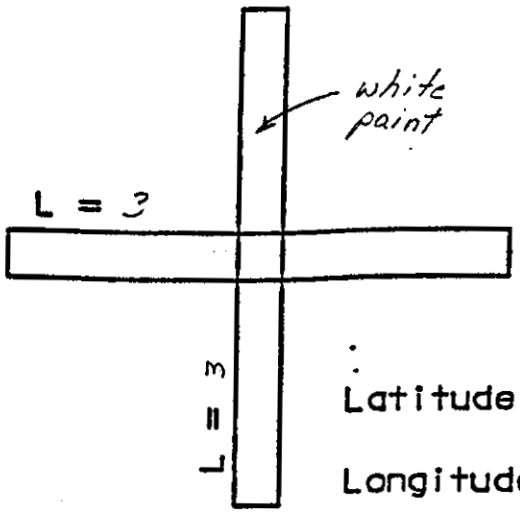
Panel Number: 347

USGS Quad: _____ Year Monumented: _____

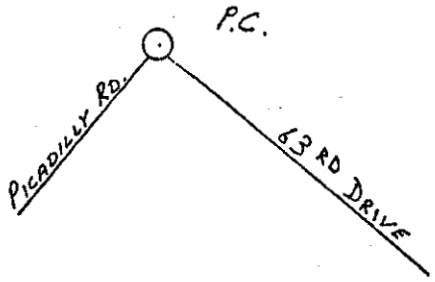
Described By: _____ Year Recovered: 7-28-99

State / County: Arizona / Maricopa

Stamped



Location Sketch



Latitude: 33° 29' 35" N

Longitude: 112° 11' 53" W

To Reach: From Sadian School Road going east, turn north (south) onto 64th drive, go to the 3rd road to the left (westerly) on Picadilly Road until you reach 63 RD Drive.

Entry Permit Required: Y ___ N ✓

Monument Description: Brass Cap Flush
City of Phoenix

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

Panel Number: _____

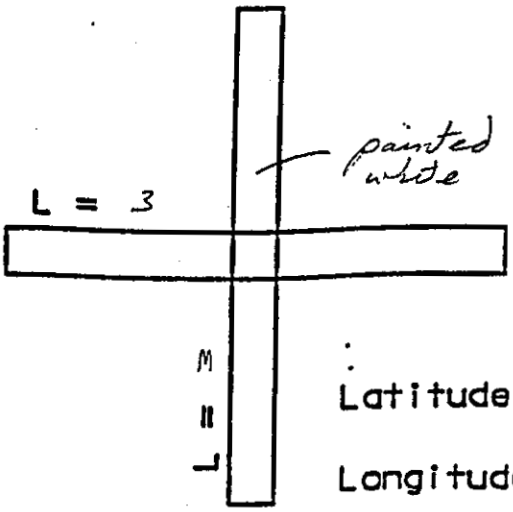
USGS Quad: _____ Year Monumented: _____

Described By: _____ Year Recovered: 7-28-99

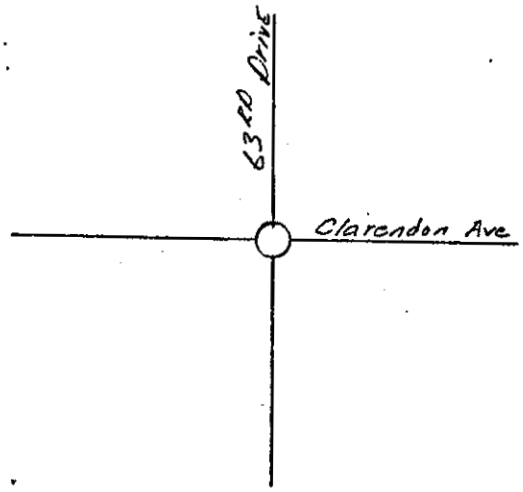
State / County: Arizona Maricopa

Stamped

C.O.P.



Location Sketch



Latitude: 33° 29' 27" N

Longitude: 112° 11' 45" W

To Reach: From Cactus School Road mile east turn north (north) into 64TH Drive to Clarendon Avenue, turn left (east) onto Clarendon and go to 63RD Drive

Entry Permit Required: Y___ N ✓

Monument Description: Brass Cap Flush
City of Phoenix

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

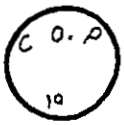
Panel Number: 335

USGS Quad: _____ Year Monumented: _____

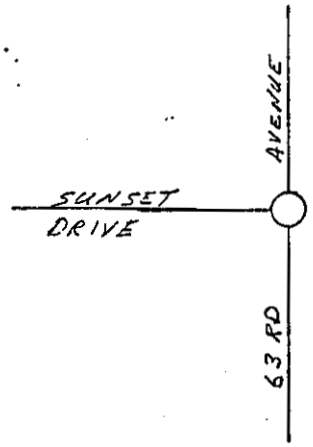
Described By: _____ Year Recovered: 7-29-99

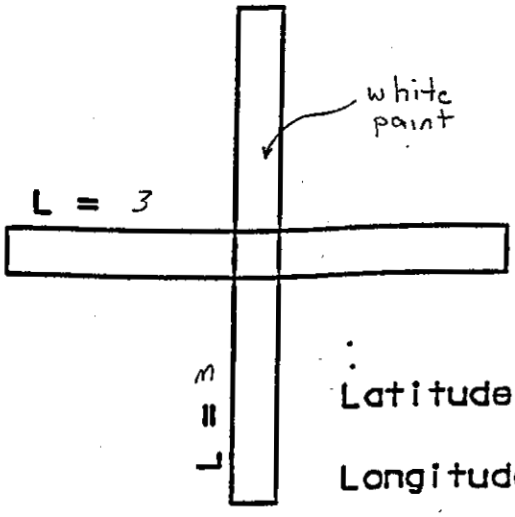
State / County: Arizona / Maricopa

Stamped



Location Sketch





Latitude: 33° 29' 34" N

Longitude: 112° 11' 42" W

To Reach: From Indian School Road going East Turn right (south) onto 63rd Avenue and on to Sunset Drive

Entry Permit Required: Y ___ N ✓

Monument Description: Cap of Phoenix [illegible]

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

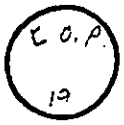
Panel Number: 337

USGS Quad: _____ Year Monumented: _____

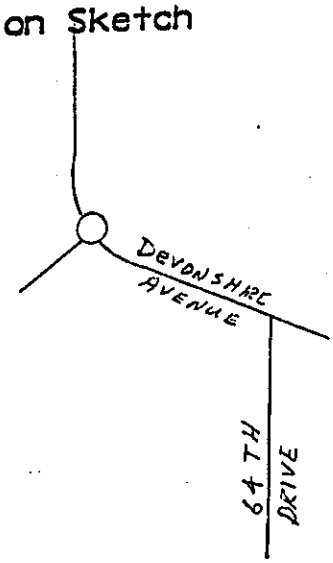
Described By: _____ Year Recovered: 7-29-99

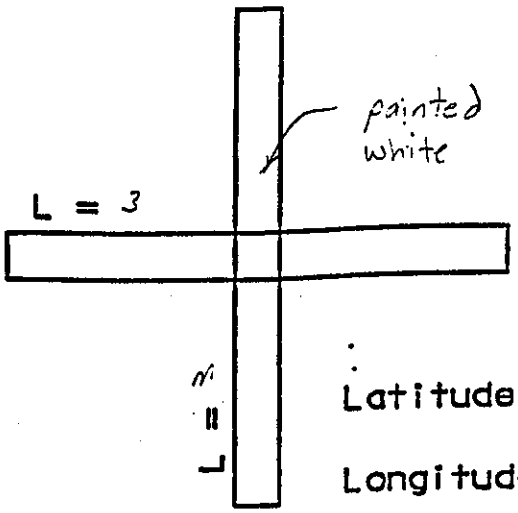
State / County: Arizona / Maricopa

Stamped



Location Sketch





Latitude: 33° 29' 42" N

Longitude: 112° 12' 02" W

To Reach: From Indian School Road, drive westerly to 64TH Drive. Turn left (north) onto 64TH and go to Devonshire Ave. turn left (westerly) and go to the first point on curve.

Entry Permit Required: Y ___ N ✓

Monument Description: City of Phoenix, Brass Cap Flush

_____

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

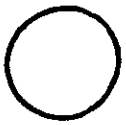
Panel Number: 336

USGS Quad: _____ Year Monumented: _____

Described By: _____ Year Recovered: 7-29-99

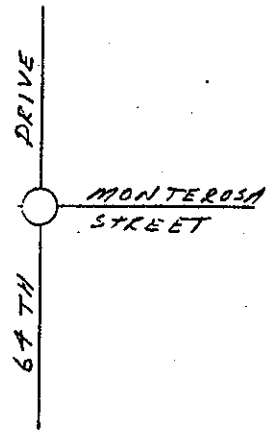
State / County: Arizona Maricopa

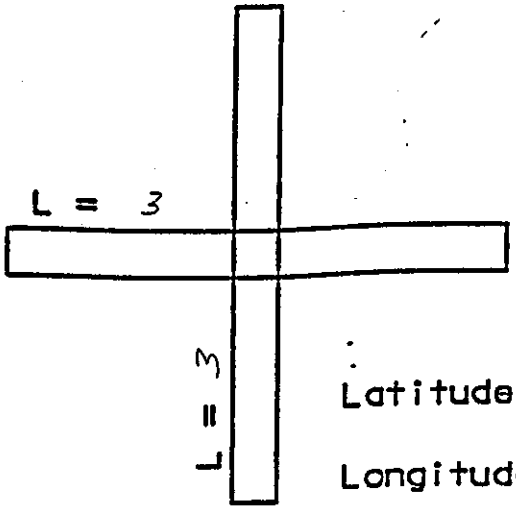
Stamped



PK NAIL

Location Sketch





Latitude: 33° 29' 48" N

Longitude: 112° 11' 52" W

To Reach: Going Easterly on Indian School Road, Turn left on 64th drive (north) and go to Montecosa Street

Entry Permit Required: Y ___ N ✓

Monument Description: PK NAIL

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

Panel Number: 341

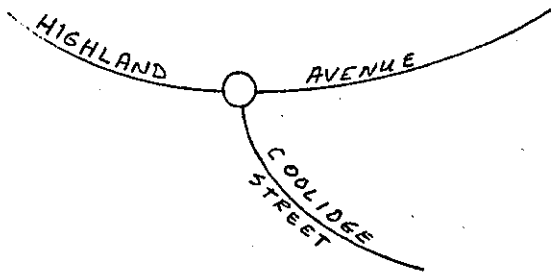
USGS Quad: _____ Year Monumented: _____

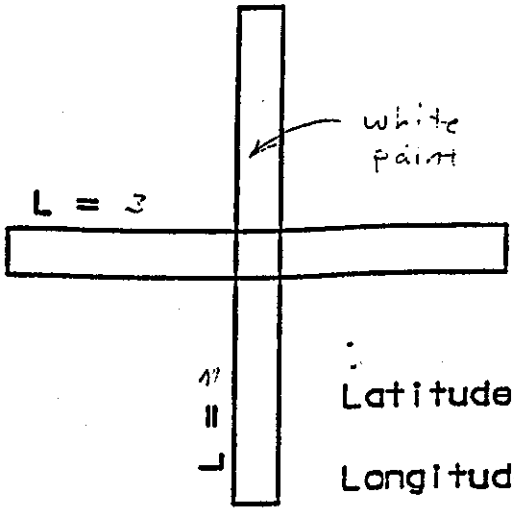
Described By: _____ Year Recovered: 7-29-99

State / County: Arizona Maricopa

Stamped

Location Sketch





Latitude: 33° 30' 20" N

Longitude: 112° 12' 53" W

To Reach: Going East on Camelback Road Turn Right (South) onto 72nd Avenue, and go Highland Ave & Coolidge St.

Entry Permit Required: Y ___ N ✓

Monument Description: Brass Cap Flush. City of Phoenix

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

Panel Number: 339

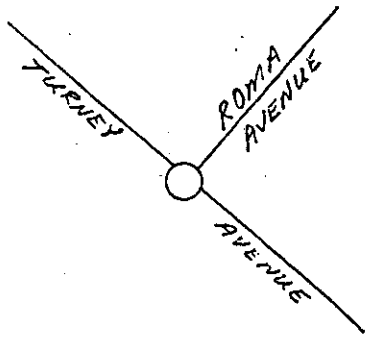
USGS Quad: _____ Year Monumented: _____

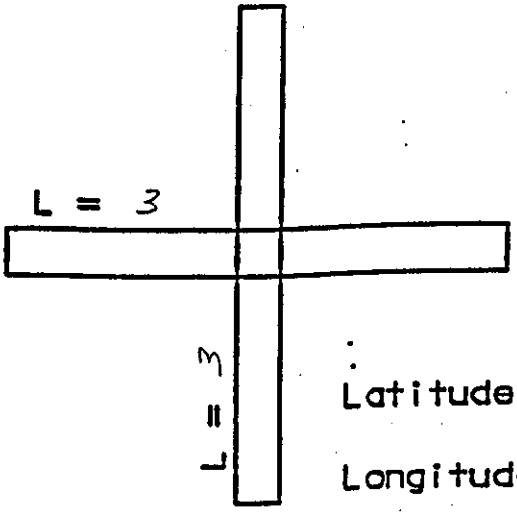
Described By: _____ Year Recovered: 7-29-99

State / County: Arizona Maricopa

Stamped

Location Sketch





Latitude: 33° 30' 04" N

Longitude: 112° 12' 32" W

To Reach: Going North on 67th avenue to Turney Ave, turn left (westerly) and go to Roma Ave.

Entry Permit Required: Y ___ N ✓

Monument Description: Brass cap flush City of Phoenix

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

Panel Number: 340

USGS Quad: _____ Year Monumented: _____

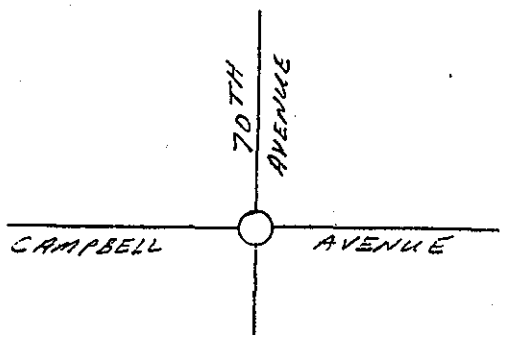
Described By: _____ Year Recovered: 7-29-99

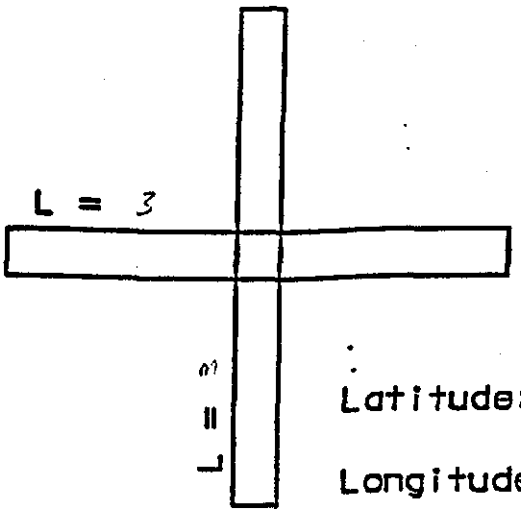
State / County: Arizona Maricopa

Stamped

C.O.P.
19

Location Sketch





Latitude: 33° 30' 09" N

Longitude: 112° 12' 34" W

To Reach: Going North on 67th avenue to Campbell ave. Turn left (west) and go to 70th avenue

Entry Permit Required: Y ___ N ✓

Monument Description: Brass Cap Flush, City of Phoenix

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

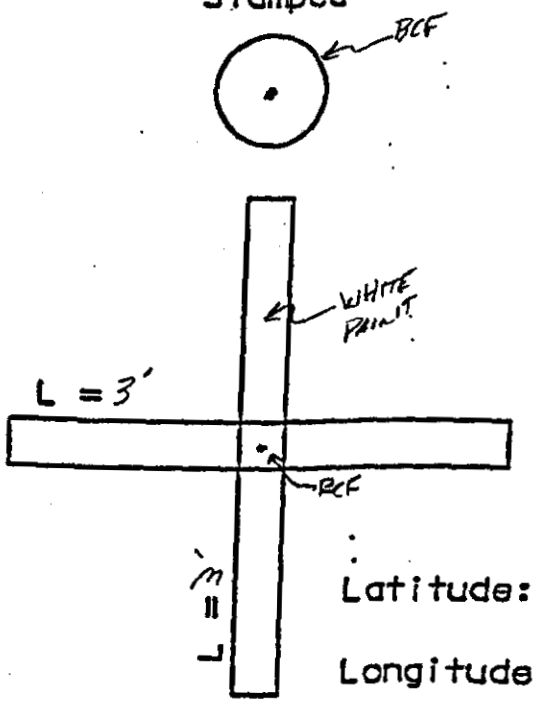
Panel Number: 327

USGS Quad: _____ Year Monumented: _____

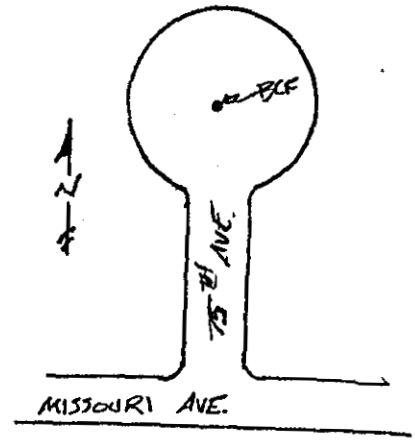
Described By: _____ Year Recovered: 07/30/97

State / County: MARICOPA

Stamped



Location Sketch



Latitude: 33°31'02"N

Longitude: 112°13'17"W

To Reach: _____

Entry Permit Required: Y ___ N X

Monument Description: BRASS CAP - FLUSH CENTER OF CULDESAC @ 75TH AVE. N. OF MISSOURI

_____

Signature Date

Collins/Piña
Phoenix - Tucson - Nogales

PANEL DATA SHEET

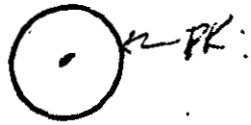
Panel Number: 379

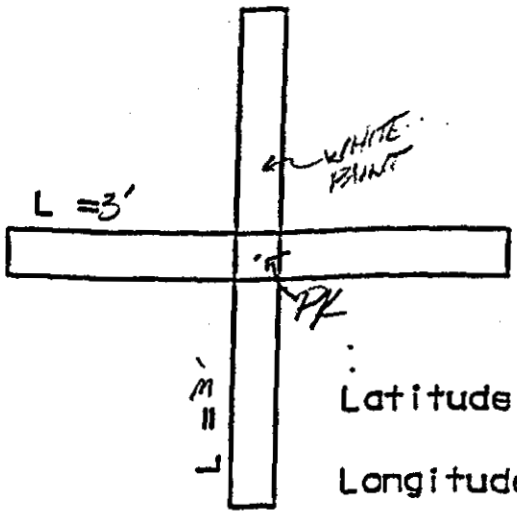
USGS Quad: _____ Year Monumented: _____

Described By: _____ Year Recovered: 07/30/99

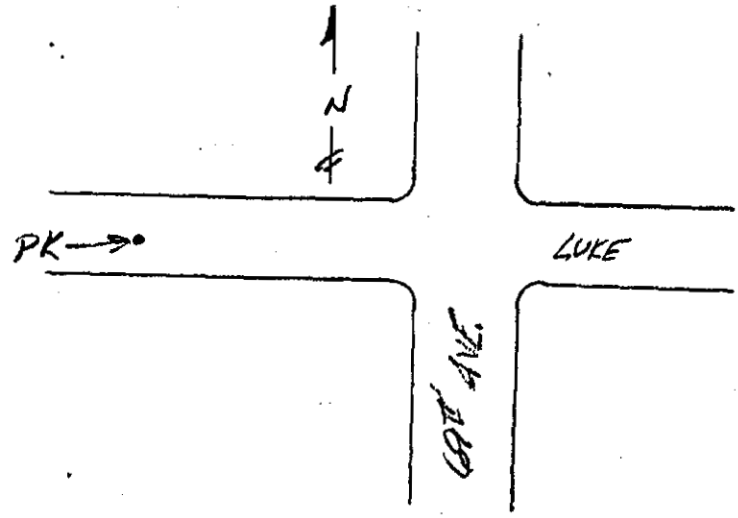
State / County: MARICOPA

Stamped





Location Sketch



Latitude: 33°31'04" N

Longitude: 112°12'31" W

To Reach: _____

Entry Permit Required: Y ___ N X

Monument Description: SET PK NAIL 6" OF LUKE ABOUT 1000' WEST OF 69TH AVE.

_____

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

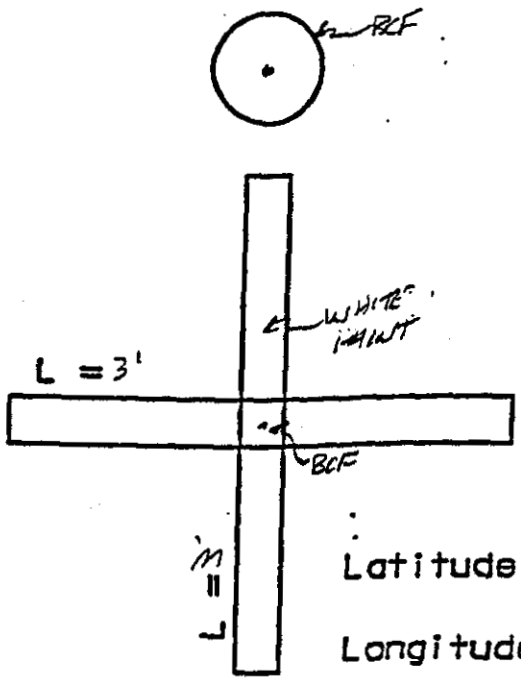
Panel Number: 378

USGS Quad: _____ Year Monumented: _____

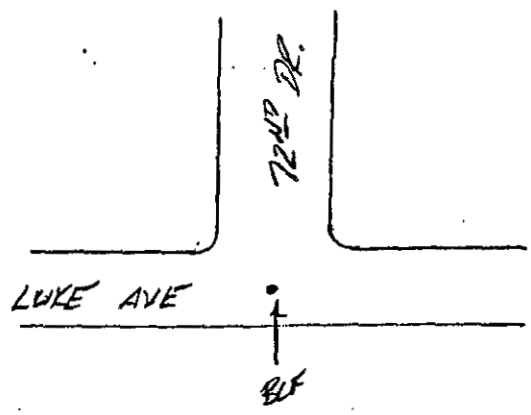
Described By: _____ Year Recovered: 07/30/99

State / County: MARICOPA

Stamped



Location Sketch



Latitude: 33°31'02" N

Longitude: 112°12'55" W

To Reach: _____

Entry Permit Required: Y ___ N X

Monument Description: CITY OF GLENDALE BRASS CAP - FLUSH @ INTER. OF LUKE & 72ND DR.

_____

Signature Date

Collins/Piña
Phoenix -- Tucson -- Nogales

PANEL DATA SHEET

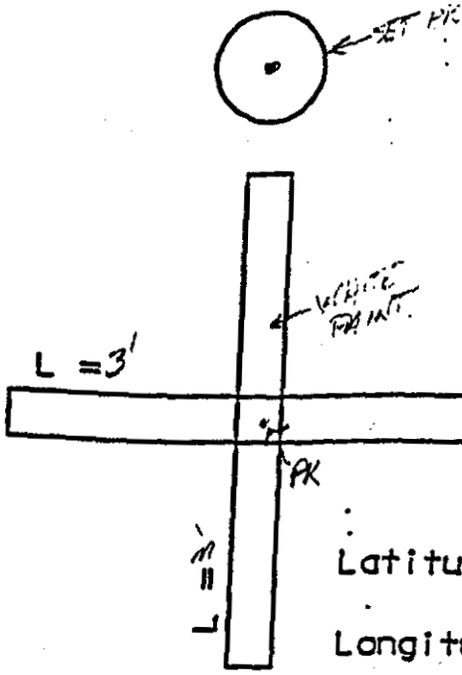
Panel Number: 344

USGS Quad: _____ Year Monumented: _____

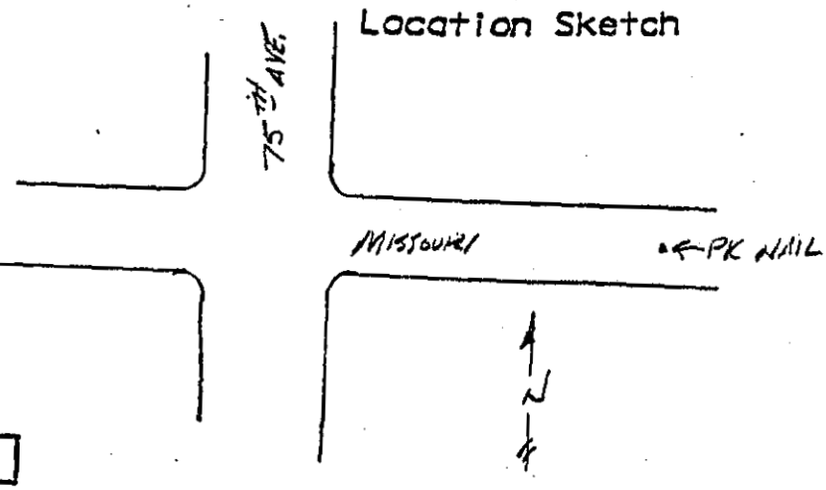
Described By: _____ Year Recovered: 07/30/99

State / County: MARICOPA

Stamped



Location Sketch



Latitude: 33°30'59"N

Longitude: 112°13'09"W

To Reach: _____

Entry Permit Required: Y ___ N X

Monument Description: SET PK NAIL ℄ OF MISSOURI @ ABOUT 1100' EAST OF 75TH AVE. INTER.

_____

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

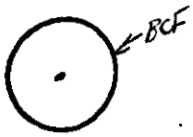
Panel Number: 367

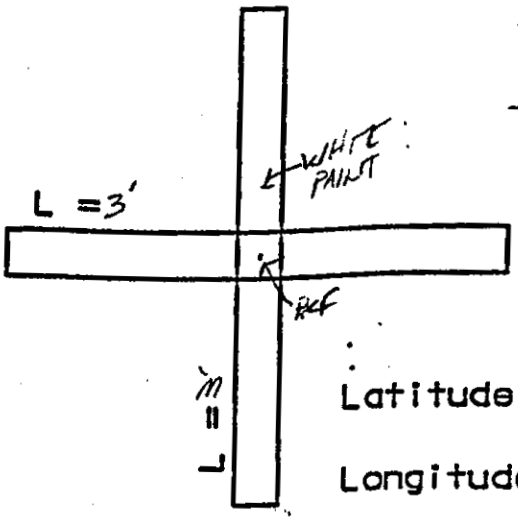
USGS Quad: _____ Year Monumented: _____

Described By: _____ Year Recovered: 07/30/99

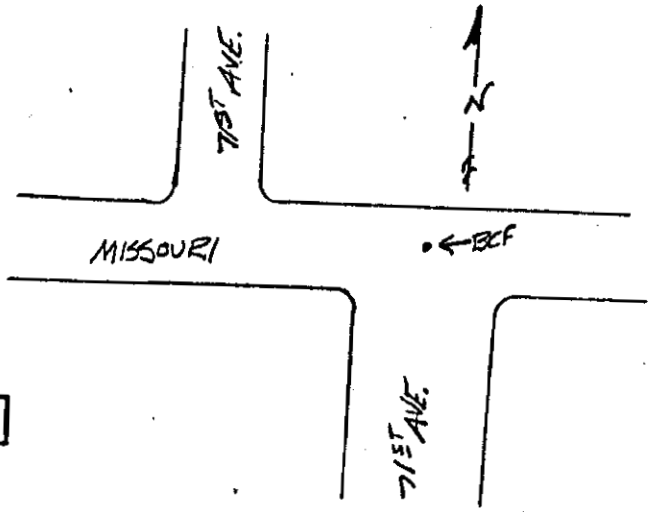
State / County: MARICOPA

Stamped





Location Sketch



Latitude: 33° 30' 58" N

Longitude: 112° 12' 42" W

To Reach: _____

Entry Permit Required: Y ___ N X

Monument Description: CITY OF GLENDALE BRASS CAP- FLUSH @ INTER. OF MISSOURI & 71ST AVE.

_____

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

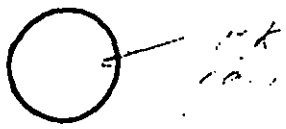
Panel Number: 382

USGS Quad: _____ Year Monumented: _____

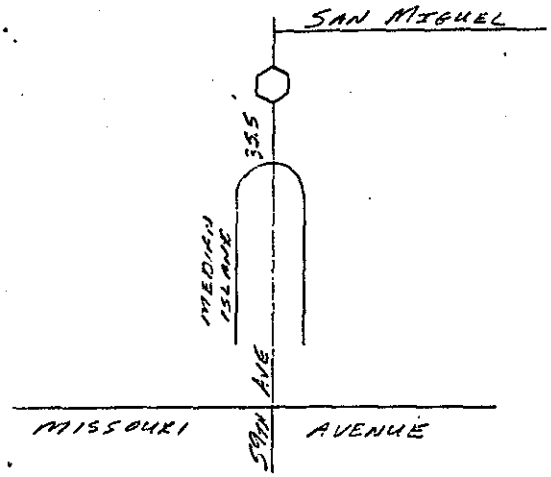
Described By: _____ Year Recovered: 7-30-99

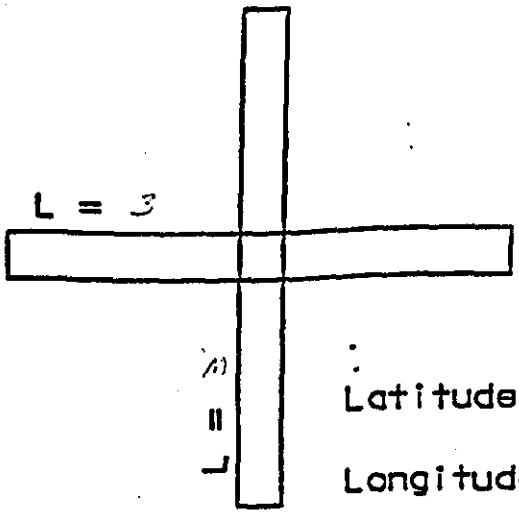
State / County: Arizona Maricopa

Stamped



Location Sketch





Latitude: 33° 31' 04" N

Longitude: 112° 11' 11" W

To Reach: From the intersection of Missouri Avenue & 59TH Avenue go north along 59TH Avenue to the end of the median island.

Entry Permit Required: Y ___ N ✓

Monument Description: PK NAIL

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

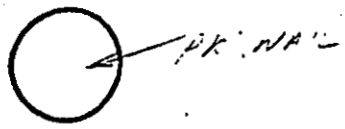
Panel Number: 372

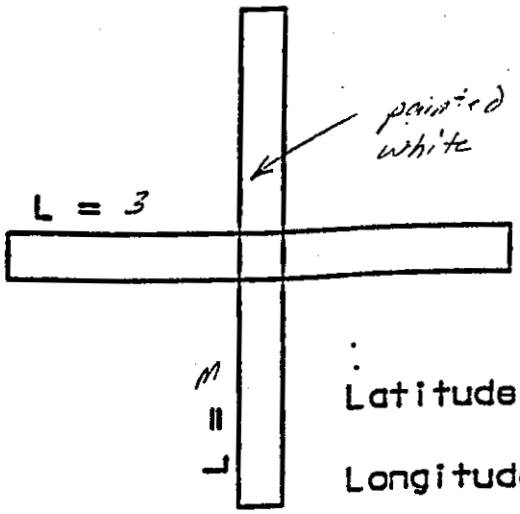
USGS Quad: _____ Year Monumented: _____

Described By: _____ Year Recovered: 7-30-99

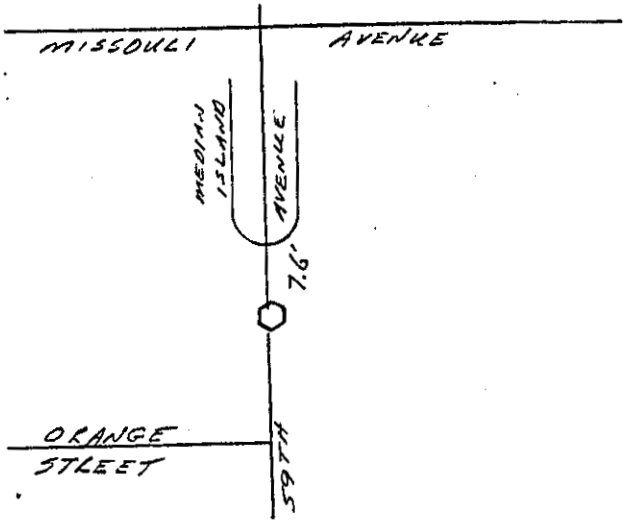
State / County: Arizona Maricopa

Stamped





Location Sketch



Latitude: 33° 30' 54" N

Longitude: 112° 11' 10" W

To Reach: From the intersection of Missouri Avenue & 59TH Avenue, go north on 59TH Avenue to the end of the median island. Along the E of 59TH Avenue & 7.6' north of the median island is the PK nail

Entry Permit Required: Y ___ N ✓

Monument Description: PK NAL

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

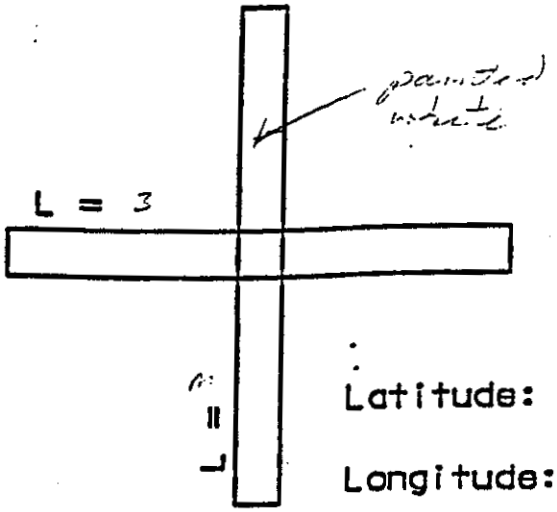
Panel Number: 375

USGS Quad: _____ Year Monumented: _____

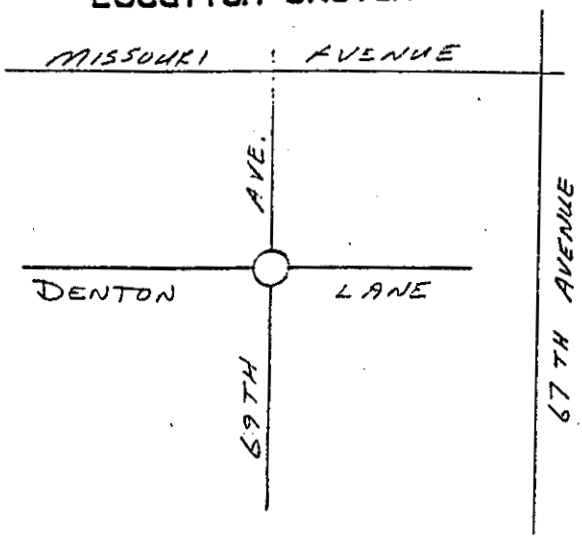
Described By: _____ Year Recovered: 7-30-99

State / County: Arizona Maricopa

Stamped



Location Sketch



Latitude: 33° 30' 56" N

Longitude: 112° 12' 26" W

To Reach: Go north on 67TH avenue turn left (west) into Missouri avenue go west to 69TH avenue turn left (south) on 69TH avenue go south to Denton lane

Entry Permit Required: Y ___ N ✓

Monument Description: Brass Cap Flush City of Glendale

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

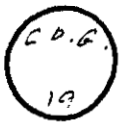
Panel Number: 376

USGS Quad: _____ Year Monumented: _____

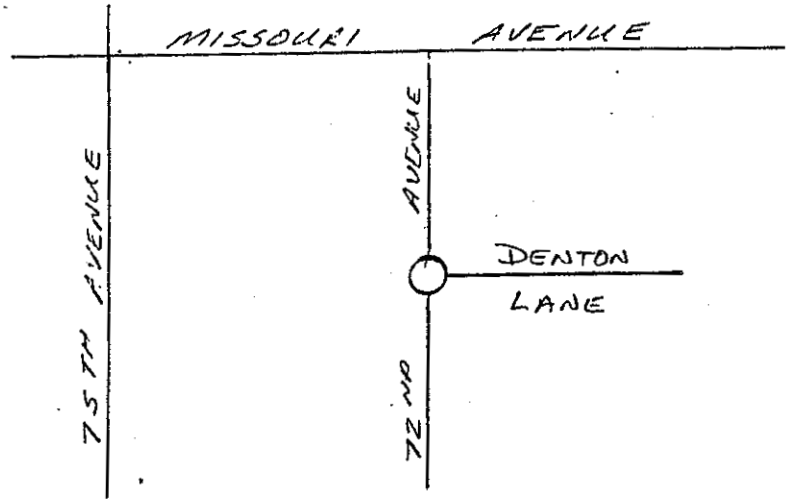
Described By: _____ Year Recovered: 7-30-99

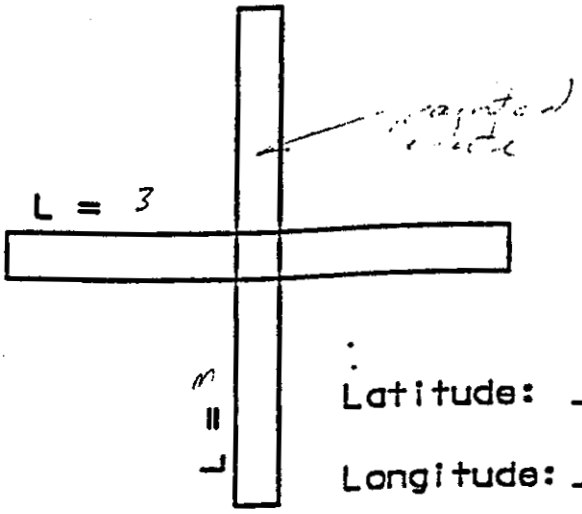
State / County: Arizona Maricopa

Stamped



Location Sketch





Latitude: 33° 30' 57" N

Longitude: 112° 12' 53" W

To Reach: Go north on 75th avenue, turn right (east) with missouri ave go east, turn right (south) onto 72nd ave and go to "Denton" lane

Entry Permit Required: Y ___ N ✓

Monument Description: Brass Cap Flush, City of Glendale

Signature _____ Date _____

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

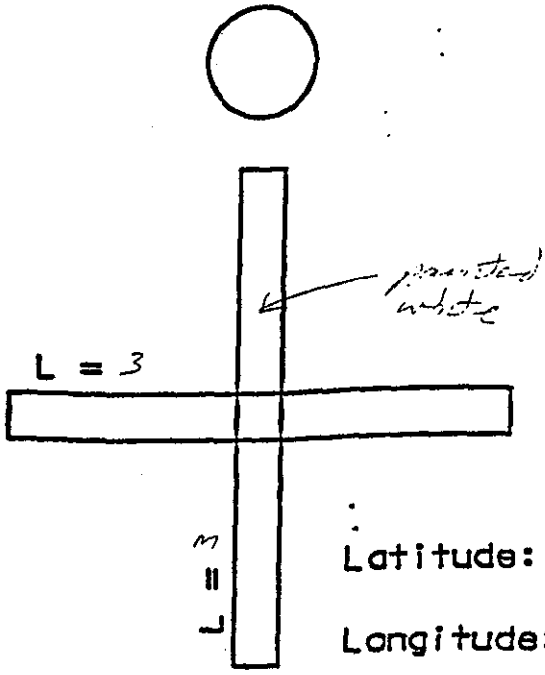
Panel Number: 377

USGS Quad: _____ Year Monumented: _____

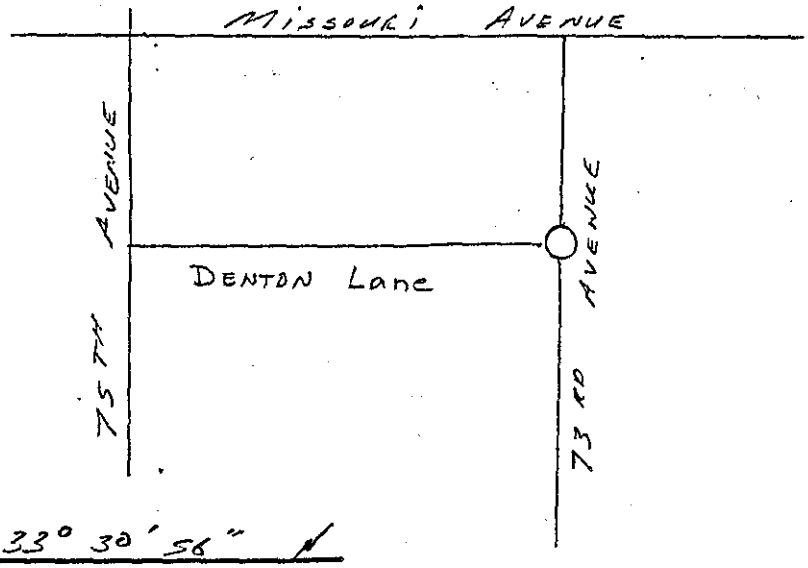
Described By: _____ Year Recovered: 7-30-99

State / County: Arizona Maricopa

Stamped



Location Sketch



Latitude: 33° 30' 56" ✓

Longitude: 112° 12' 58" W

To Reach: Go north on 75TH ave, turn right (east) onto Denton Lane and go to 73rd ave

Entry Permit Required: Y___ N ✓

Monument Description: Brass Cap Flush (no mon)

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

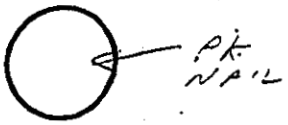
Panel Number: 374

USGS Quad: _____ Year Monumented: _____

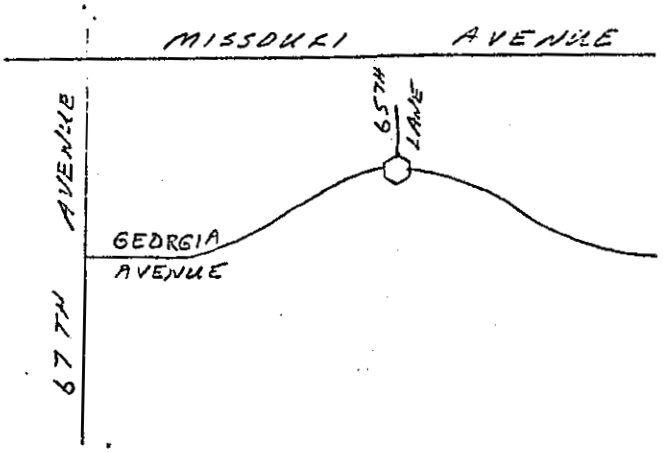
Described By: _____ Year Recovered: 7-30-99

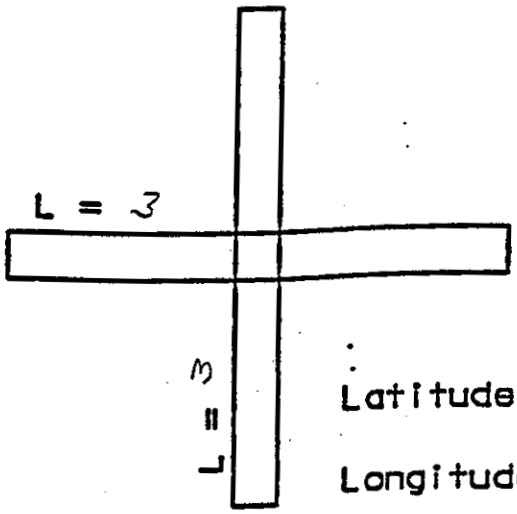
State / County: Arizona Maricopa

Stamped



Location Sketch





Latitude: 33° 30' 57" N

Longitude: 112° 12' 05" W

To Reach: Go north on 67TH avenue, turn left (east) onto Georgia Avenue, go east to 65TH Lane

Entry Permit Required: Y ___ N ✓

Monument Description: Pk nail @ E intersection

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

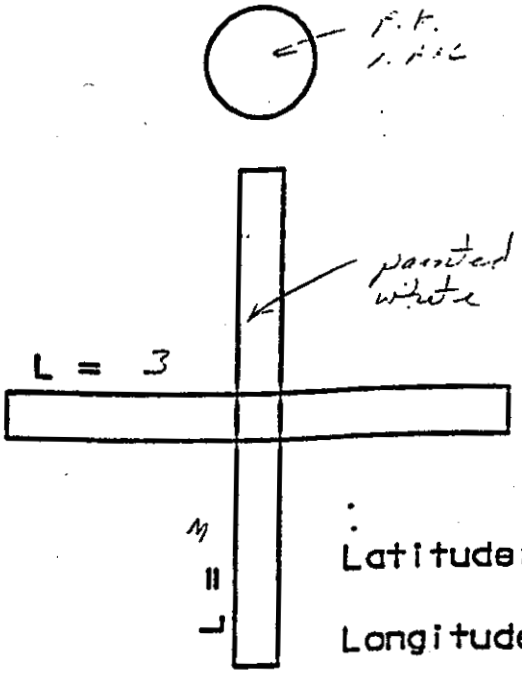
Panel Number: 373

USGS Quad: _____ Year Monumented: _____

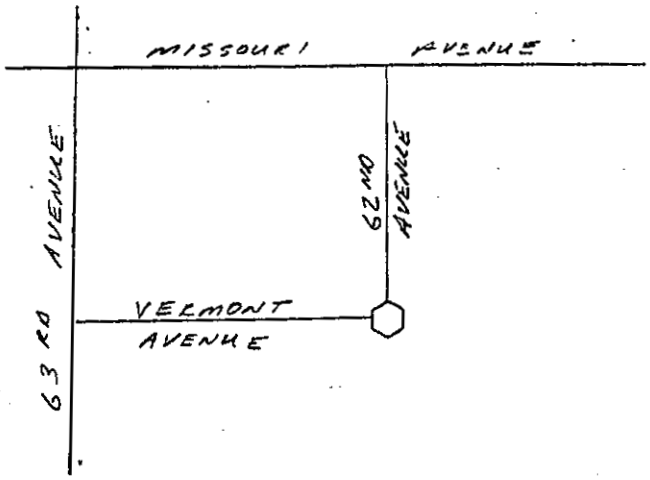
Described By: _____ Year Recovered: 7-30-99

State / County: Arizona Maricopa

Stamped



Location Sketch



Latitude: 33° 30′ 57″ N

Longitude: 112° 11′ 34″ W

To Reach: Go north on 63rd avenue turn right (east) into Vermont avenue and go to 62nd avenue intersection

Entry Permit Required: Y ___ N ✓

Monument Description: PK nail in center of intersection of street centerline

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

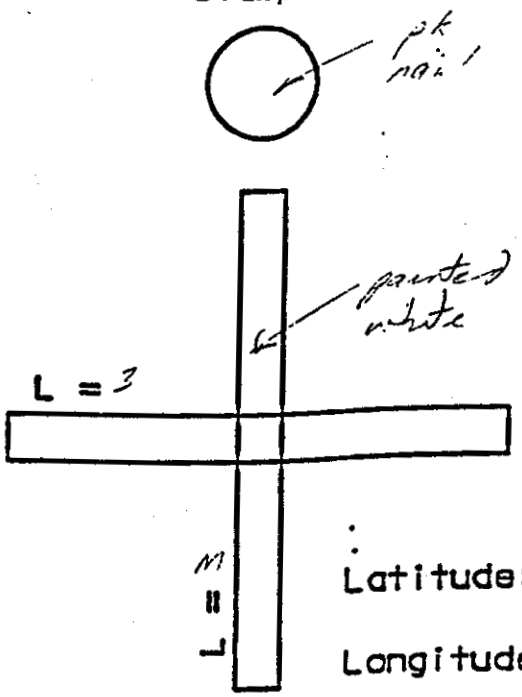
Panel Number: 3860

USGS Quad: _____ Year Monumented: 8-2-99

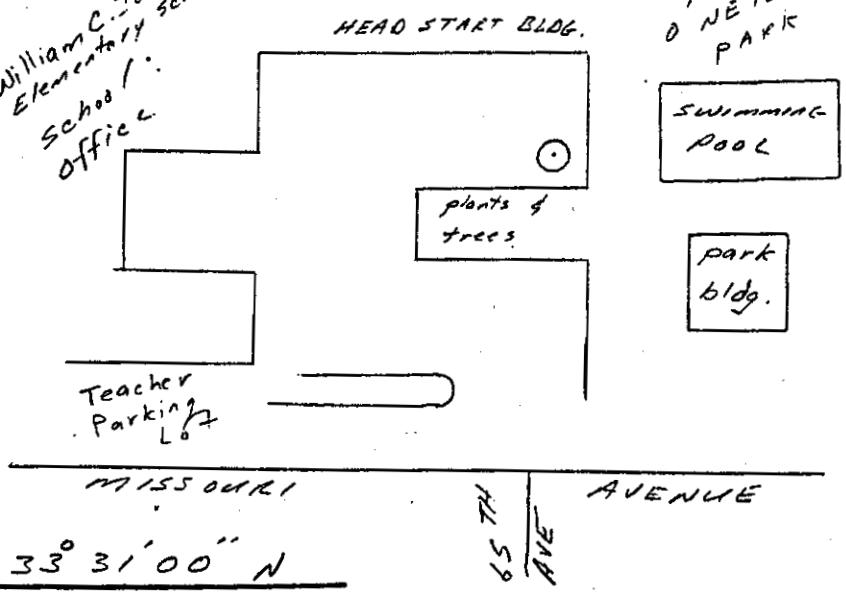
Described By: _____ Year Recovered: _____

State / County: Arizona Maricopa

Stamped



Location Sketch



Latitude: 33° 31' 00" N

Longitude: 112° 11' 57" W

To Reach: Go east from the intersection of 67th Avenue on Missouri Ave, turn left (north) into School Parking lot (west of O'neil park) and go to head start parking lot area

Entry Permit Required: Y ___ N ✓

Monument Description: Pk Nail

Signature Date

Collins/Pina
Phoenix – Tucson – Nogales

PANEL DATA SHEET

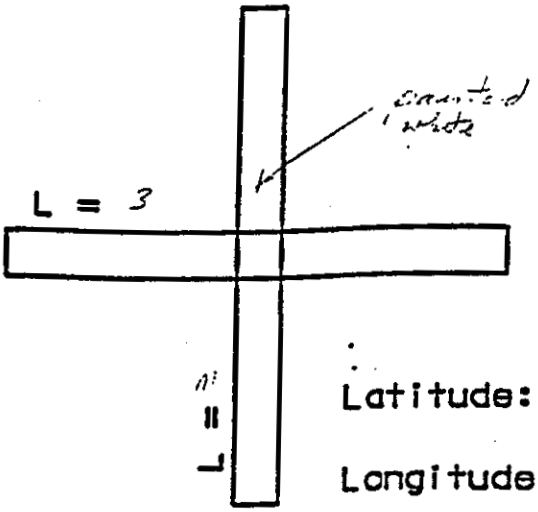
Panel Number: 378

USGS Quad: _____ Year Monumented: _____

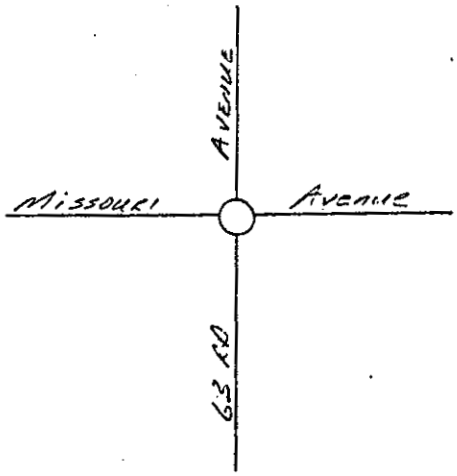
Described By: _____ Year Recovered: 7-30-99

State / County: Arizona Maricopa

Stamped



Location Sketch



Latitude: 33° 31' 00" N

Longitude: 112° 11' 43" W

To Reach: Go north on 63 RD avenue to Missouri Avenue

Entry Permit Required: Y ___ N ✓

Monument Description: Brass Cap Flush, City of Glendale

Signature Date

Collins/Pina
Phoenix – Tucson – Nogales

PANEL DATA SHEET

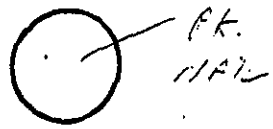
Panel Number: 369

USGS Quad: _____ Year Monumented: _____

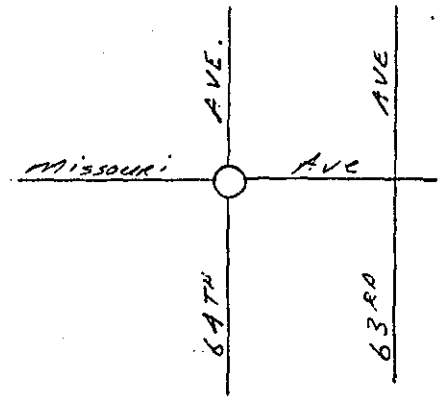
Described By: _____ Year Recovered: 7-30-99

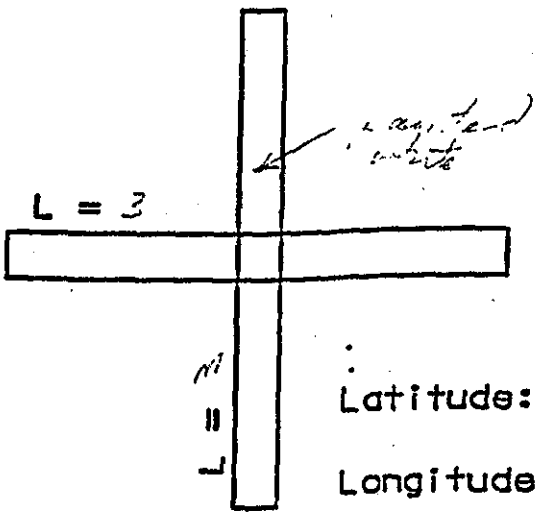
State / County: Arizona Maricopa

Stamped



Location Sketch





Latitude: 33° 31' 02" N

Longitude: 112° 11' 50" W

To Reach: Go north on 63RD ave, turn left (west) onto Missouri Ave, go to 64TH ave

Entry Permit Required: Y ___ N ✓

Monument Description: Brass Cap Flush, City of Glendale

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

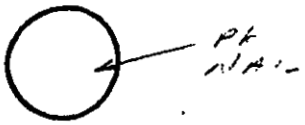
Panel Number: 368

USGS Quad: _____ Year Monumented: _____

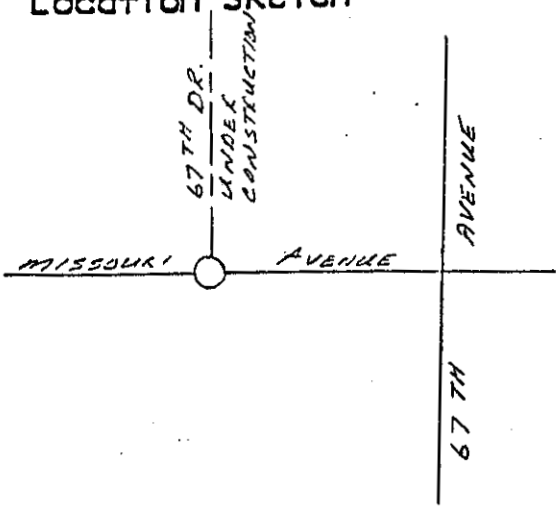
Described By: _____ Year Recovered: 7-30-99

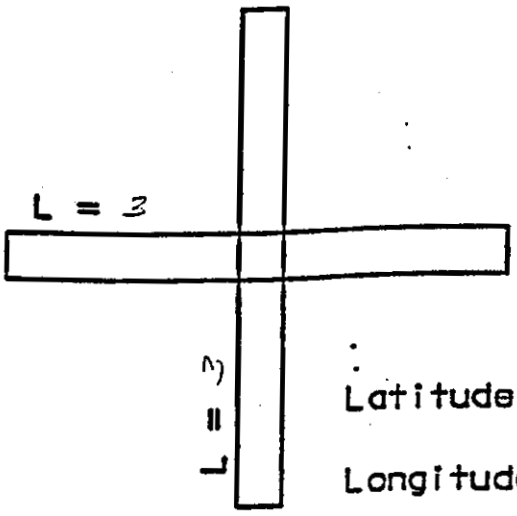
State / County: Arizona Maricopa

Stamped



Location Sketch





Latitude: 33° 30' 59" N

Longitude: 112° 12' 18" W

To Reach: Go north on 67TH avenue turn left (west) into Missouri avenue, go to 67TH Drive

Entry Permit Required: Y ___ N ✓

Monument Description: PK NAIL

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

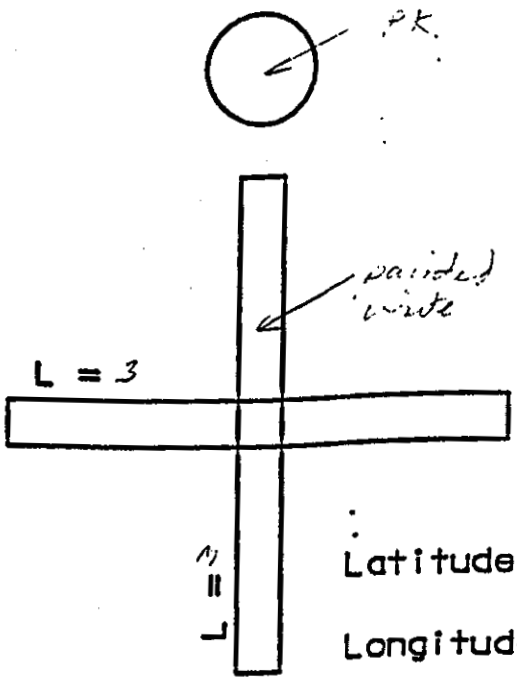
Panel Number: 341

USGS Quad: _____ Year Monumented: _____

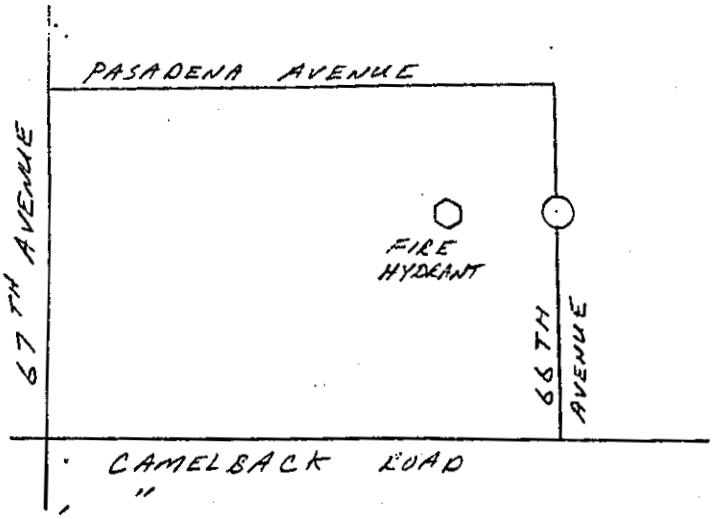
Described By: _____ Year Recovered: 8-2-99

State / County: Arizona / Maricopa

Stamped



Location Sketch



Latitude: 33° 30' 36" N

Longitude: 112° 12' 04" W

To Reach: Going East on Camelback Road turn left (north) on 66TH avenue, go north 350± to fire hydrant

Entry Permit Required: Y ___ N ✓

Monument Description: Pk Nail in ℄ road

Signature _____ Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

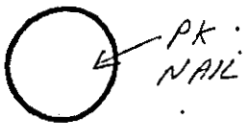
Panel Number: 360

USGS Quad: _____ Year Monumented: _____

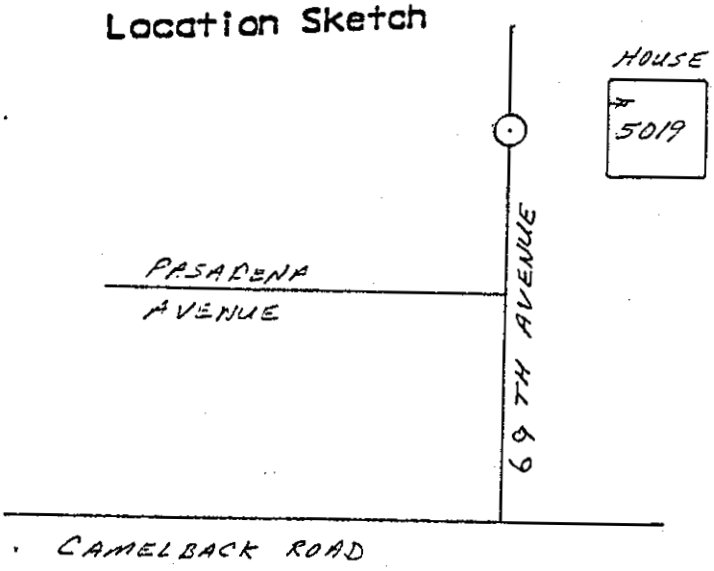
Described By: _____ Year Recovered: 8-2-99

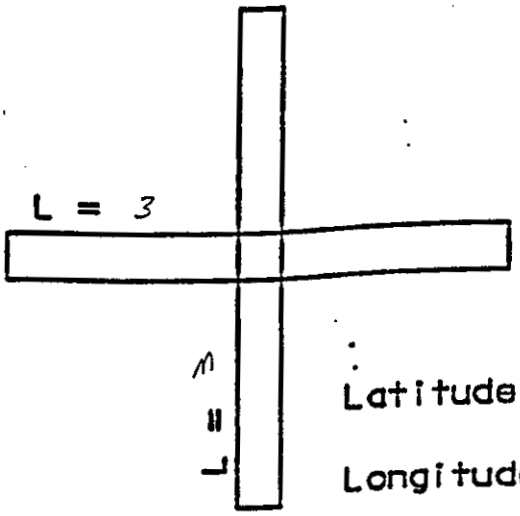
State / County: Arizona Maricopa

Stamped



Location Sketch





Latitude: 33°30'36" N

Longitude: 112°12'30" W

To Reach: Go east on Camelback Road, turn left (north) onto 69TH Avenue, go north 100± Pasadena Avenue

Entry Permit Required: Y ___ N ✓

Monument Description: PK Nail

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

Panel Number: 359

USGS Quad: _____ Year Monumented: _____

Described By: _____ Year Recovered: 8-2-99

State / County: Arizona Maricopa

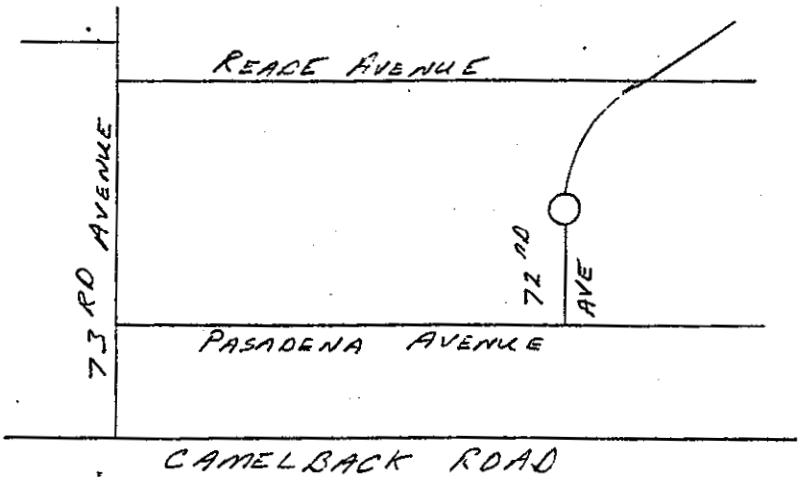
Stamped

C.O.S
10

L = 3

M = 1

Location Sketch



Latitude: 33° 30' 36" N

Longitude: 112° 12' 51" W

To Reach: Going east on Camelback Road turn left (north) onto 73rd Avenue, going north turn right (east) onto Pasadena Avenue, going east turn left (north) onto 72nd Avenue to the P.C. on the ℄.

Entry Permit Required: Y ___ N ✓

Monument Description: City of Glendale, Brass Cap Flush

Signature Date

Collins/Pina
Phoenix – Tucson – Nogales

PANEL DATA SHEET

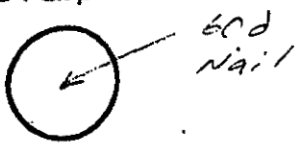
Panel Number: 348

USGS Quad: _____ Year Monumented: _____

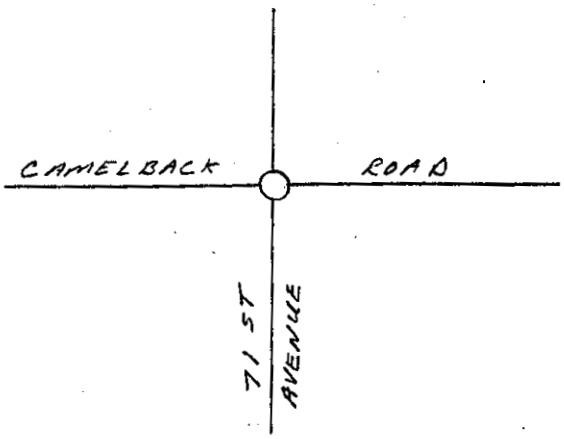
Described By: _____ Year Recovered: 8-2-99

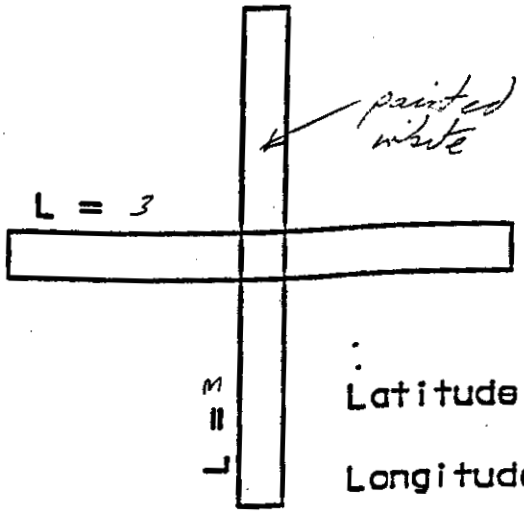
State / County: Arizona / Maricopa

Stamped



Location Sketch





Latitude: 33° 30' 31" N

Longitude: 112° 12' 41" W

To Reach: Go to the intersection of Camelback Road & 71ST Avenue

Entry Permit Required: Y ___ N ✓

Monument Description: 60d Nail

Signature Date

Collins/Pina
Phoenix – Tucson – Nogales

PANEL DATA SHEET

Panel Number: 350

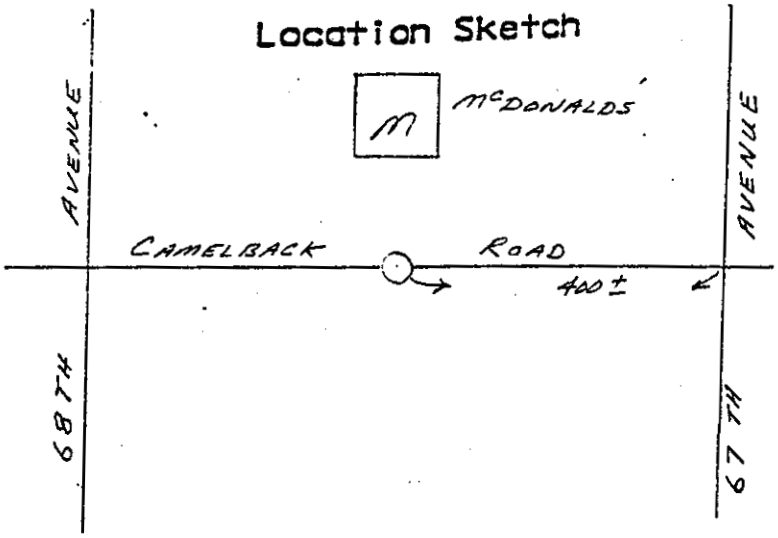
USGS Quad: _____ Year Monumented: _____

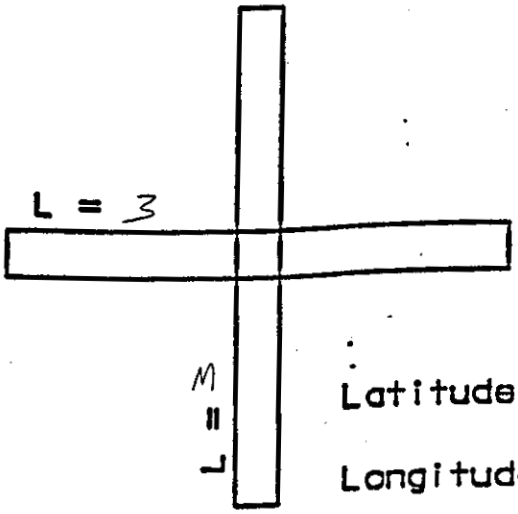
Described By: _____ Year Recovered: 8-2-99

State / County: Arizona Maricopa

Stamped

Location Sketch





Latitude: 33 30 33 N

Longitude: 112 12 17 W

To Reach: From 67TH Avenue, go West on Camelback Rd. 400± feet. Panel point is in the E of Camelback Rd. across from McDonalds

Entry Permit Required: Y ___ N ✓

Monument Description: PK NAIL

Signature Date

Collins/Pina
Phoenix – Tucson – Nogales

PANEL DATA SHEET

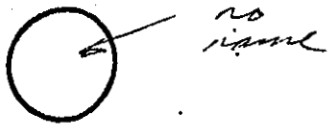
Panel Number: 357

USGS Quad: _____ Year Monumented: _____

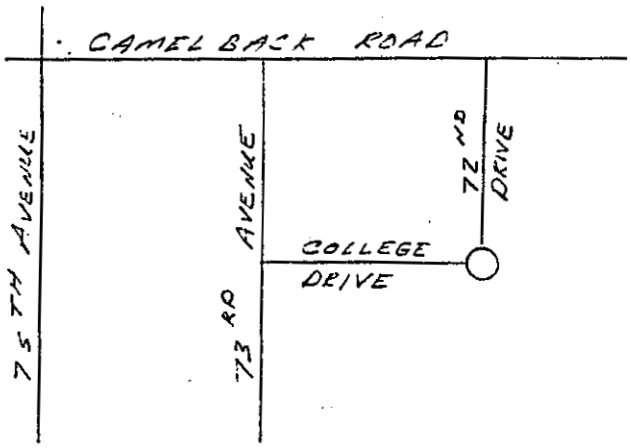
Described By: _____ Year Recovered: 8-2-99

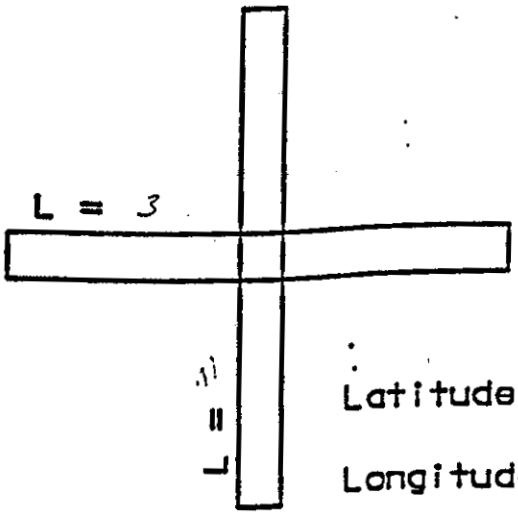
State / County: Arizona Maricopa

Stamped



Location Sketch





Latitude: 33°30'57" N.

Longitude: 112°13'18" W

To Reach: Drive East on Camelback Road, turn right (south) onto 72nd Drive, go south to College Drive

Entry Permit Required: Y ___ N ✓

Monument Description: Brass Cap Flush

Signature _____ Date _____

Collins/Pina
Phoenix – Tucson – Nogales

PANEL DATA SHEET

Panel Number: 354

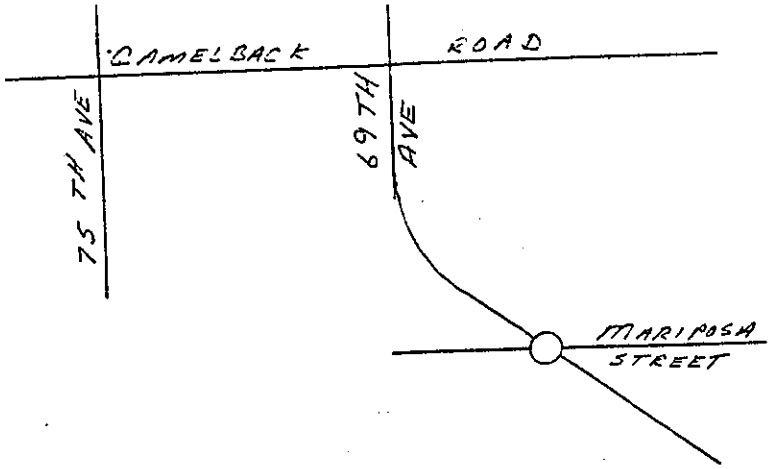
USGS Quad: _____ Year Monumented: _____

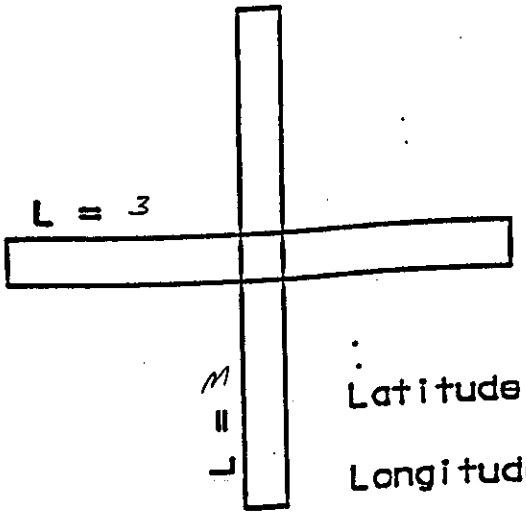
Described By: _____ Year Recovered: 8-2-97

State / County: Arizona / Maricopa

Stamped

Location Sketch





Latitude: 33° 20' 26" N

Longitude: 112° 12' 27" W

To Reach: Go east on Camelback Road, turn right (south) onto 69TH Avenue, go to Mariposa Street

Entry Permit Required: Y ___ N ✓

Monument Description: Brass Cap Flush at corner Phoenix

Signature

Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

Panel Number: 355

USGS Quad: _____ Year Monumented: _____

Described By: _____ Year Recovered: 8-2-99

State / County: Arizona / Maricopa

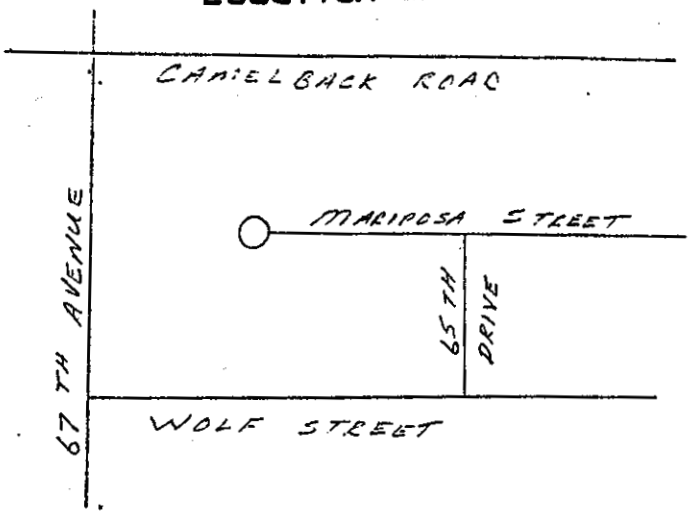
Stamped

C.O.P.
19

L = 3

M = 1

Location Sketch



Latitude: 33° 30' 31" N

Longitude: 112° 12' 03" W

To Reach: From Camelback Road, go south on 67TH AVE turn left (east) into Wolf Street go east to 65TH Drive, turn left (north) into 65TH Drive go north & turn left (west) into Mariposa Street & go west to dead end.

Entry Permit Required: Y___ N ✓

Monument Description: City of Phoenix Brass Cap Flush

Signature _____ Date _____

Collins/Pina
Phoenix – Tucson – Nogales

PANEL DATA SHEET

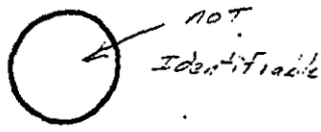
Panel Number: 354

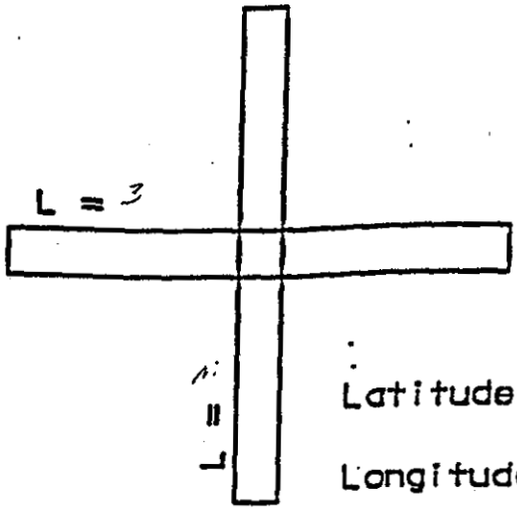
USGS Quad: _____ Year Monumented: _____

Described By: _____ Year Recovered: 8-2-99

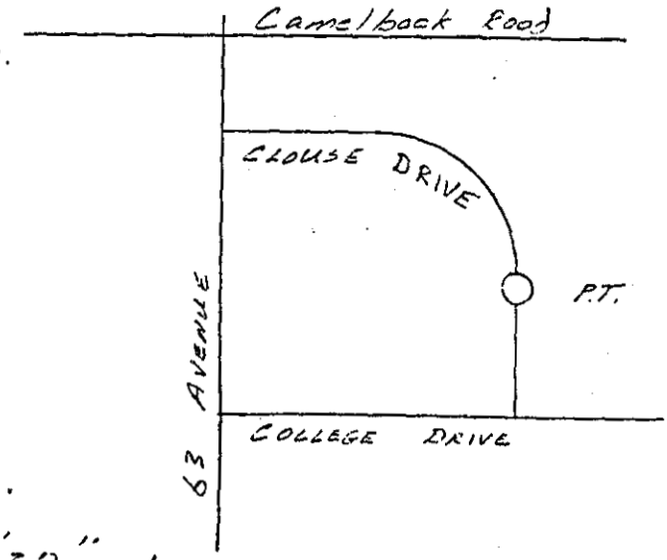
State / County: Arizona Maricopa

Stamped





Location Sketch



Latitude: 33° 30' 30" N

Longitude: 112° 11' 37" W

To Reach: Going South on 63RD Avenue turn left (east) into Clouse Drive, go east to the P.T. of the 2 in Clouse

Entry Permit Required: Y ___ N ✓

Monument Description: Brass Cap Flush

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

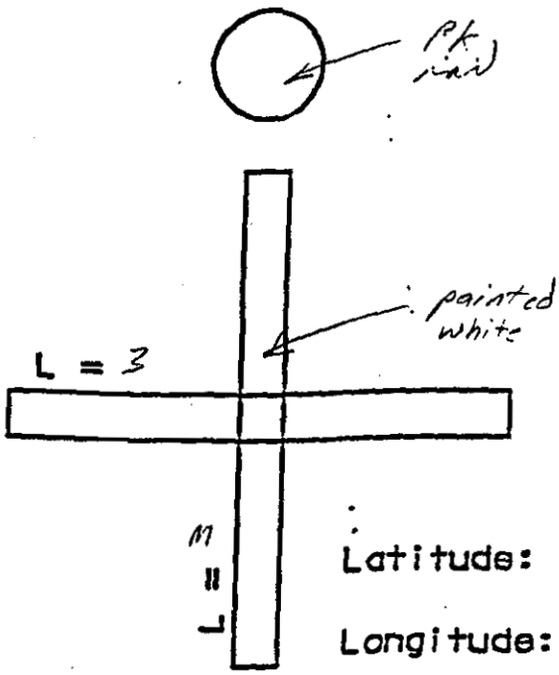
Panel Number: 5340

USGS Quad: _____ Year Monumented: _____

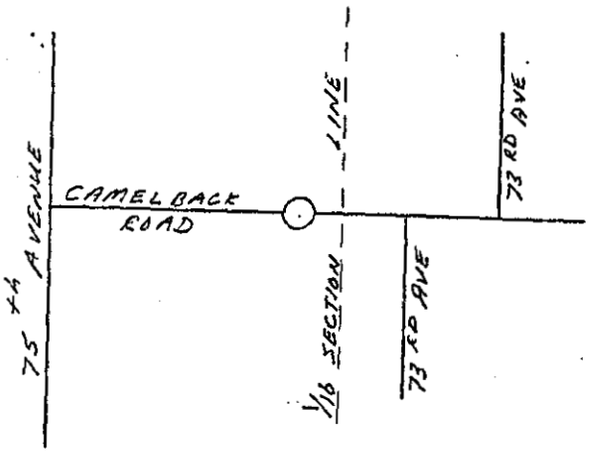
Described By: _____ Year Recovered: 8-2-99

State / County: Arizona Maricopa

Stamped



Location Sketch



Latitude: 33° 30' 32" N

Longitude: 112° 13' 05" W

To Reach: From 75TH avenue go east on Camelback road 0.2 mile to the small point. Said point being west of 73 avenue 100'

Entry Permit Required: Y___ N ✓

Monument Description: Pk nail

Signature Date

Collins/Piña
Phoenix – Tucson – Niagara

PANEL DATA SHEET

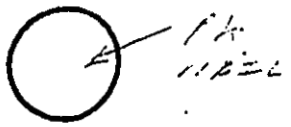
Panel Number: 362

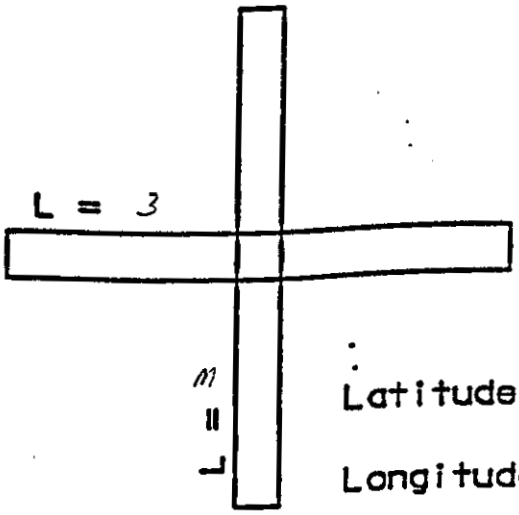
USGS Quad: _____ Year Monumented: _____

Described By: _____ Year Recovered: 8-2-99

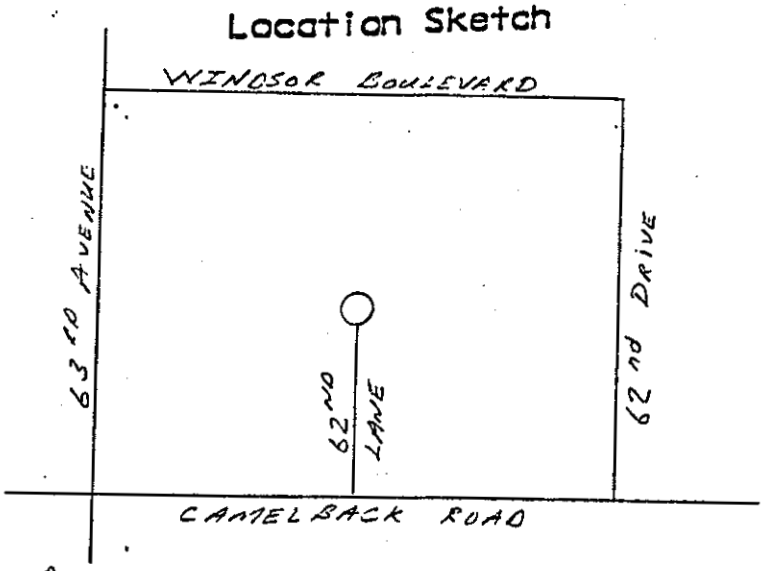
State / County: Arizona Maricopa

Stamped





Location Sketch



Latitude: 33° 30' 37" N

Longitude: 112° 11' 39" W

To Reach: Go North on 63rd avenue turn right (east) onto Windsor Blvd. turn right (south) onto 62nd Drive go north to Camelback Road (north side road) turn right (west) onto 62nd Lane (?) turn right (north) into 62nd Lane & go to end of cul de sac

Entry Permit Required: Y ___ N ✓

Monument Description: Pk Nail

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

Panel Number: 351

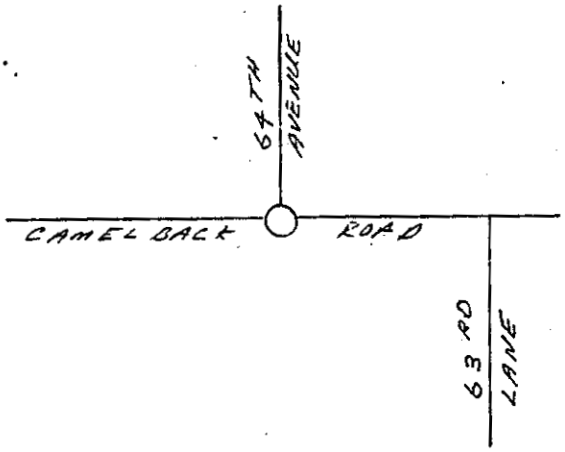
USGS Quad: _____ Year Monumented: _____

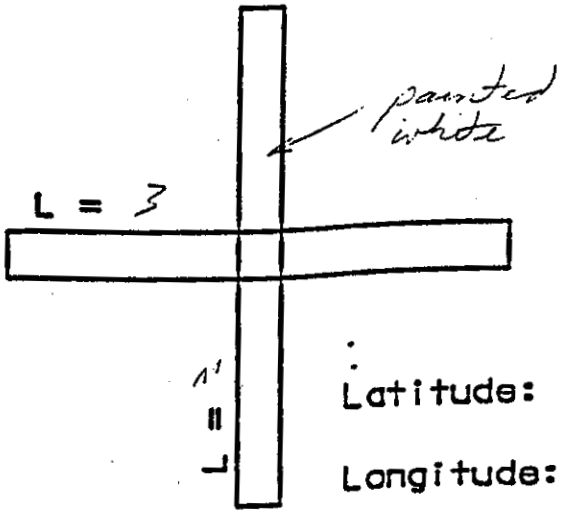
Described By: _____ Year Recovered: 8-2-99

State / County: Arizona Maricopa

Stamped

Location Sketch





Latitude: 33° 30' 33" N

Longitude: 112° 11' 49" W

To Reach: From 67th Avenue going East on Camelback Road go to the intersection with 64th Avenue

Entry Permit Required: Y ___ N ✓

Monument Description: City of Glendale Brass Cap Flush

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

Panel Number: 352

USGS Quad: _____ Year Monumented: _____

Described By: _____ Year Recovered: 8-2-99

State / County: Arizona Maricopa

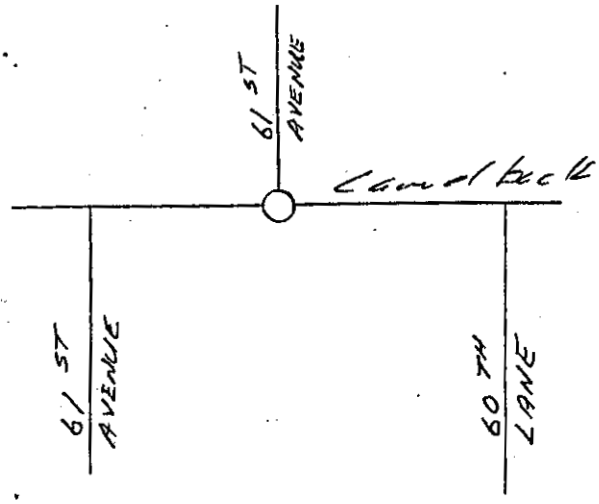
Stamped

painted white

L = 3

M
II
L

Location Sketch



Latitude: 33° 30' 33" N

Longitude: 112° 11' 27" W

To Reach: Going west from 59TH avenue on Camelback Rd. go to the intersection of 61ST Avenue (to the north)

Entry Permit Required: Y ___ N ✓

Monument Description: Brass Cap Flush, at N. Parkside

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

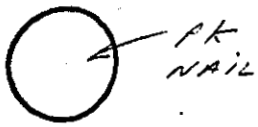
Panel Number: 363

USGS Quad: _____ Year Monumented: _____

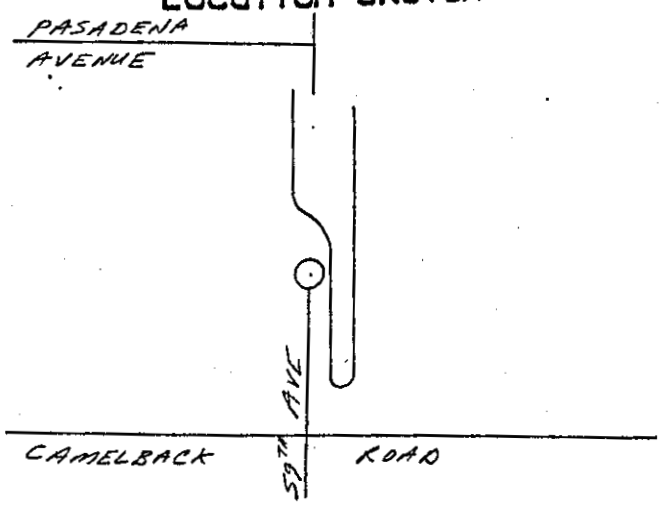
Described By: _____ Year Recovered: 8-2-99

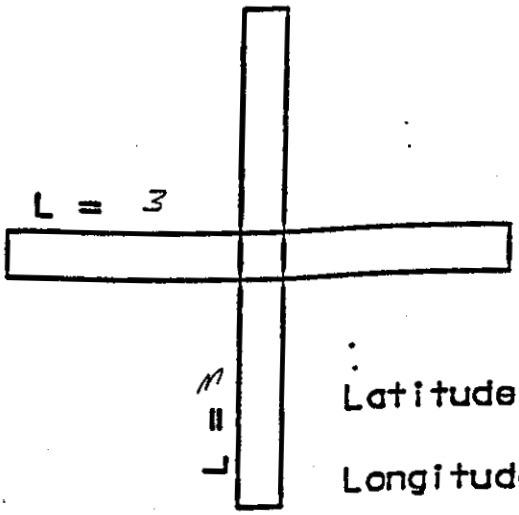
State / County: Arizona Maricopa

Stamped



Location Sketch





Latitude: 33° 30′ 37″ N

Longitude: 112° 11′ 11″ W

To Reach: From the intersection of Camelback Road & 59TH Avenue, go north on 59TH Avenue 300±, but stay south of Pasadena Avenue. PK nail located in the South Bound left turn lane

Entry Permit Required: Y ___ N ✓

Monument Description: PK Nail

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

Panel Number: 353

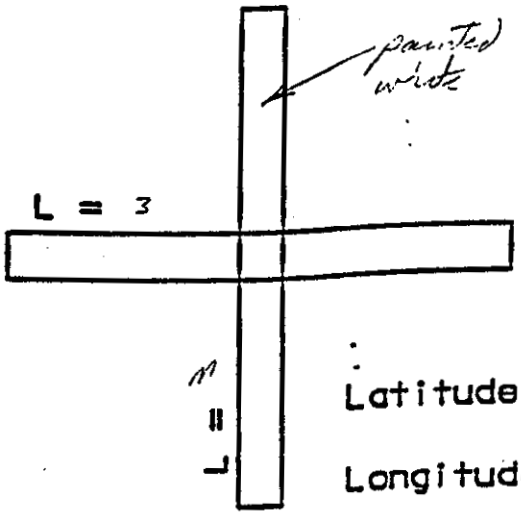
USGS Quad: _____ Year Monumented: _____

Described By: _____ Year Recovered: 8-2-99

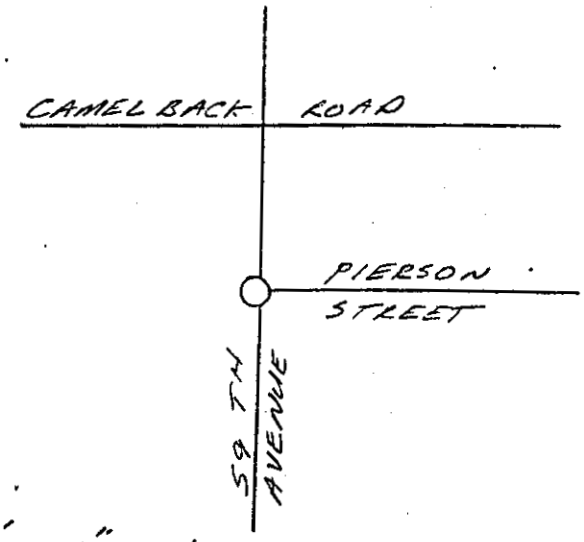
State / County: Arizona Maricopa

Stamped

C O.P.
19



Location Sketch



Latitude: 33° 30' 31" N

Longitude: 112° 11' 12" W

To Reach: From the intersect of Camelback Road and 59TH Avenue go south on 59th Avenue to the intersection of Pierson Street

Entry Permit Required: Y ___ N ✓

Monument Description: Brass Cap Flush, ct., of Phoenix

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

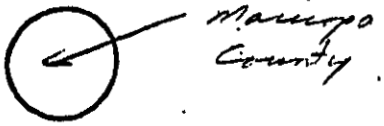
Panel Number: 315

USGS Quad: _____ Year Monumented: _____

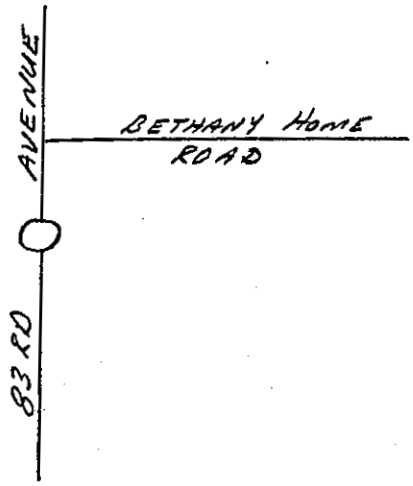
Described By: _____ Year Recovered: 8-5-99

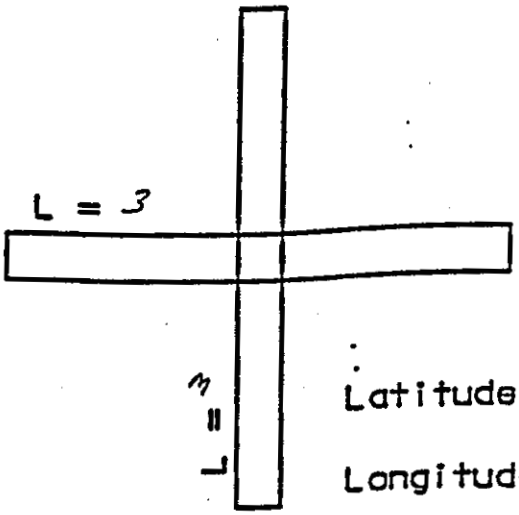
State / County: Arizona Maricopa

Stamped



Location Sketch





Latitude: _____

Longitude: _____

To Reach: Go to intersection of 83rd Avenue & Bethany Home Road

Entry Permit Required: Y ___ N ✓

Monument Description: Brass cap flush

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

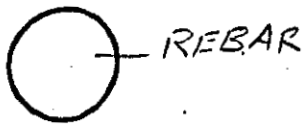
Panel Number: 321

USGS Quad: _____ Year Monumented: 8-10-99

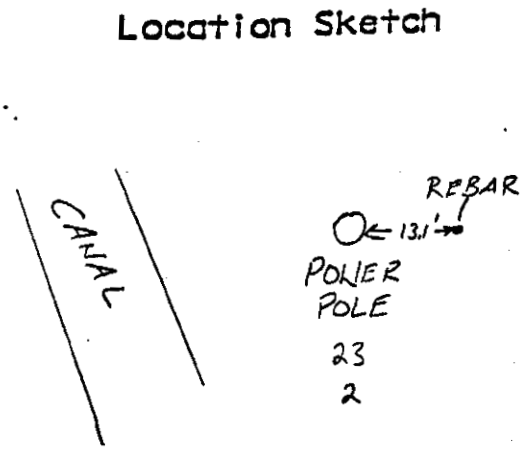
Described By: _____ Year Recovered: _____

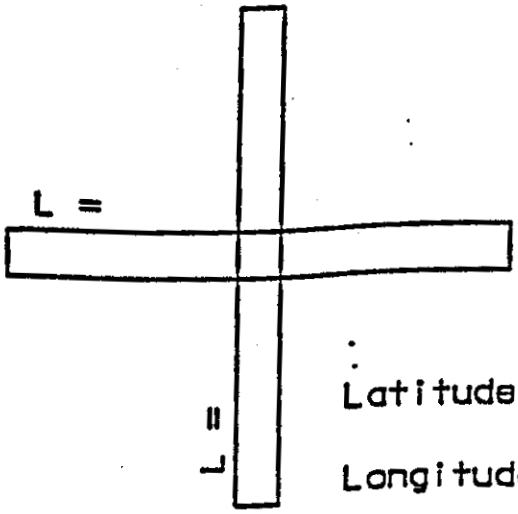
State / County: ARIZONA / MARICOPA

Stamped



Location Sketch





Latitude: 33° 31' 12" N

Longitude: 112° 13' 55" W

To Reach: GO SOUTHEAST ALONG CANAL FROM 83rd AVE. AND BETHANY HOME ON NORTHEAST SIDE OF CANAL UNTIL YOU REACH POLE # 23/2. REBAR IS 13.1' FROM POLE, PERPENDICULAR TO CANAL.

Entry Permit Required: Y ___ N ✓

Monument Description: REBAR

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

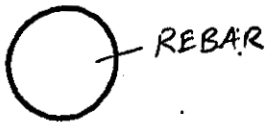
Panel Number: 328

USGS Quad: _____ Year Monumented: 8-10-99

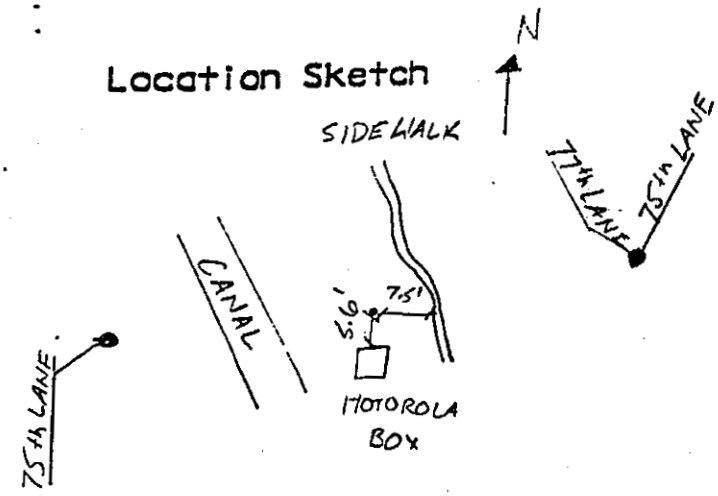
Described By: _____ Year Recovered: _____

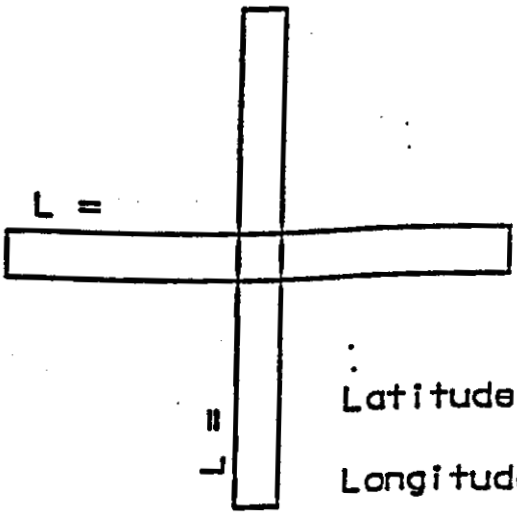
State / County: ARIZONA MARICOPA

Stamped



Location Sketch





Latitude: 33° 30' 41" N

Longitude: 112° 13' 22" W

To Reach: FROM 75th AVE, TRAVELING SOUTH, TURN RIGHT BEFORE CANAL. TRAVEL ON NORTH EAST SIDE OF CANAL, GOING NORTHWEST, APROX. 1000'. REBAR IS BETWEEN CANAL AND SIDEWALK, 5.6' NORTHWEST OF MOTOROLA BOX AND 7.5' PERPENDICULAR FROM SIDEWALK

Entry Permit Required: Y ___ N ✓

Monument Description: REBAR

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

Panel Number: 330

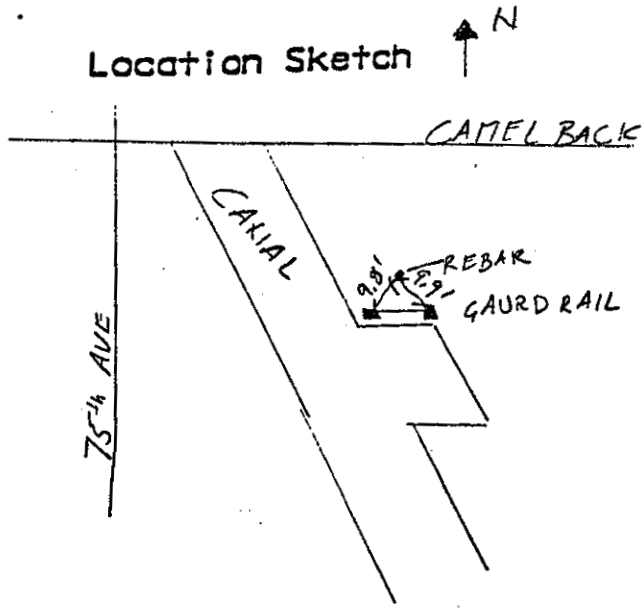
USGS Quad: _____ Year Monumented: _____

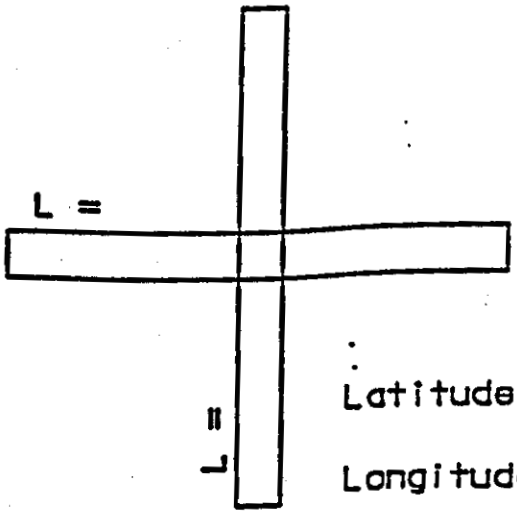
Described By: _____ Year Recovered: 8-10-99

State / County: ARIZONA MARICOPA

Stamped

Location Sketch





Latitude: 33° 30' 31" N

Longitude: 112° 13' 11" W

To Reach: TRAVELING WEST ON CAMEL BACK, TURN LEFT ON ROAD BEFORE THE CANAL AT 75th AVE. TRAVEL SOUTHEAST ON NORTH EAST SIDE OF CANAL APROX. 200' TO GAURD RAIL. REBAR IS 9.9' FROM WESTERLY POST AND 9.9' FROM EASTERLY POST OF GAURD RAIL THAT IS PERPENDICULAR TO CANAL.

Entry Permit Required: Y ____ N ✓

Monument Description: REBAR

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

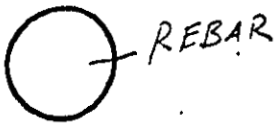
Panel Number: 300

USGS Quad: _____ Year Monumented: 8-10-99

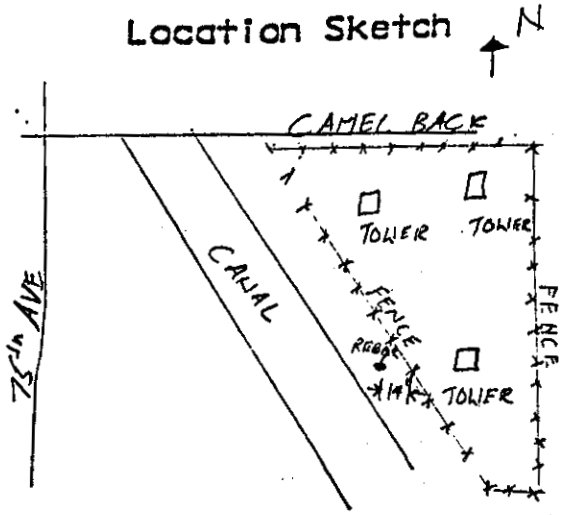
Described By: _____ Year Recovered: _____

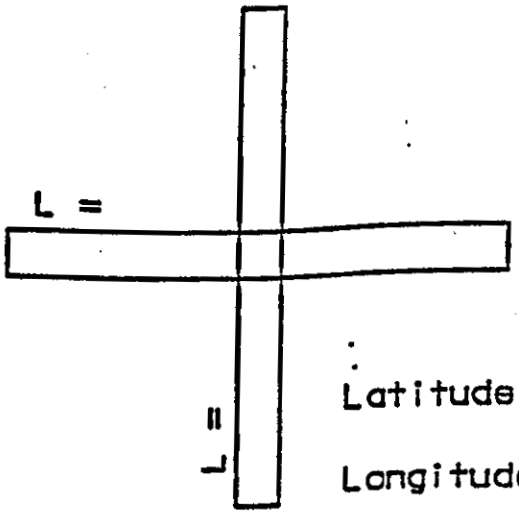
State / County: ARIZONA MARICOPA

Stamped



Location Sketch





Latitude: 33° 30' 26" N

Longitude: 112° 13' 04" W

To Reach: GOING WEST ON CAMELBACK TURN LEFT BEFORE CANAL AT 75th AVE. TRAVE SOUTHEAST ON NORTHEAST SIDE OF CANAL UNTIL SOUTHERLY RADIO TOWER. REBAR IS 14' PERPENDICULAR FROM FENCE TOWARDS CANAL.

Entry Permit Required: Y ___ N ✓

Monument Description: REBAR

Signature Date

Collins/Pina
Phoenix – Tucson – Nogales

PANEL DATA SHEET

Panel Number: 331

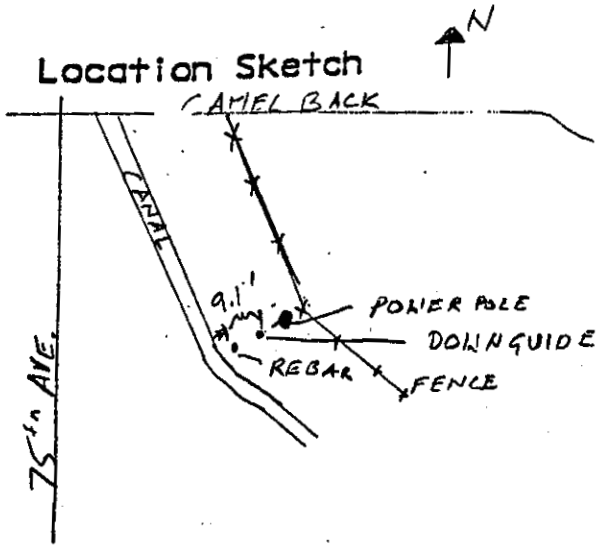
USGS Quad: _____ Year Monumented: 8/10/99

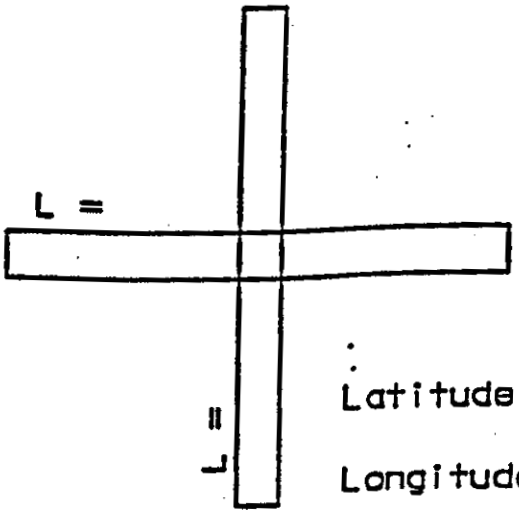
Described By: _____ Year Recovered: _____

State / County: ARIZONA MARICOPA

Stamped

Location Sketch





Latitude: 33° 30' 14" N

Longitude: 112° 12' 50" W

To Reach: GOING WEST ON CAMEL BACK, TURN LEFT BEFORE CANAL AT 75th AVE. GOING SOUTHEAST ON NORTHEAST SIDE OF CANAL, TRAVEL UNTIL THE FENCE ON NORTHEAST SIDE OF CANAL MAKES AN ANGLE. REBAR IS 9.1' AWAY FROM DOWN GUIDE ON THE WESTERLY SIDE IN LINE WITH POWER POLE.

Entry Permit Required: Y ___ N ✓

Monument Description: REBAR

_____

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

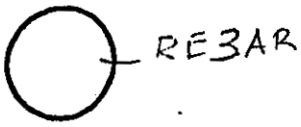
Panel Number: 332

USGS Quad: _____ Year Monumented: 8-10-99

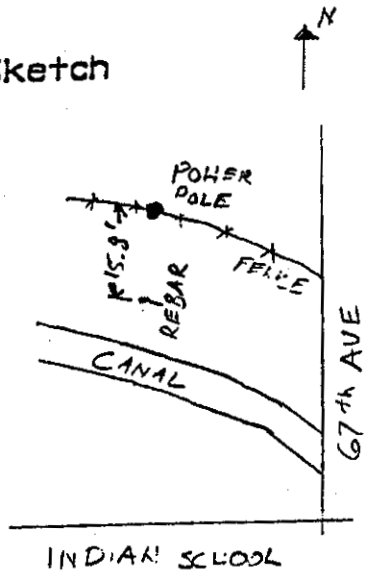
Described By: _____ Year Recovered: _____

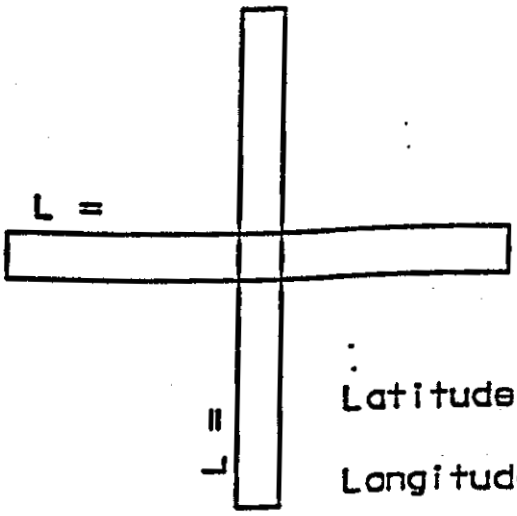
State / County: ARIZONA MARICOPA

Stamped



Location Sketch





Latitude: 33° 30' 02" N

Longitude: 112° 12' 23" W

To Reach: HEADING SOUTH ON 67th AVE TURN RIGHT BEFORE THE CANAL AT INDIAN SCHOOL RD. TRAVELING NORTHWEST ON THE NORTHEAST SIDE OF THE CANAL, 40 8 POWER POLES ON THE NORTH EAST SIDE. REBAR IS 15.8' ALWAY FROM FENCE TOWARDS THE CANAL

Entry Permit Required: Y ___ N ✓

Monument Description: REBAR

Signature Date

Collins/Pina
Phoenix – Tucson – Nogales

PANEL DATA SHEET

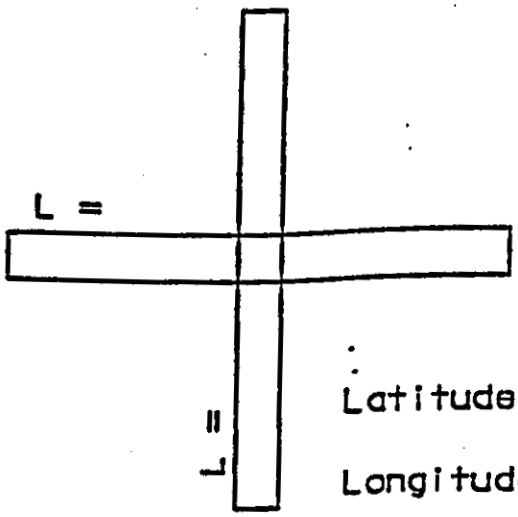
Panel Number: 333

USGS Quad: _____ Year Monumented: 8-10-99

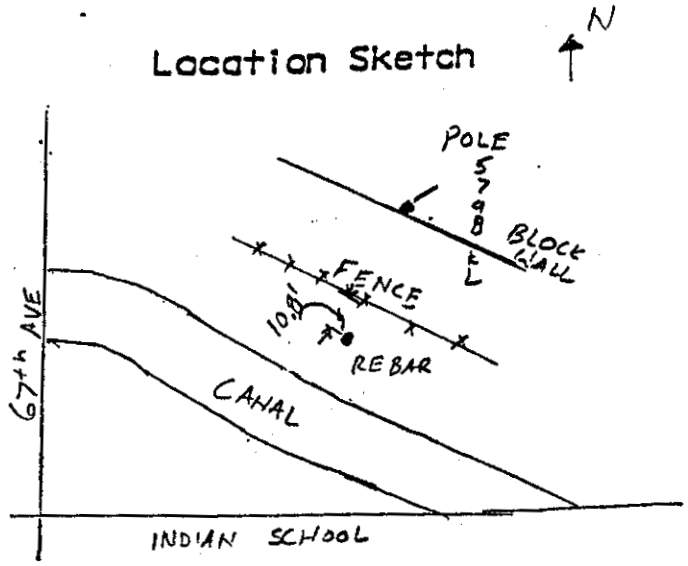
Described By: _____ Year Recovered: _____

State / County: ARIZONA MARICOPA

Stamped



Location Sketch



Latitude: 33° 29' 51" N

Longitude: 112° 12' 06" W

To Reach: TRAVELING SOUTH ON 67th AVE. TURN LEFT BEFORE CANAL AT INDIAN SCHOOL RD. TRAVEL SOUTH EAST ON NORTHEAST SIDE OF CANAL UNTIL POWER POLE 5798KL. REBAR IS 10.8' FROM CHAIN LINK FENCE TOWARDS CANAL.

Entry Permit Required: Y ___ N ✓

Monument Description: REBAR

Signature Date

Collins/Pina
Phoenix – Tucson – Nogales

PANEL DATA SHEET

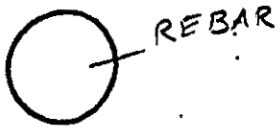
Panel Number: 334

USGS Quad: _____ Year Monumented: 8-10-99

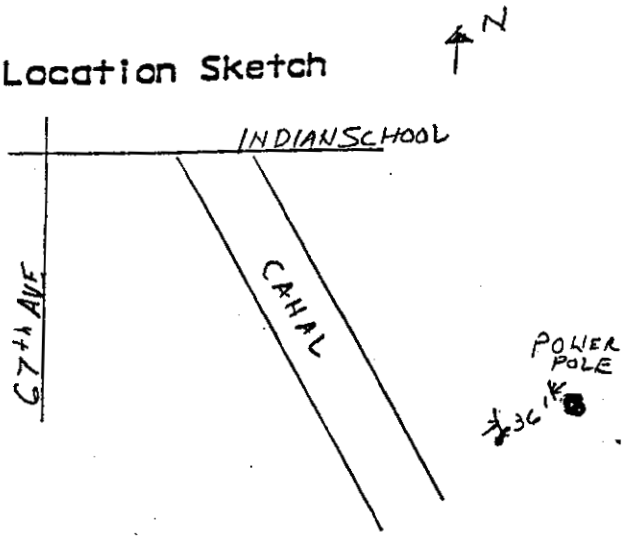
Described By: _____ Year Recovered: _____

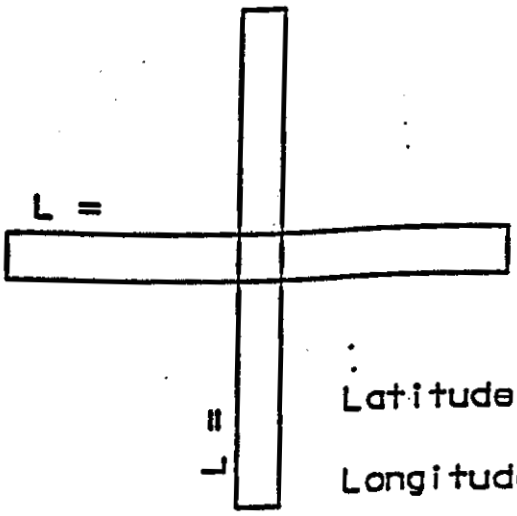
State / County: ARIZONA MARICOPA

Stamped



Location Sketch





Latitude: 33° 29' 35" N

Longitude: 112° 11' 49" W

To Reach: TRAVELING WEST ON INDIAN SCHOOL TURN LEFT BEFORE CANAL AT 67th AVE. TRAVELING SOUTHEAST ON NORTHEAST SIDE OF CANAL GO TO POWER POLE # 6343. REBAR IS 36' FROM POWER POLE TOWARDS CANAL.

Entry Permit Required: Y ___ N ✓

Monument Description: REBAR

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

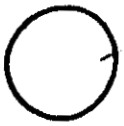
Panel Number: 303

USGS Quad: _____ Year Monumented: 8-10-99

Described By: _____ Year Recovered: _____

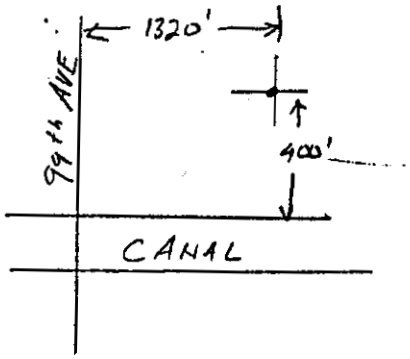
State / County: ARIZONA MARICOPA

Stamped

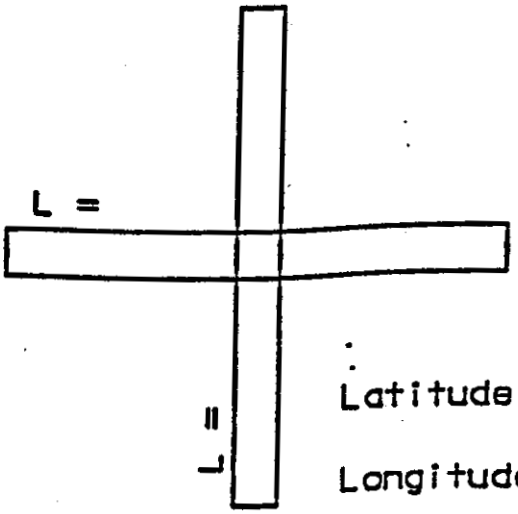


1/2" IRON ROD

Location Sketch



L =



W =

Latitude: 33° 31' 30" N

Longitude: 112° 16' 05" W

To Reach: GO NORTH ON 99th AVE. TURN RIGHT JUST AFTER THE CANAL. GOING EAST ON THE NORTH SIDE OF THE CANAL GO 1320' EAST AND 400' NORTH OF THE CANAL. REBAR IS NEAR THE EAST RIGHT OF WAY OF THE 101.

Entry Permit Required: Y ___ N ✓

Monument Description: 1/2" IRON ROD

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

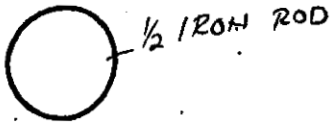
Panel Number: 301

USGS Quad: _____ Year Monumented: 8-10-99

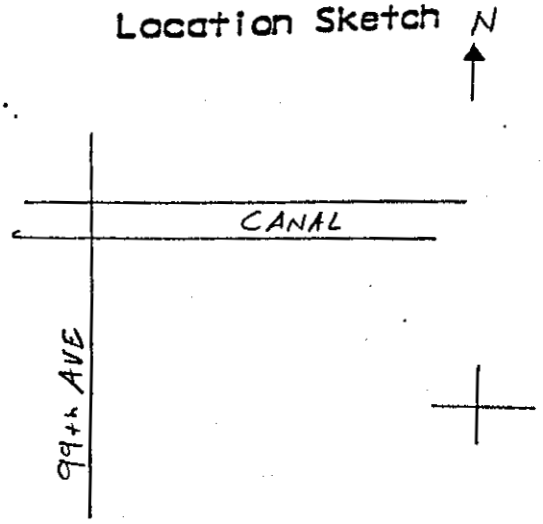
Described By: _____ Year Recovered: _____

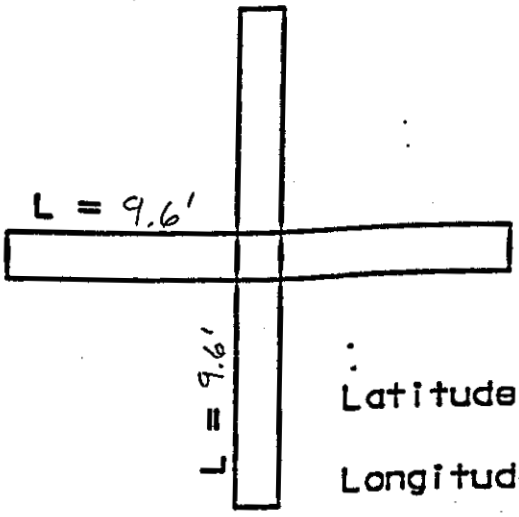
State / County: ARIZONA MARICOPA

Stamped



Location Sketch





Latitude: 33° 31' 20" N

Longitude: 112° 16' 05" W

To Reach: TRAVELING NORTH ON 99th AVE TURN RIGHT JUST BEFORE THE CANAL. TRAVELING EAST ON THE SOUTH SIDE OF THE CANAL CA 1320'± AND 300'± SOUTH OF THE CANAL. THE PANEL IS ALONG THE EAST RIGHT OF WAY OF THE 101.

Entry Permit Required: Y ___ N ✓

Monument Description: ½ IRON ROD

Signature Date

Collins/Pina
Phoenix – Tucson – Nogales

PANEL DATA SHEET

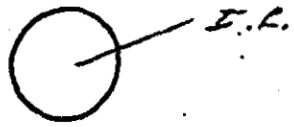
Panel Number: 307

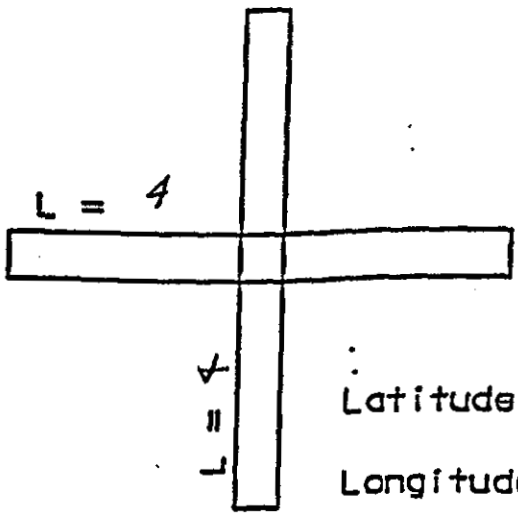
USGS Quad: _____ Year Monumented: _____

Described By: _____ Year Recovered: 8-11-99

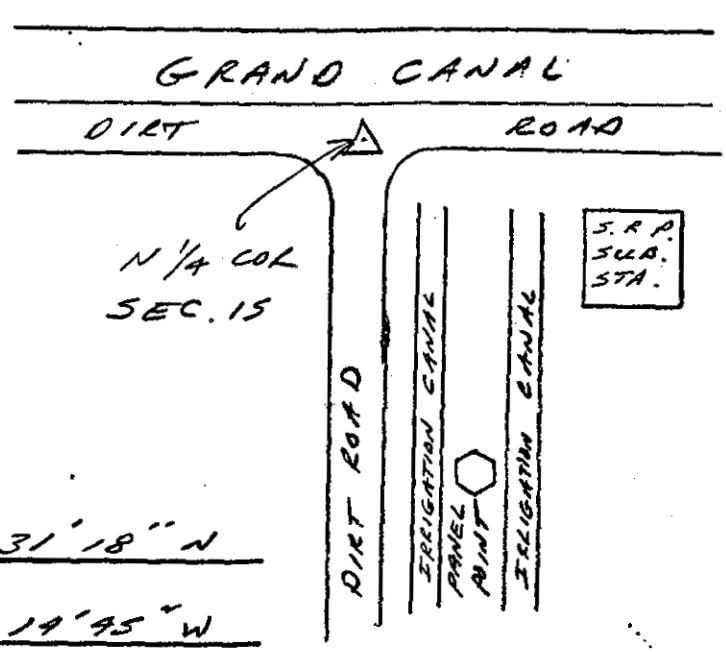
State / County: Arizona Maricopa

Stamped





Location Sketch



Latitude: 33°31'18" N

Longitude: 112°14'45" W

To Reach: From ~~85TH~~ 83RD Avenue, go west along the South side of the Grand Canal, 0.5 mile. Then Go South ±300 feet to panel point

Entry Permit Required: Y___ N ✓

Monument Description: 1/2" iron rod

Signature Date

Collins/Piña
Phoenix — Tucson — Nogales

PANEL DATA SHEET

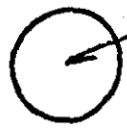
Panel Number: 309

USGS Quad: _____ Year Monumented: _____

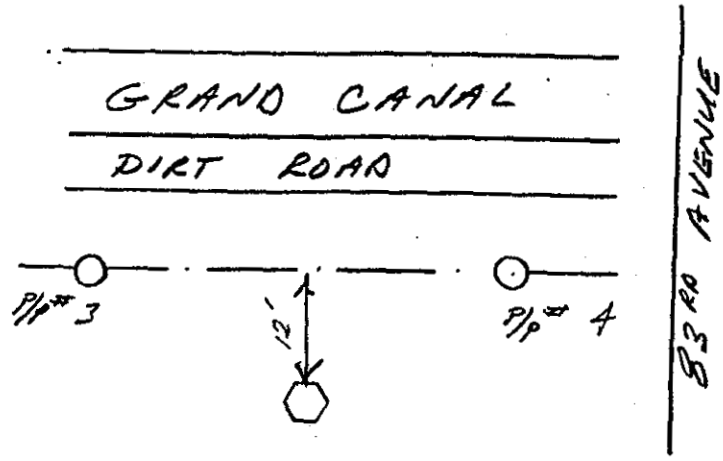
Described By: _____ Year Recovered: 8-11-99

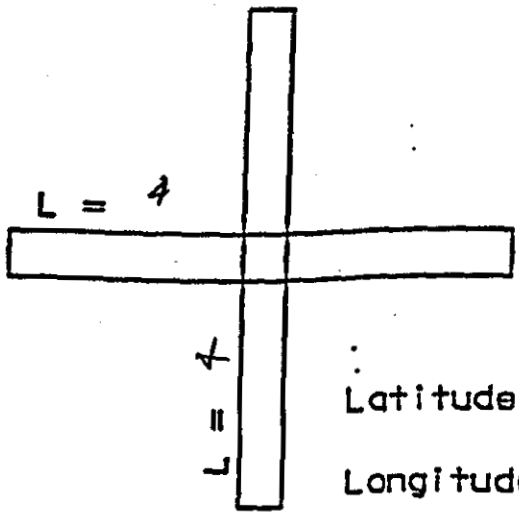
State / County: Arizona Maricopa

Stamped



Location Sketch





Latitude: 33° 31' 25" N

Longitude: 112° 14' 40" W

To Reach: From 83rd Avenue go West along the South side of Grand Canal 0.30 mile, between P/P # 3 & # 4 12' south of Powerline

Entry Permit Required: Y ___ N ✓

Monument Description: 1/2" I.R.

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

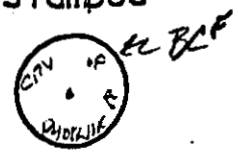
Panel Number: 314

USGS Quad: _____ Year Monumented: 19?

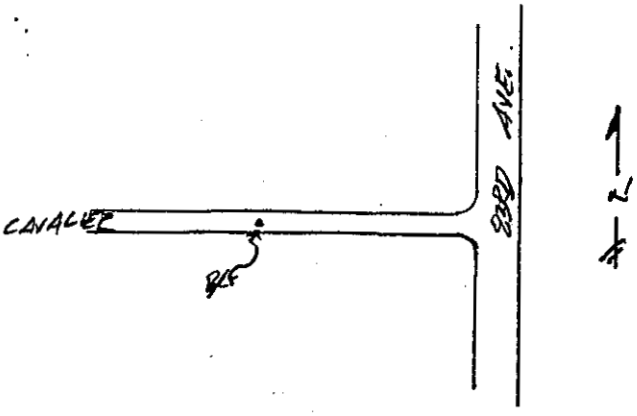
Described By: CHH Year Recovered: 1999

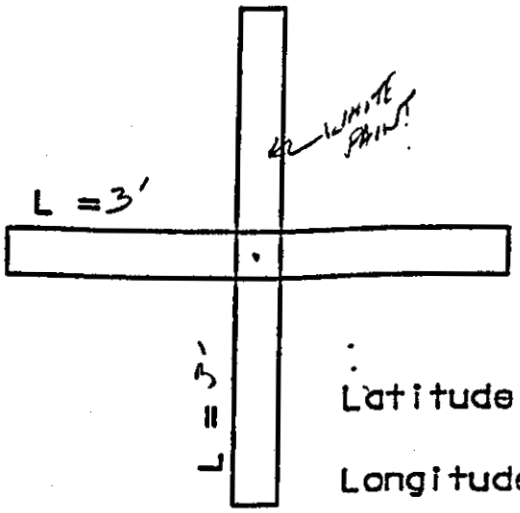
State / County: MARICOPA

Stamped



Location Sketch





Latitude: 33°31'27 N

Longitude: 112°14'33" W

To Reach: CENTER LINE OF CAVALIER 1200' WEST OF 83RD AVE, FND BRASS CAP FLUSH - CITY OF PHOENIX

Entry Permit Required: Y ___ N X

Monument Description: _____

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

Panel Number: 364

USGS Quad: _____ Year Monumented: _____

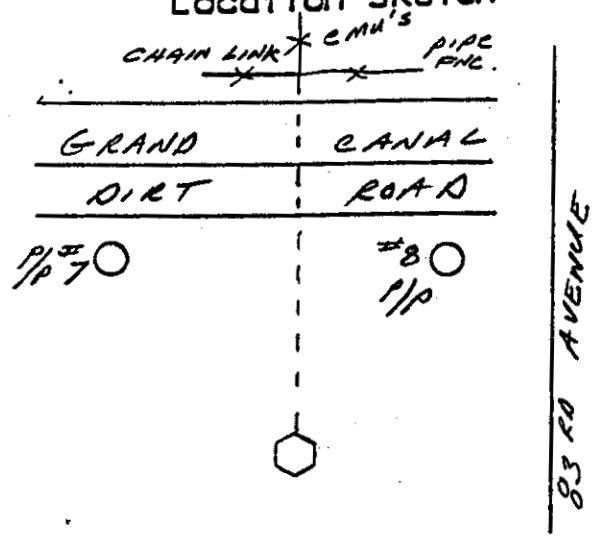
Described By: _____ Year Recovered: 8-11-99

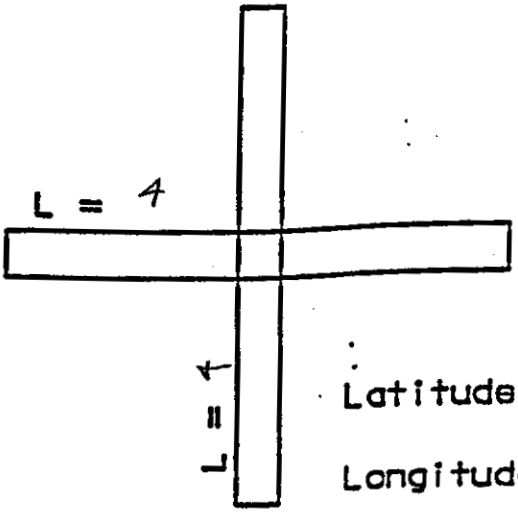
State / County: Arizona Maricopa

Stamped

1/2" I.R.

Location Sketch





Latitude: 33°31'21" N

Longitude: 112° 14' 30" W

To Reach: From 83rd Avenue, go west along the South side of the Grand Canal ± 800 feet. Then go South ± 300 feet into cotton field

Entry Permit Required: Y ___ N ✓

Monument Description: 1/2" I.R.

Signature Date

Collins/Pina
Phoenix – Tucson – Nogales

PANEL DATA SHEET

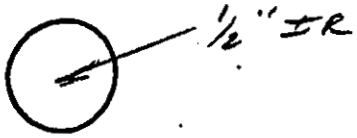
Panel Number: 304

USGS Quad: _____ Year Monumented: _____

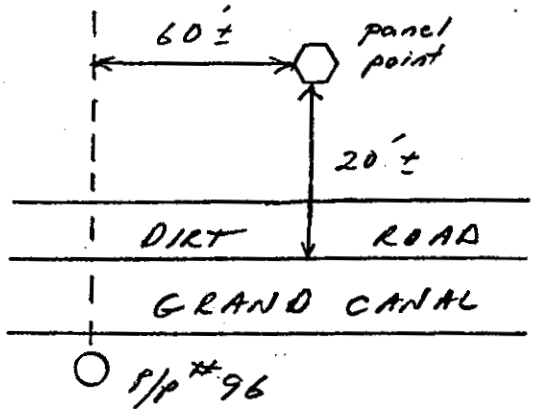
Described By: _____ Year Recovered: 8-11-99

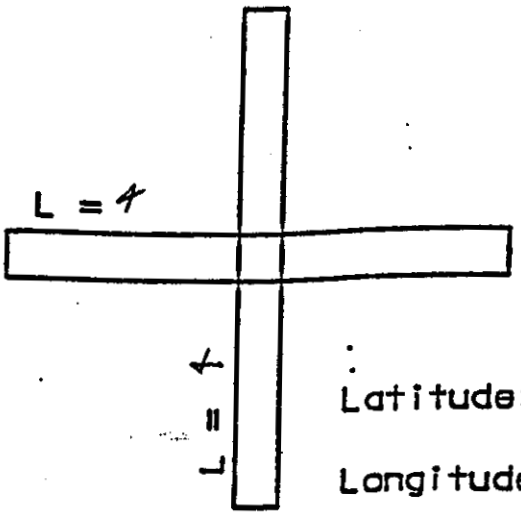
State / County: Arizona Maricopa

Stamped



Location Sketch





Latitude: 33°31'24" N.

Longitude: 112° 15' 49" W

To Reach: From 91ST Avenue, go west on the North Side of the Grand Canal 0.45 miles, near S/P #96

Entry Permit Required: Y ___ N ✓

Monument Description: 1/2" I.R.

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

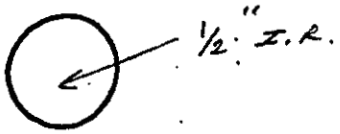
Panel Number: 305

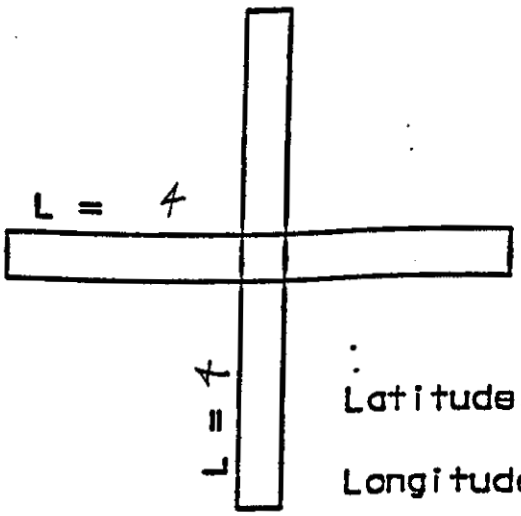
USGS Quad: _____ Year Monumented: _____

Described By: _____ Year Recovered: 8-11-99

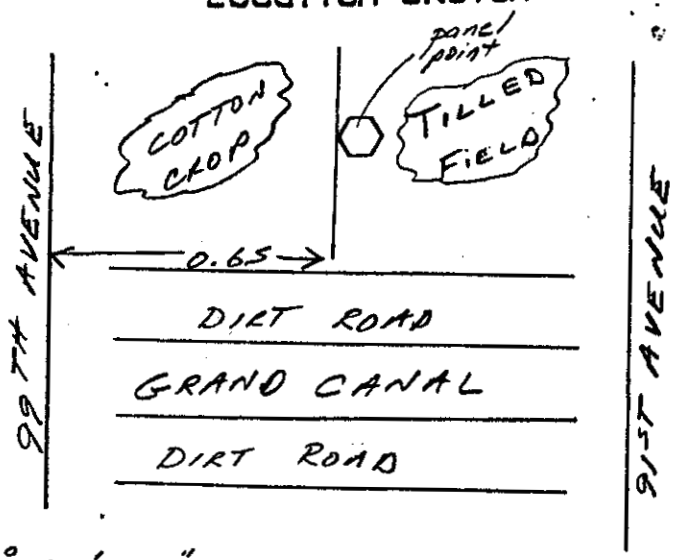
State / County: Arizona Maricopa

Stamped





Location Sketch



Latitude: 33° 31' 29"

Longitude: 112° 16' 05"

To Reach: From 99TH AVE, go East along the North side of the Grand Canal 0.65 miles to a mature cotton crop on the West & a freshly tilled field on the East, Go North between the said fields 300±

Entry Permit Required: Y ___ N ✓

Monument Description: 1/2" iron rod

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

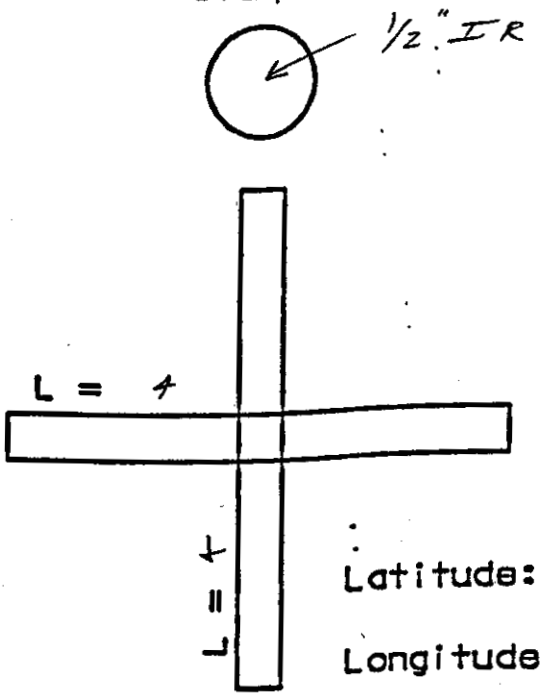
Panel Number: 302

USGS Quad: _____ Year Monumented: _____

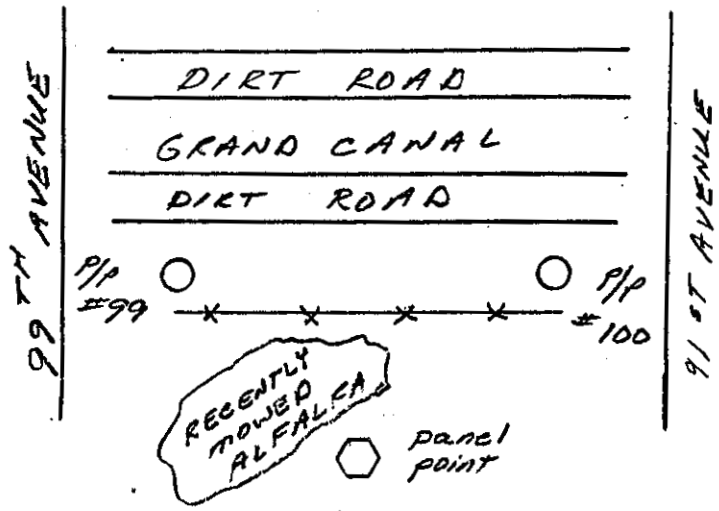
Described By: _____ Year Recovered: 8-11-99

State / County: Arizona Maricopa

Stamped



Location Sketch



Latitude: 33°31'20" N

Longitude: 112° 15' 37" W

To Reach: From 91st Avenue go west along the South side of the Grand Canal 0.30 miles Go south ± 300 feet

Entry Permit Required: Y ___ N ✓

Monument Description: 1/2" I.R.

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

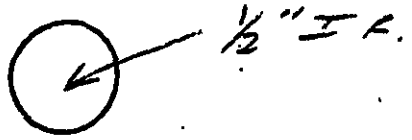
Panel Number: 306

USGS Quad: _____ Year Monumented: _____

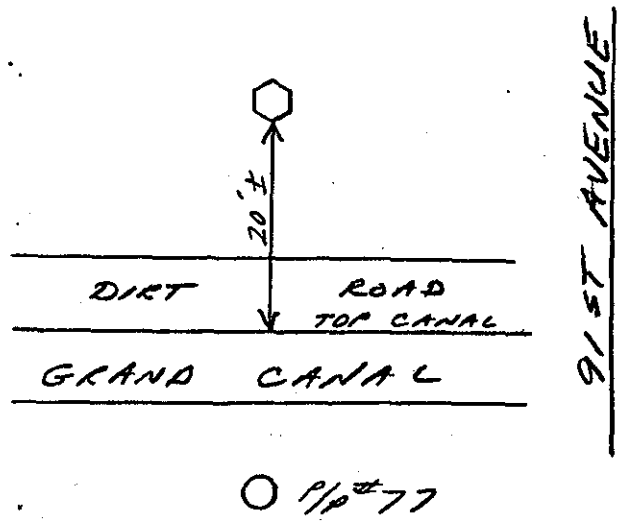
Described By: _____ Year Recovered: 8-11-99

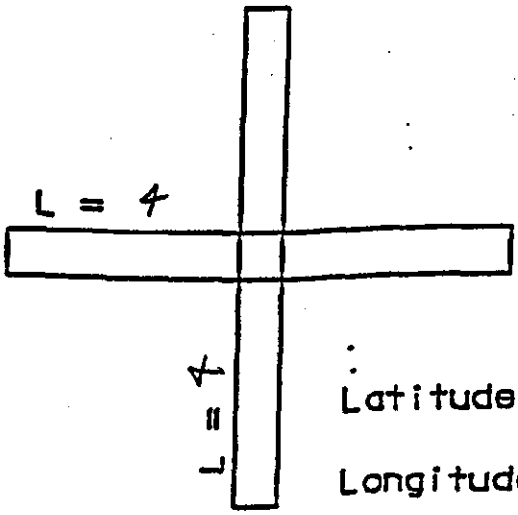
State / County: Arizona Maricopa

Stamped



Location Sketch





Latitude: 33°31'21" N

Longitude: 112°15'32" W

To Reach: From 91ST avenue, go west along the North side of Grand Canal 0.20 mile, across from P/P #77, 20± North of Top Bank of Canal

Entry Permit Required: Y ___ N ✓

Monument Description: 1/2" I.R.

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

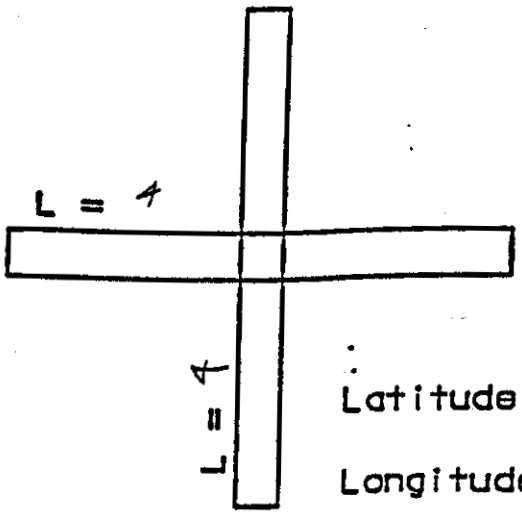
Panel Number: 316

USGS Quad: _____ Year Monumented: _____

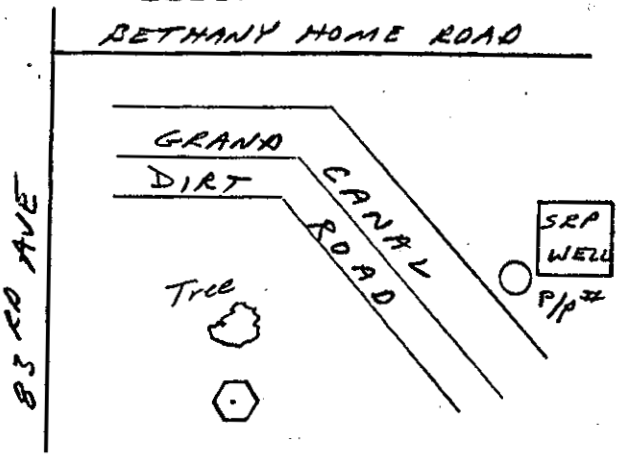
Described By: _____ Year Recovered: 8-11-99

State / County: Arizona Maricopa

Stamped 1/2" I.R.



Location Sketch



Latitude: 33° 31' 21" N

Longitude: 112° 14' 09" W

To Reach: From 83rd Avenue go east along the south side of the Grand Canal, 0.13 miles, then 300± West of Grand Canal

Entry Permit Required: Y ___ N ✓

Monument Description: 1/2" I.R.

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

Panel Number: 307

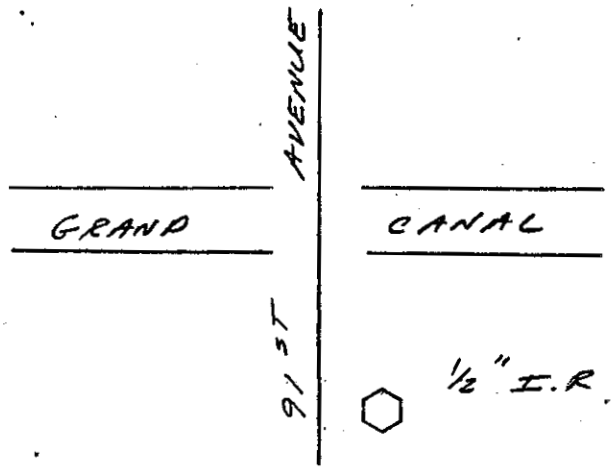
USGS Quad: _____ Year Monumented: _____

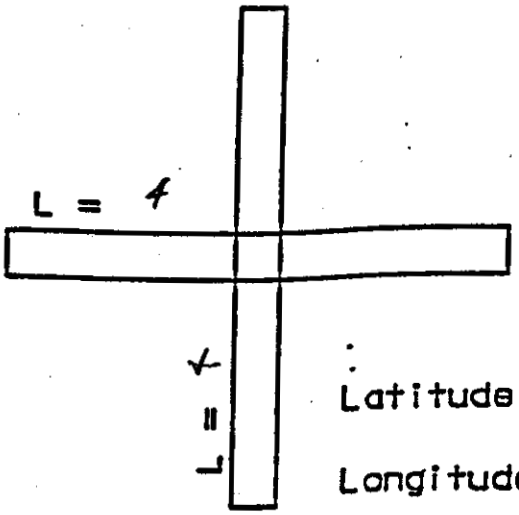
Described By: _____ Year Recovered: 8-11-99

State / County: Arizona Maricopa

Stamped

Location Sketch





Latitude: 33° 31' 20" N

Longitude: 112° 15' 18" W

To Reach: From 91ST Avenue, go south of the Grand Canal 300± along the East side of 91ST AVE. Panel Point is ±5' east of curb

Entry Permit Required: Y ___ N ✓

Monument Description: 1/2" I.R.

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

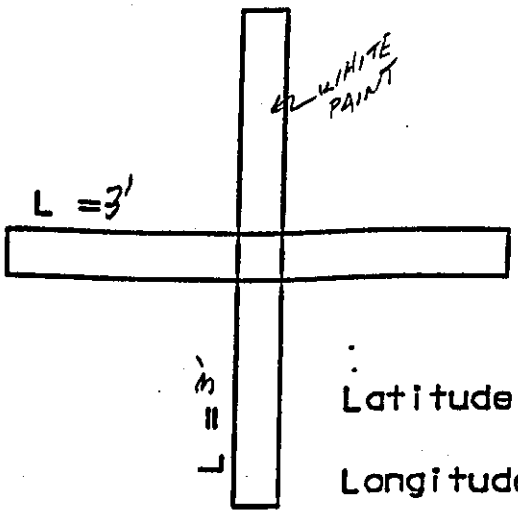
Panel Number: 310

USGS Quad: _____ Year Monumented: _____

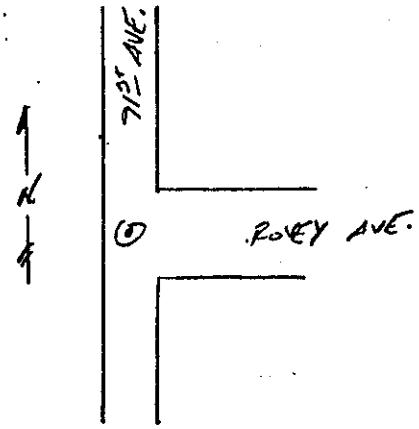
Described By: CAH Year Recovered: 07/27/97

State / County: MARICOPA

Stamped



Location Sketch



Latitude: 33°31'29" N

Longitude: 112°15'18" W

To Reach: _____

Entry Permit Required: Y ___ N ___

Monument Description: FOUND BLF @ 91ST AVE & ROVEY AVE E OF INTERSECTION

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

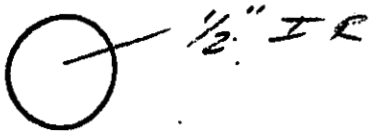
Panel Number: 313

USGS Quad: _____ Year Monumented: _____

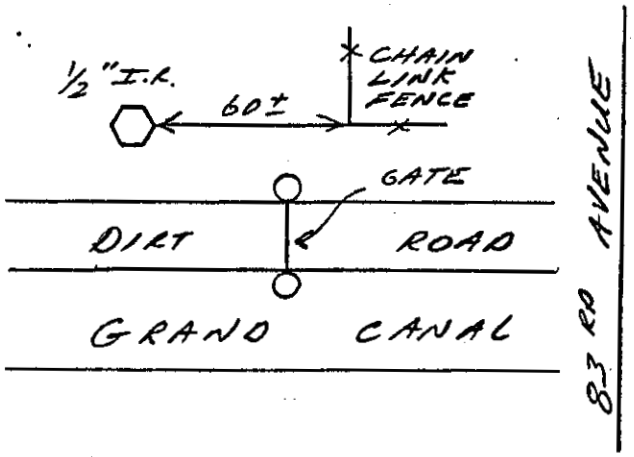
Described By: _____ Year Recovered: 8-11-99

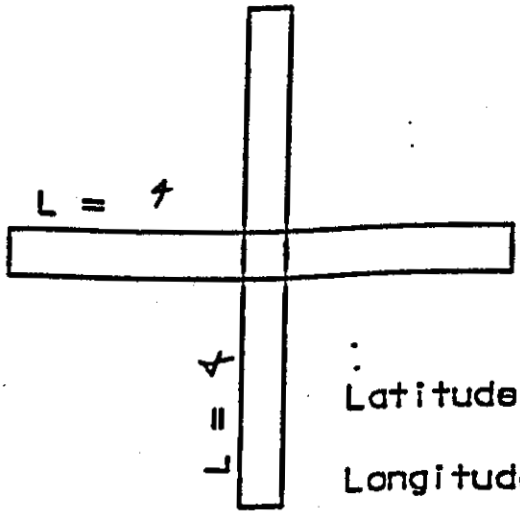
State / County: Arizona Maricopa

Stamped



Location Sketch





Latitude: 33° 31' 24" N

Longitude: 112° 14' 46" W

To Reach: From 83rd avenue go west along the North side of the Grand Canal 0.50 miles

Entry Permit Required: Y ___ N ✓

Monument Description: 1/2" I.R.

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

PANEL DATA SHEET

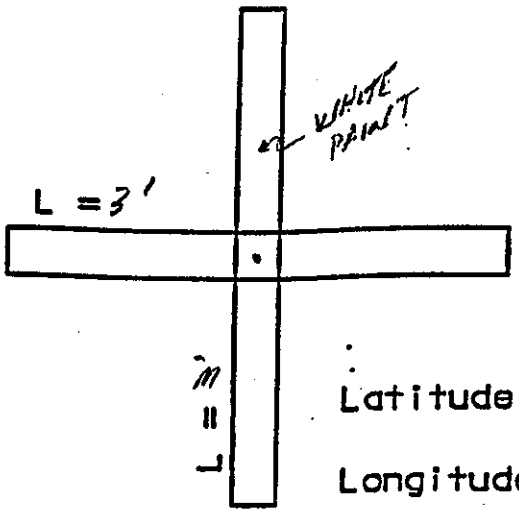
Panel Number: 311

USGS Quad: _____ Year Monumented: _____

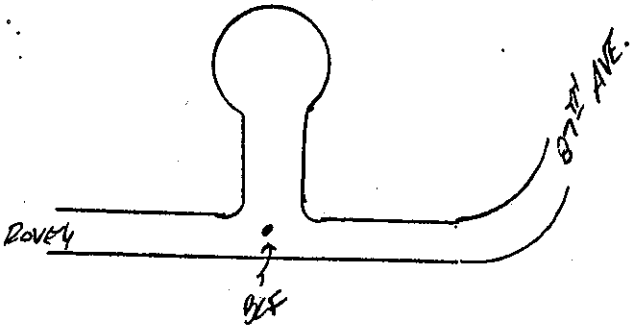
Described By: CAH Year Recovered: 1999

State / County: MARICOPA

Stamped



Location Sketch



Latitude: 33° 31' 27" N

Longitude: 112° 14' 51" W

To Reach: CITY OF GLENDALE BRASS CAP - FLUSH. @ ROVEY & 87TH AVE INTER. S.

Entry Permit Required: Y ____ N X

Monument Description: _____

Signature Date

Collins/Piña
Phoenix – Tucson – Nogales

SEWER CATALOGING

VERIFY DESCRIPTION BEFORE CITY PLANS

SEWER MANHOLE DATA SHEET

MANHOLE NUMBER: 7

MANHOLE DESCRIPTION – TYPE: Sanitary Sewer

SIZE: 2.5'

CONDITION: Good, in use

NORTHING

EASTING

RIM ELEVATION 1095.72

HORIZONTAL DATUM

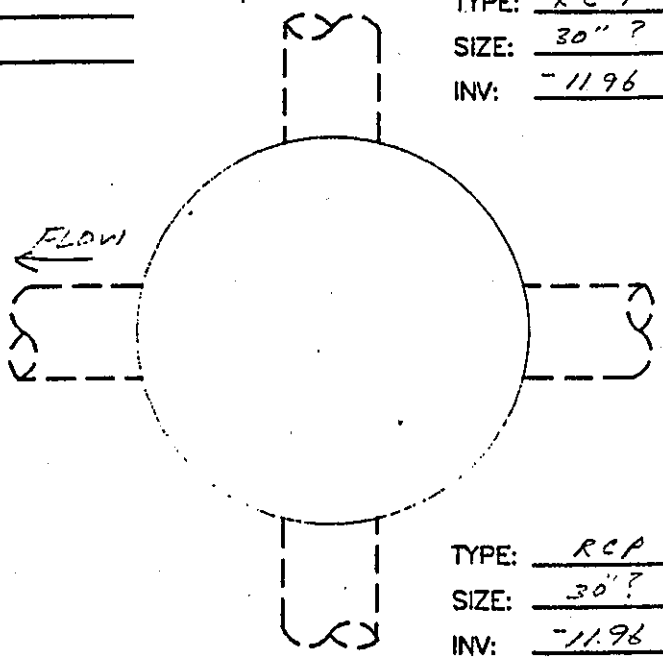
VERTICAL DATUM 050090 SRP 1097.0622

LAT. N:

LONG. W:

TYPE: RCP
SIZE: 30" ?
INV: -11.96

TYPE: RCP
SIZE: 48"
INV: -12.30



TYPE: RCP
SIZE: 48"
INV: -12.30

TYPE: RCP
SIZE: 30" ?
INV: -11.96

LOCATION: From the North East corner of Section 23 : 25' EAST, 6' NORTH

DESCRIBED BY: Duwayne Lee Haroldt

DATE RECOVERED: 8-29-99

Collins Pina Consulting Engineers, Inc.
40 E. VIRGINIA AVENUE SUITE 200 PHOENIX AZ 85004 - 602.264.7505

SEWER CATALOGING

SEWER MANHOLE DATA SHEET

[illegible] CITY PLAINS

MANHOLE NUMBER: 8

MANHOLE DESCRIPTION – TYPE: Sanitary Sewer

SIZE: 2.5

CONDITION: Good, in use

NORTHING

EASTING

RIM ELEVATION 1095.99

HORIZONTAL DATUM 050090 SRP

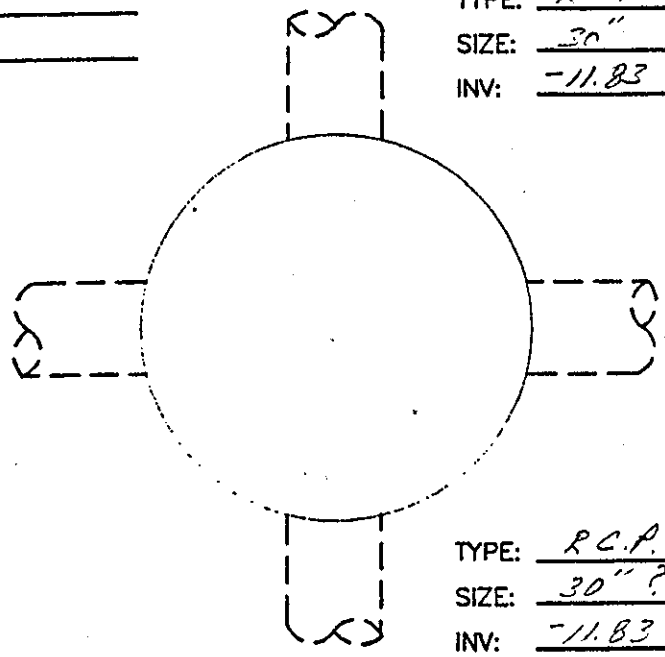
VERTICAL DATUM 1097.0622

LAT. N:

LONG. W:

TYPE: RCP
SIZE: 30"
INV: -11.83

TYPE:
SIZE:
INV:



TYPE: PVC
SIZE: 18" ?
INV: -11.86

TYPE: R.C.P.
SIZE: 30" ?
INV: -11.83

LOCATION: From the northeast corner of section 23: 25' East, 20' North

DESCRIBED BY: Dwayne Lee Nauert DATE RECOVERED: 8-29-99

Collins Pino Consulting Engineers, Inc.
40 E. VIRGINIA AVENUE SUITE 200 PHOENIX AZ 85004 - 602.264.7505

SEWER CATALOGING

SEWER MANHOLE DATA SHEET

VERIFY DISC., TYPE, AND SIZE FROM CITY PLANS

MANHOLE NUMBER: 9

MANHOLE DESCRIPTION – TYPE: Sanitary Sewer

SIZE: 2.0

CONDITION: Good, in use

NORTHING

EASTING

RIM ELEVATION 1095.58

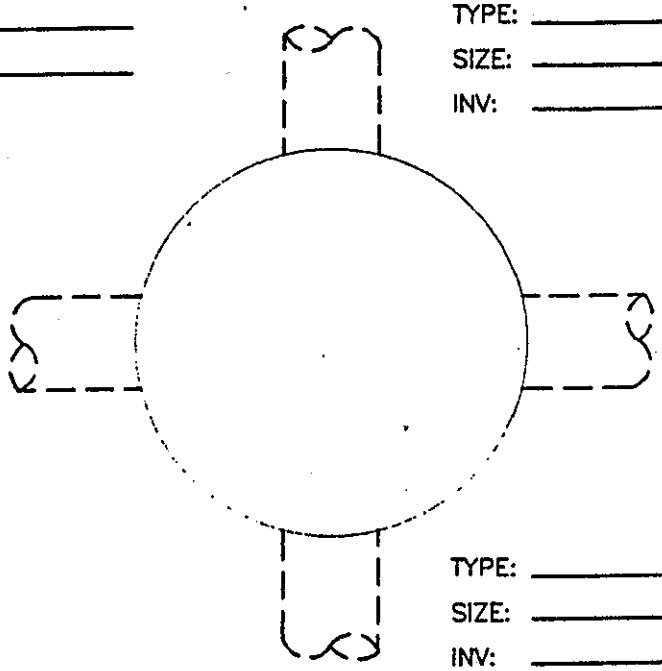
HORIZONTAL DATUM

VERTICAL DATUM 050090 SRP 1097 0622

LAT. N:

LONG. W:

TYPE:
SIZE:
INV:



TYPE: R.C.P.
SIZE: 30"?
INV: -12.35

TYPE: R.C.P.
SIZE: 30"
INV: -12.35

TYPE:
SIZE:
INV:

LOCATION: From the Northeast corner of section 23: 5' west, 6' south

DESCRIBED BY: Dwayne Lee Hacott DATE RECOVERED: 8-29-99

Collins Pina Consulting Engineers, Inc.
40 E. VIRGINIA AVENUE SUITE 200 PHOENIX AZ 85004 - 602.254.7505

SEWER CATALOGING

VERIFY DESC, TYPE & [illegible] PER CITY PLANS

SEWER MANHOLE DATA SHEET

MANHOLE NUMBER: 10

MANHOLE DESCRIPTION – TYPE: Storm Drain

SIZE: 2.5

CONDITION: good, in use

NORTHING

EASTING

RIM ELEVATION 1094.80

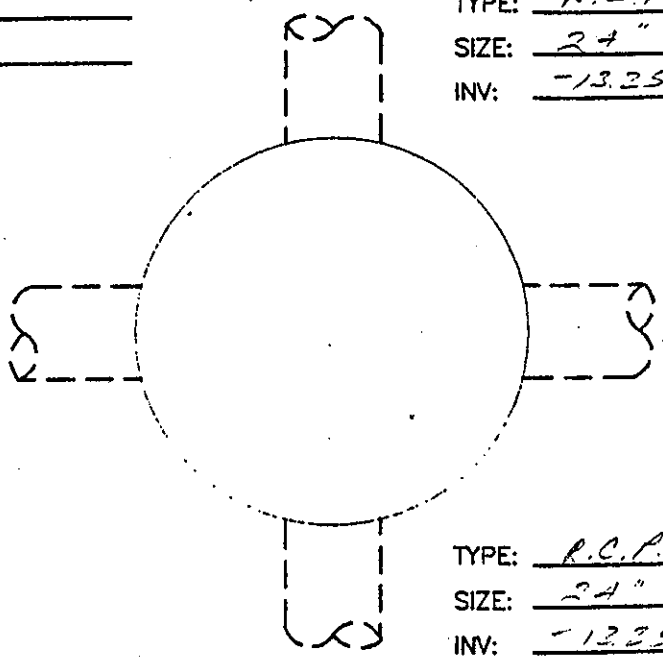
HORIZONTAL DATUM

VERTICAL DATUM 050090 SRP 1097.0622

LAT. N:

LONG. W:

TYPE: R.C.P.
SIZE: 24"
INV: -13.35



TYPE:
SIZE:
INV:

TYPE:
SIZE:
INV:

TYPE: R.C.P.
SIZE: 24"
INV: -13.35

LOCATION: From the Northeast corner of section 23: 3' East, 46' South

DESCRIBED BY: Dwayne Ta Hayat DATE RECOVERED: 8-29-99

Collins Pina Consulting Engineers, Inc.
40 E. VIRGINIA AVENUE SUITE 200 PHOENIX AZ 85004 - 602.264.7505

SEWER CATALOGING

VERIFY DIAG., TYPE, [illegible] FROM CITY PLANS

SEWER MANHOLE DATA SHEET

MANHOLE NUMBER: 11

MANHOLE DESCRIPTION – TYPE: Sanitary Sewer

SIZE: 2.0

CONDITION: unknown, See City Plans

NORTHING

EASTING

RIM ELEVATION 1094.36

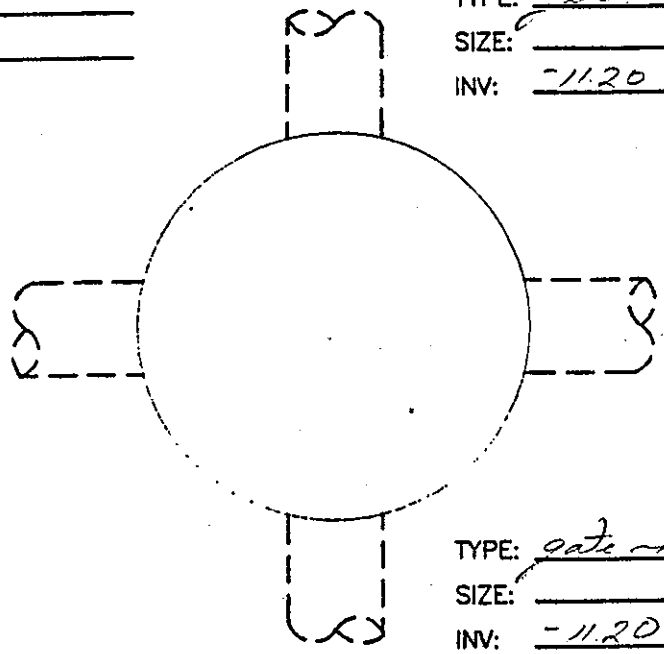
HORIZONTAL DATUM 050090 SRD

VERTICAL DATUM 1097.0622

LAT. N:

LONG. W:

TYPE: gate valve box
SIZE:
INV: -11.20



TYPE:
SIZE:
INV:

TYPE:
SIZE:
INV:

TYPE: gate valve box
SIZE:
INV: -11.20

LOCATION: From the Northeast corner section 23: 7' West, 64' South

DESCRIBED BY: Dwayne Lee Kaufman DATE RECOVERED: 8-29-99

Collins Piña Consulting Engineers, Inc.
40 E. VIRGINIA AVENUE SUITE 200 PHOENIX AZ 85004 - 602.264.7505

SEWER CATALOGING

VERIFY DESC, TYPE, & SIZE per City Plans

SEWER MANHOLE DATA SHEET

MANHOLE NUMBER: 12

MANHOLE DESCRIPTION – TYPE: Storm Drain

SIZE: 2.5'

CONDITION: unknown See City Plans

NORTHING

EASTING

RIM ELEVATION 1094.60

HORIZONTAL DATUM

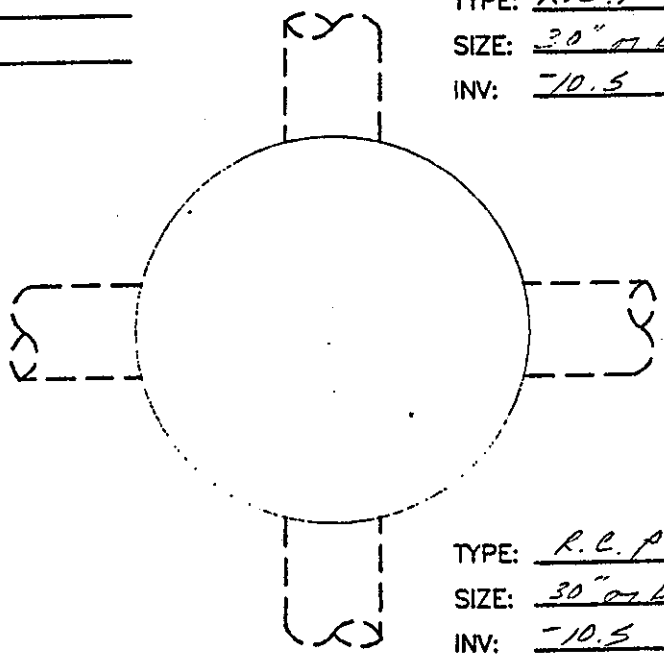
VERTICAL DATUM 050090 SRP 1097.0622

LAT. N:

LONG. W:

TYPE: R.C.P ?
SIZE: 30" or Box ?
INV: -10.5

TYPE:
SIZE:
INV:



TYPE:
SIZE:
INV:

TYPE: R.C.P ?
SIZE: 30" or Box ?
INV: -10.5

LOCATION: From the Northeast corner of section 23: 24' East 60' South

DESCRIBED BY: Dwayne Lee Harport DATE RECOVERED: 8-29-99

Collins Pina Consulting Engineers, Inc.
40 E. VIRGINIA AVENUE SUITE 200 PHOENIX AZ 85004 - 602.254.7505

SEWER CATALOGING

SEWER MANHOLE DATA SHEET

Verify Desc. Type, & Size per City Plans

MANHOLE NUMBER: 13

MANHOLE DESCRIPTION – TYPE: Sewer ?

SIZE: 2.5'

CONDITION: Abandon ?

NORTHING

EASTING

RIM ELEVATION 1094.81

HORIZONTAL DATUM

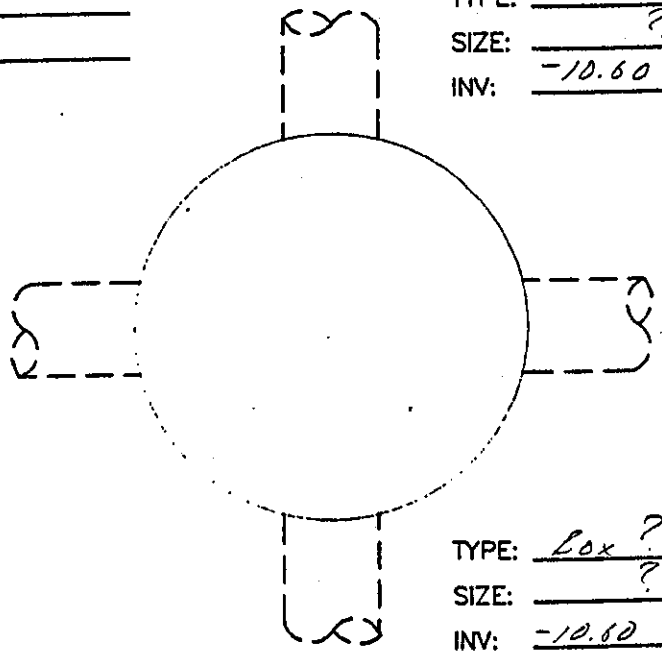
VERTICAL DATUM 050090 SRP 1097.0622

LAT. N:

LONG. W:

TYPE: Box ?
SIZE: ?
INV: -10.60

TYPE:
SIZE:
INV:



TYPE:
SIZE:
INV:

TYPE: Box ?
SIZE: ?
INV: -10.60

LOCATION: From the Northeast corner of section 23: 23' East, 15' South

DESCRIBED BY: Dwayne Lee Kaupert DATE RECOVERED: 8-29-99

Coffman Pina Consulting Engineers, Inc.
40 E. VIRGINIA AVENUE SUITE 200 PHOENIX AZ 85004 - 602.284.7505

SEWER CATALOGING

SEWER MANHOLE DATA SHEET

MANHOLE NUMBER: 14

MANHOLE DESCRIPTION – TYPE: SRP

SIZE: 25'

CONDITION: Bolted Shut

NORTHING

EASTING

RIM ELEVATION 1095.82

HORIZONTAL DATUM

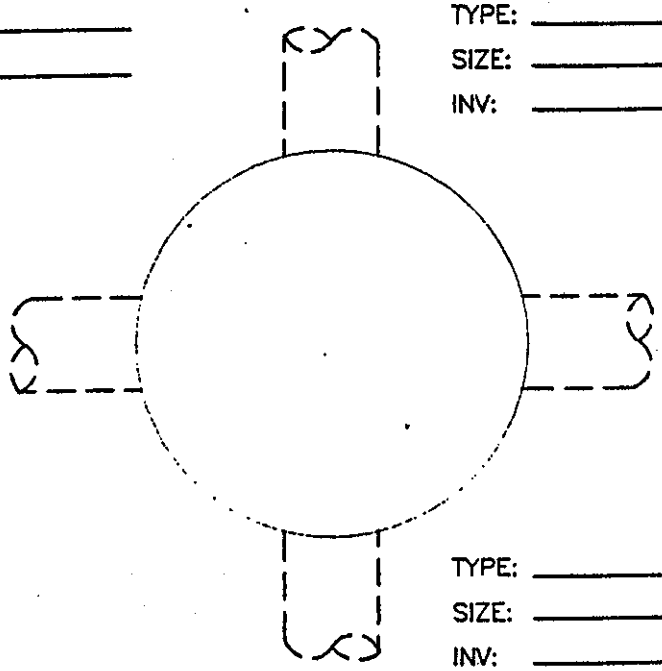
0500 90 SRP

VERTICAL DATUM 1097.06ZZ

LAT. N:

LONG. W:

TYPE:
SIZE:
INV:



TYPE:
SIZE:
INV:

TYPE:
SIZE:
INV:

TYPE:
SIZE:
INV:

LOCATION: From the Northeast corner section 23: 64' East, 23' North

DESCRIBED BY: Dwayne Lee Kawast DATE RECOVERED: 8-29-99

Collins Pina Consulting Engineers, Inc.
40 E. VIRGINIA AVENUE SUITE 200 PHOENIX AZ 85004 - 602.264.7505

SEWER CATALOGING

SEWER MANHOLE DATA SHEET

MANHOLE NUMBER: 15

MANHOLE DESCRIPTION – TYPE: SRP

SIZE: 2.0'

CONDITION: good, in use

NORTHING

EASTING

RIM ELEVATION 1095.64

HORIZONTAL DATUM

050090 SRP

VERTICAL DATUM 1097.0622

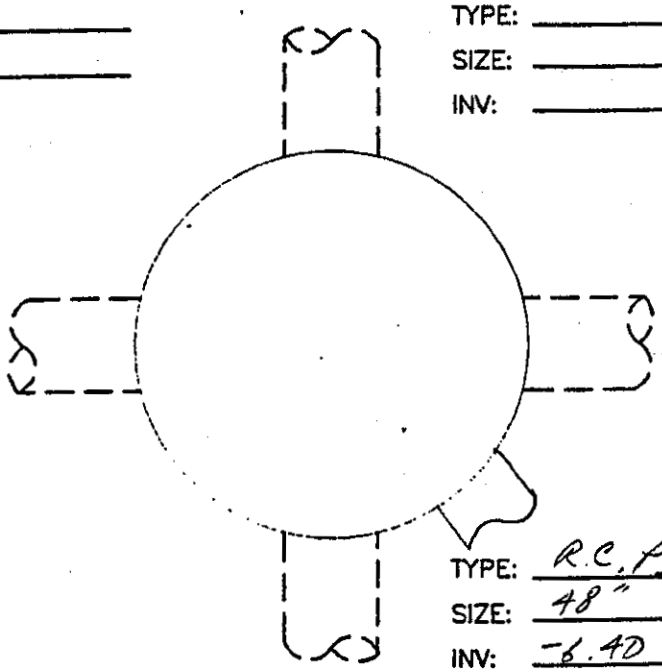
LAT. N:

LONG. W:

TYPE:

SIZE:

INV:



TYPE: R.C.P.

SIZE: 48"

INV:

TYPE:

SIZE:

INV:

TYPE: R.C.P.

SIZE: 48"

INV: -6.40

LOCATION: From the Northeast corner of section 23: 100' East, 20' south

DESCRIBED BY: Dwayne Lee Kaufman

DATE RECOVERED: 8-29-99

Collins Pina Consulting Engineers, Inc.
40 E. VIRGINIA AVENUE SUITE 200 PHOENIX AZ 85004 - 602.264.7505

SEWER CATALOGING

SEWER MANHOLE DATA SHEET

MANHOLE NUMBER: 16

MANHOLE DESCRIPTION – TYPE: STORM DRAIN

SIZE: 2.6

CONDITION: GOOD, IN USE

NORTHING _____ HORIZONTAL DATUM _____

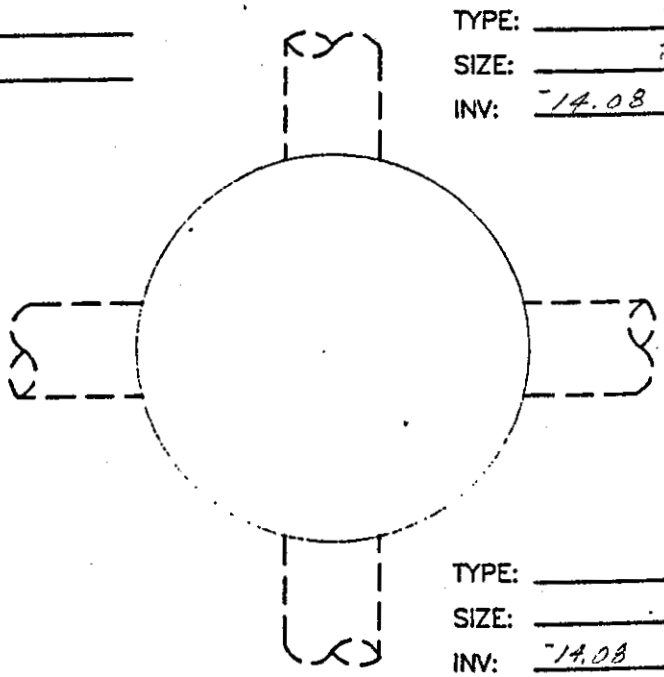
EASTING _____

RIM ELEVATION _____ VERTICAL DATUM _____

LAT. N: _____

LONG. W: _____

TYPE: ?
SIZE: ?
INV: -14.08



TYPE: _____
SIZE: _____
INV: _____

TYPE: _____
SIZE: _____
INV: _____

TYPE: ?
SIZE: ?
INV: -14.08

LOCATION: From the centerline intersection of 67TH Avenue & 66TH Avenue 3.5 south, 3.8 west

DESCRIBED BY: Dwayne Lee Hoyt DATE RECOVERED: 8-31-99

Collins Piña Consulting Engineers, Inc.
40 E. VIRGINIA AVENUE SUITE 200 PHOENIX AZ 85004 - 602.264.7505

SEWER CATALOGING

SEWER MANHOLE DATA SHEET

MANHOLE NUMBER: 17

MANHOLE DESCRIPTION – TYPE: STORM DRAIN

SIZE: 2.6

CONDITION: good, in use

NORTHING

EASTING

RIM ELEVATION

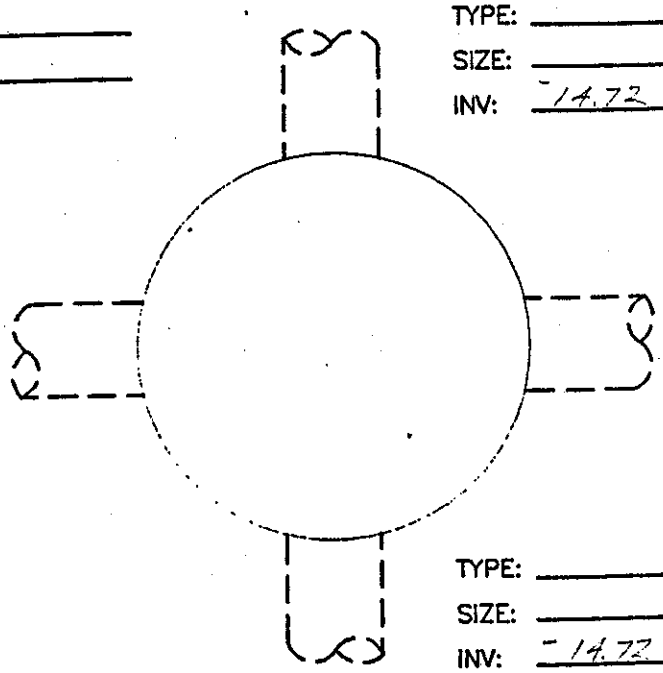
HORIZONTAL DATUM

VERTICAL DATUM

LAT. N:

LONG. W:

TYPE: ?
SIZE: ?
INV: -14.72



TYPE:
SIZE:
INV:

TYPE:
SIZE:
INV:

TYPE: ?
SIZE: ?
INV: -14.72

LOCATION: From the base cap @ 67TH Avenue & Heatherdale
3' West & 72 South

DESCRIBED BY: [illegible]

DATE RECOVERED: 8-31-99

Collins Pina Consulting Engineers, Inc.
40 E. VIRGINIA AVENUE SUITE 200 PHOENIX AZ 85004 - 602.264.7505

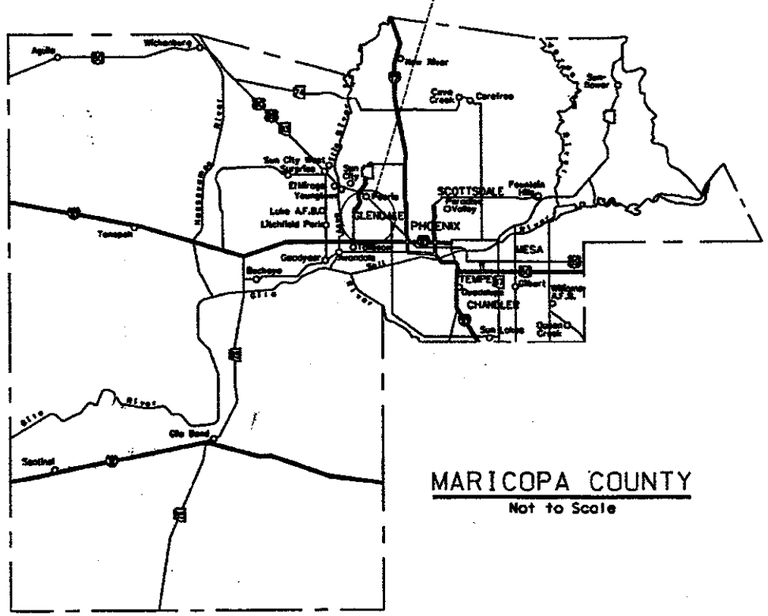
C.2 – RESULTS OF SURVEY

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

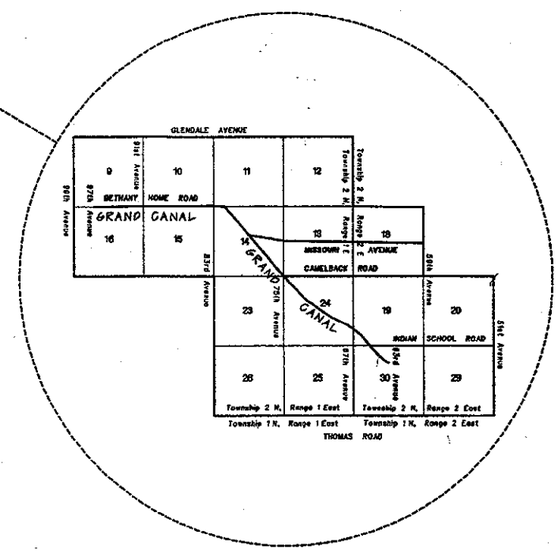
BETHANY HOME OUTFALL CHANNEL PHASE II RESULTS OF SURVEY

F.C.D. CONTRACT No. 98-46

PROJECT LOCATION



MARICOPA COUNTY
Not to Scale



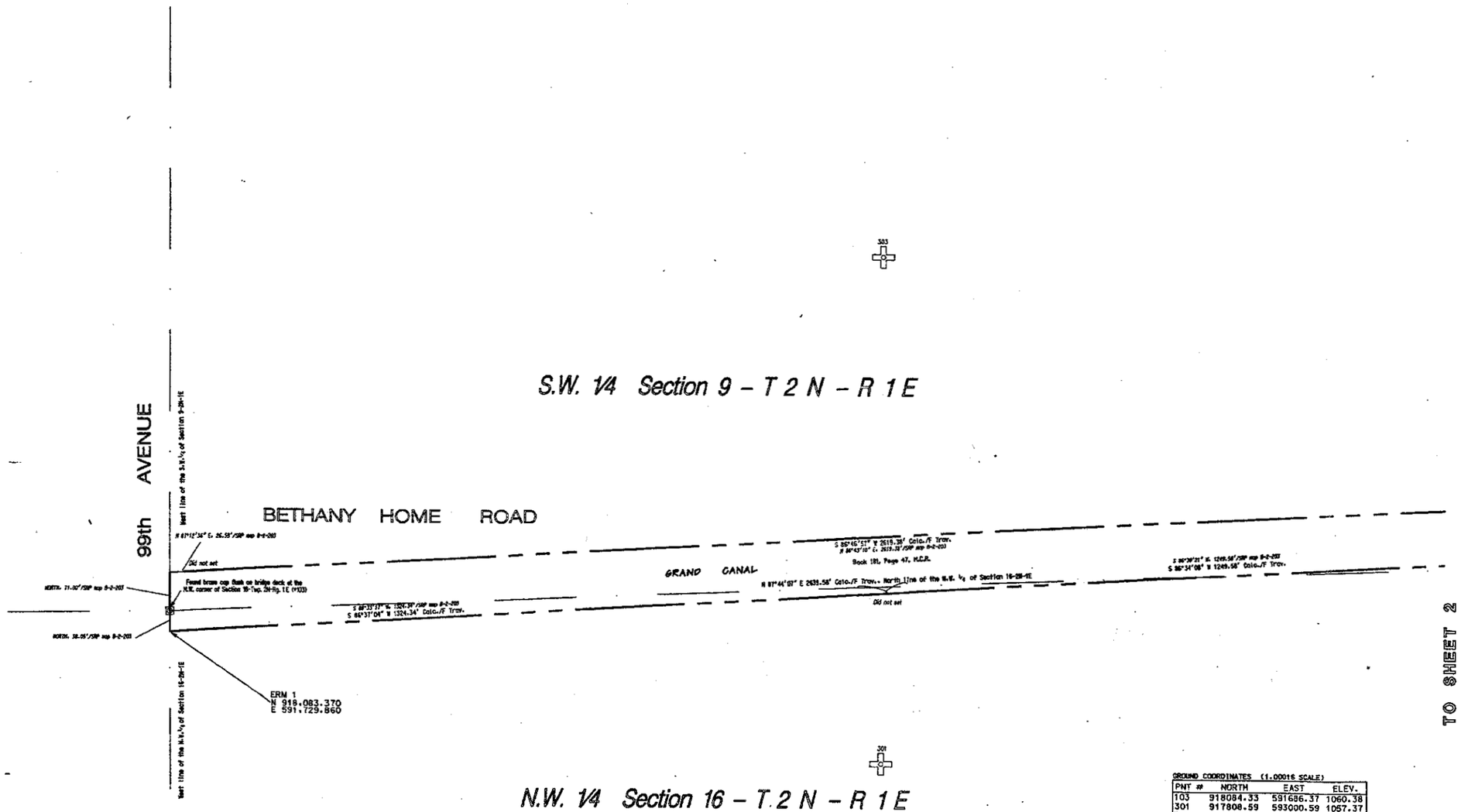
VICINITY MAP
Not to Scale

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY		
BETHANY HOME OUTFALL CHANNEL PHASE II RESULTS OF SURVEY F.C.D. CONTRACT No. 98-46		
Collins Pina — Phoenix - Tucson - Nogales		
	BY	DATE
DESIGN	JRC	
DESIGN CHK.		4/27/2000
PLANS	CAH	
PLANS CHK.		5/01/2000

PROFESSIONAL LAND SURVEYOR CERTIFICATE NO. 22755 JOHN R. COLLINS ARIZONA U.S.A.

38

...\deliverables\BethCover.dgn.dgn 04/28/00 07:26:25 AM



GROUND COORDINATES (1.00016 SCALE)

PNT #	NORTH	EAST	ELEV.
103	918084.33	591686.37	1060.38
301	917808.59	593000.59	1057.37
303	918748.29	593003.65	1061.08

LEGEND

CANAL RIGHT OF WAY
SUBDIVISION AND LOT LINES
SECTION LINES
QUARTER SECTION LINES
EASEMENT LINES
PK - PARKER KAYLON NAIL
AERIAL PANEL

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929. CONVERSION FACTOR OF N.G.V.D. 1929 TO N.A.V.D. 1988 THE NORTH AMERICAN VERTICAL DATUM OF 1988 = + 1.9098

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 1	1062.176	3" BRASS CAP LOCATED ON THE S. END ON THE E. SIDE GUARD RIAL FOR THE 99TH AVE. BRIDGE OVER THE GRAND CANAL. STAMPED "MCHD 1062.19"

NOTES

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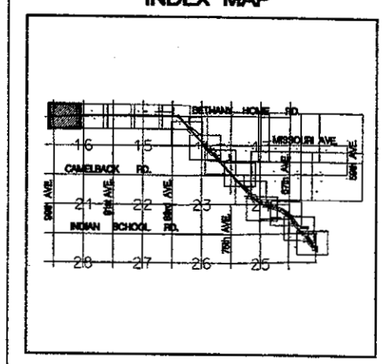
INDEX MAP



100 0 100 200
SCALE: 1" = 100 FEET

No.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BETHANY HOME OUTFALL CHANNEL PHASE II RESULTS OF SURVEY F.C.D. CONTRACT No. 98-46

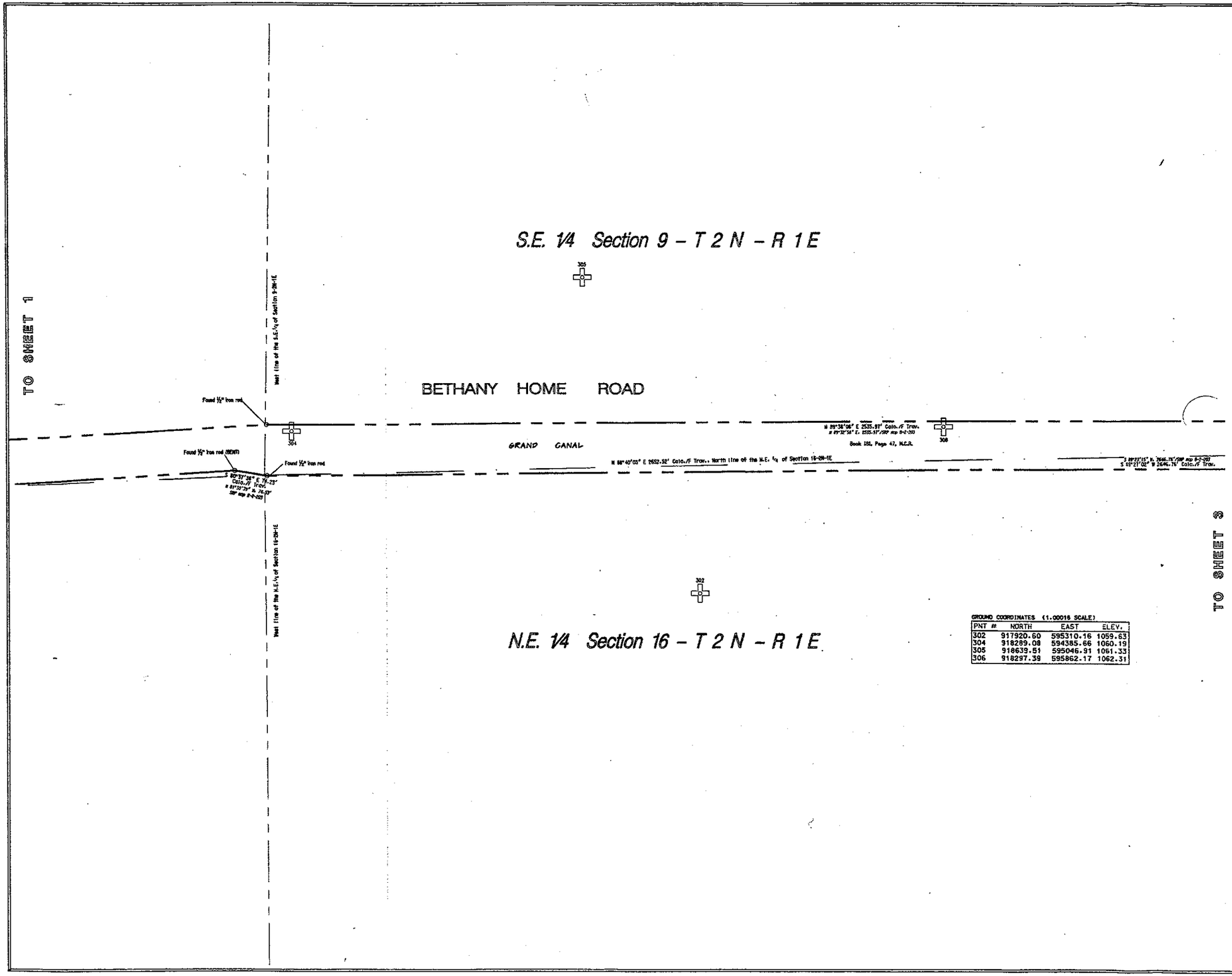
PROFESSIONAL LAND SURVEYOR CERTIFICATE NO. 22756 JOHN R. COLLINS DATE SIGNED 5/8/00 ARIZONA U.S.A.

Collins/Piña
Phoenix - Tucson - Nogales

	BY	DATE
DESIGN	JRC	
DESIGN CHK.	CAH	05/03/2000
PLANS	CAH	
PLANS CHK.	JRC	5/07/2000

SHEET 39

GROUND CONTROL SURVEY DATA PROVIDED BY COLLINS - PIÑA ENGINEERING, INC.



GROUND COORDINATES (1.00015 SCALE)

PNT #	NORTH	EAST	ELEV.
302	917920.60	595310.16	1059.63
304	918289.08	594385.66	1060.19
305	918639.51	595046.91	1061.33
306	918297.39	595862.17	1062.31

LEGEND

CANAL RIGHT OF WAY
SUBDIVISION AND LOT LINES
SECTION LINES
QUARTER SECTION LINES
EASEMENT LINES
PK - PARKER KAYLON NAIL
AERIAL PANELS

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929. CONVERSION FACTOR OF N.G.V.D. 1929 TO N.A.V.D. 1988 THE NORTH AMERICAN VERTICAL DATUM OF 1988 = + 1.9098

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION

NOTES

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FIELD SURVEY CERTIFICATION

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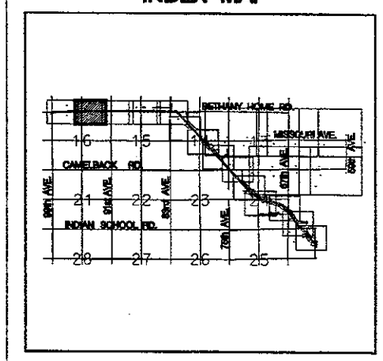
INDEX MAP



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SCALE: 1"= 100 FEET

No.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BETHANY HOME OUTFALL CHANNEL PHASE II
RESULTS OF SURVEY
F.C.D. CONTRACT No. 98-46

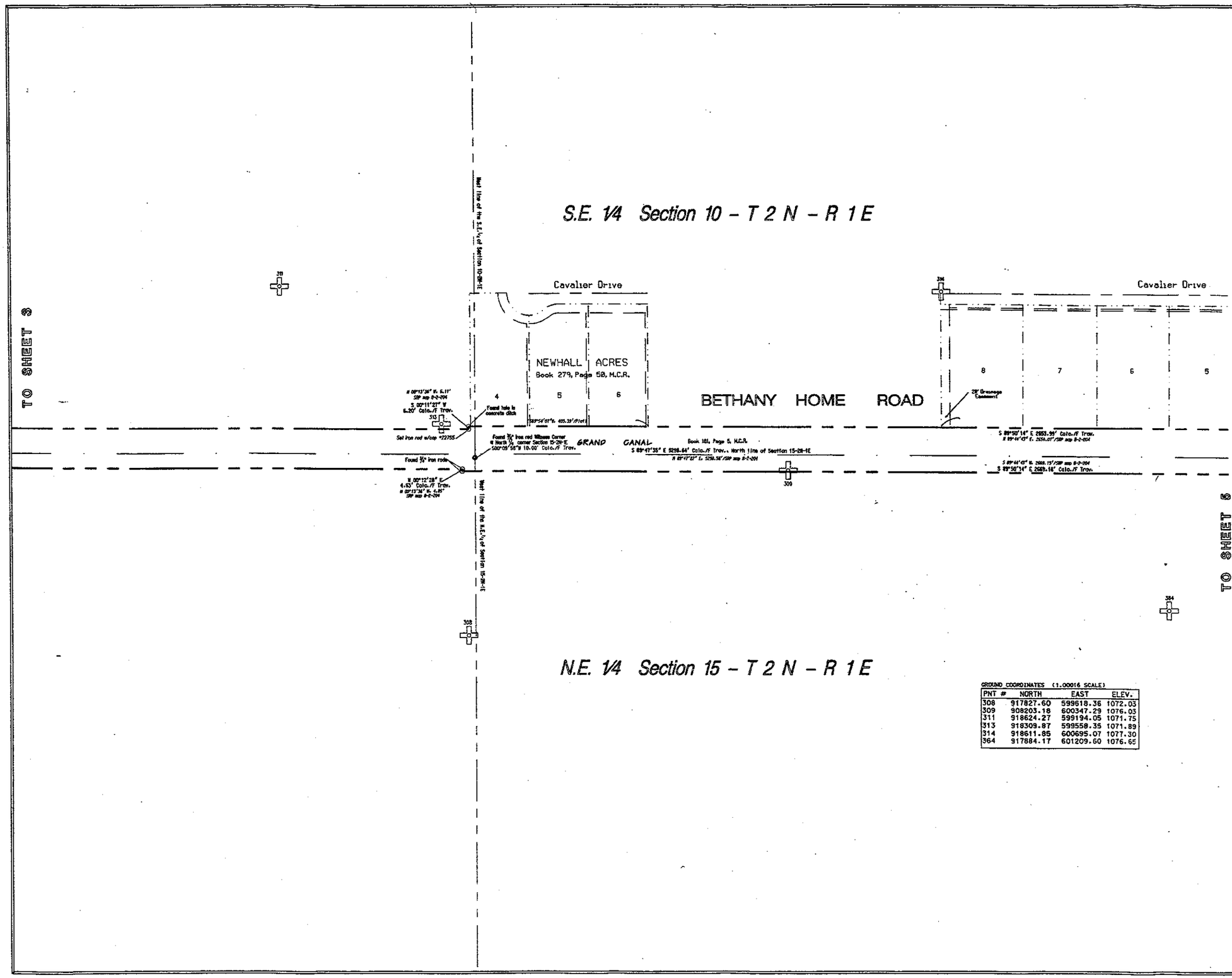
PROFESSIONAL LAND SURVEYOR CERTIFICATE NO. 22755 JOHN K. COLLINS Date Signed 5/31/00 ARIZONA U.S.A.

Collins/Piña
Phoenix - Tucson - Nogales

	BY	DATE
DESIGN	JRC	
DESIGN CHK.	[illegible]	05/31/2000
PLANS	CAH	
PLANS CHK.	[illegible]	5/31/2000

SHEET 4.0

GROUND CONTROL SURVEY DATA PROVIDED BY COLLINS - PIÑA ENGINEERING, INC.



GROUND COORDINATES (1.00016 SCALE)

PNT #	NORTH	EAST	ELEV.
308	917827.60	599618.36	1072.03
309	908203.18	600347.29	1076.03
311	918624.27	599194.05	1071.75
313	918309.87	599558.35	1071.89
314	918611.85	600695.07	1077.30
364	917884.17	601209.50	1076.65

LEGEND

CANAL RIGHT OF WAY
SUBDIVISION AND LOT LINES
SECTION LINES
QUARTER SECTION LINES
EASEMENT LINES
PK - PARKER KAYLON NAIL
AERIAL PANEL

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929. CONVERSION FACTOR OF N.G.V.D. 1929 TO N.A.V.D. 1988 THE NORTH AMERICAN VERTICAL DATUM OF 1988 = + 1.9098

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION

NOTES

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FIELD SURVEY CERTIFICATION

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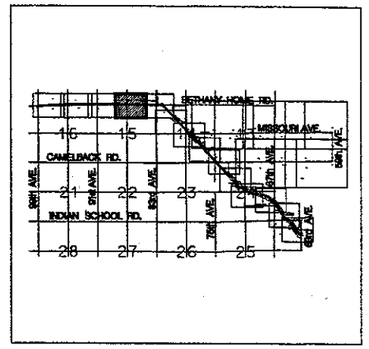
INDEX MAP



100 0 100 200
SCALE: 1"= 100 FEET

No.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BETHANY HOME OUTFALL CHANNEL PHASE II RESULTS OF SURVEY F.C.D. CONTRACT No. 98-46

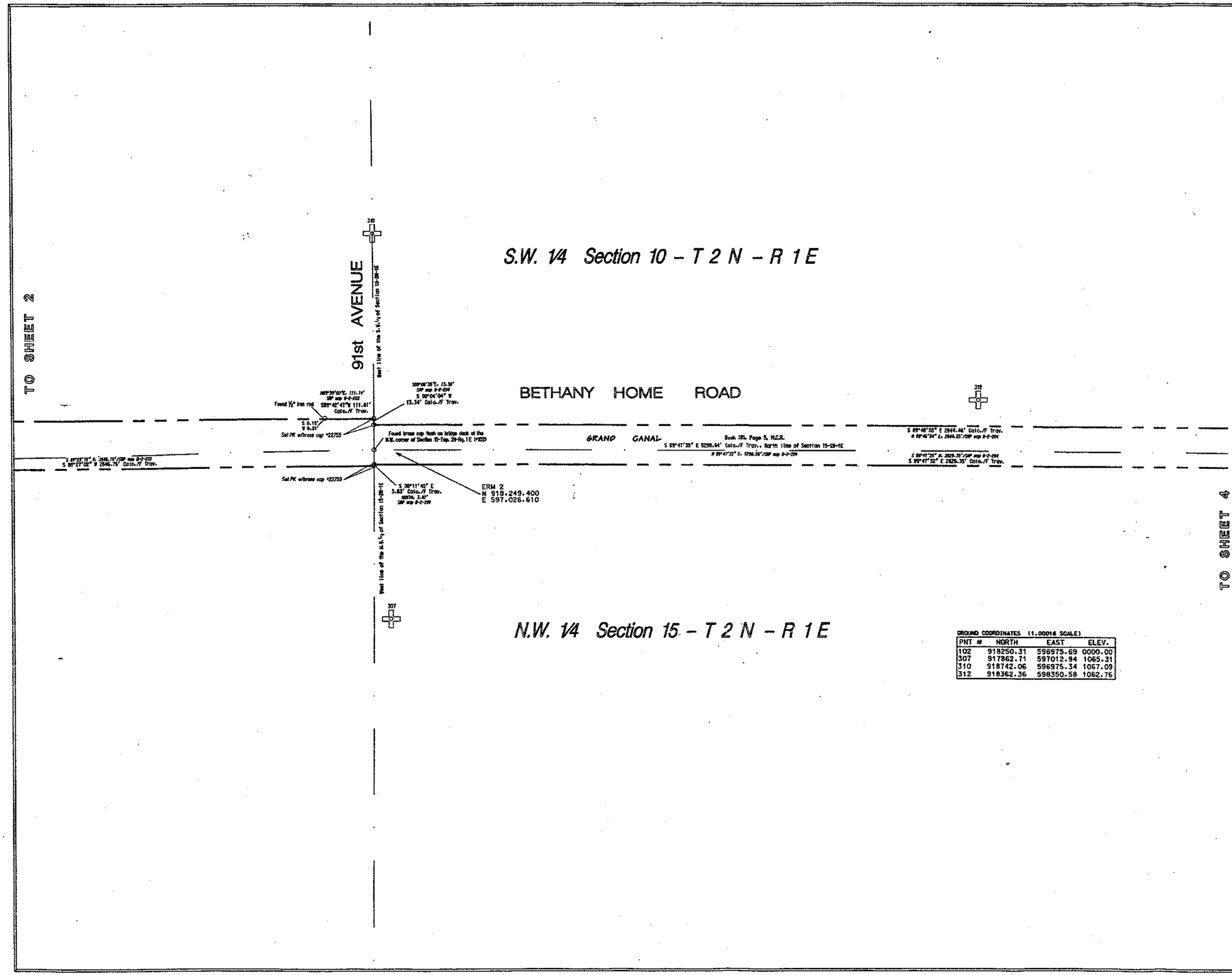
PROFESSIONAL LAND SURVEYOR CERTIFICATE NO. 22755 JOHN D. COLLINS ARIZONA U.S.A. Date Signed 5/11/00

Collins/Pina
Phoenix - Tucson - Nogales

	BY	DATE
DESIGN	JRC	
DESIGN CHK.	CAH	05/08/2000
PLANS	CAH	
PLANS CHK.	JRC	5/11/2000

SHEET 42

GROUND CONTROL SURVEY DATA PROVIDED BY COLLINS - PINA ENGINEERING, INC.



GROUND COORDINATES (1.00016 SCALE)

PNT #	NORTH	EAST	ELEV.
102	918250.31	596975.69	0000.00
307	917862.71	597012.94	1065.31
310	918742.06	596975.34	1067.09
312	918362.36	598350.58	1062.76

LEGEND

CANAL RIGHT OF WAY
SUBDIVISION AND LOT LINES
SECTION LINES
QUARTER SECTION LINES
EASEMENT LINES
PK – PARKER KAYLON NAIL
AERIAL PANEL

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929. CONVERSION FACTOR OF N.G.V.D. 1929 TO N.A.V.D. 1988 THE NORTH AMERICAN VERTICAL DATUM OF 1988 = + 1.9098

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 2	1069.053	3" BRASS CAP LOCATED ON THE SW CORNER OF THE RADIAL GATE #2-22 FOR THE GRAND CANAL SITUATED EAST OF 91ST AVE., STAMPED "SRVWUA ENGINEERING DEPT. BENCHMARK"

NOTES

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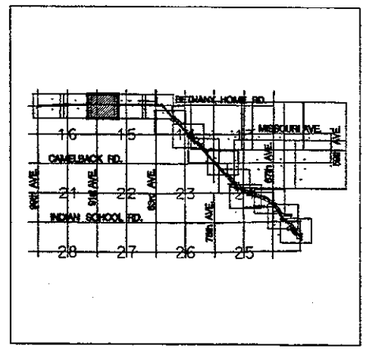
The intent of this field survey is to provide ground elevation and horizontal control reference data, to be utilized in the preparation of photogrammetric mapping. Field verification of photogrammetric data was conducted using spot shots, profile and cross-section elevations obtained by Global Positioning Systems (GPS) and conventional surveying methods. This map is not intended for use as an American Land Title Association (ALTA) boundary or facilities location survey. The ground coordinates/bearings shown, are based on the North American Datum of 1983 State Plane Coordinate System, Arizona Central Zone, as published by the Arizona Department of Transportation.

INDEX MAP



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SCALE: 1"= 100 FEET

No.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BETHANY HOME OUTFALL CHANNEL PHASE II
RESULTS OF SURVEY
F.C.D. CONTRACT No. 98-46

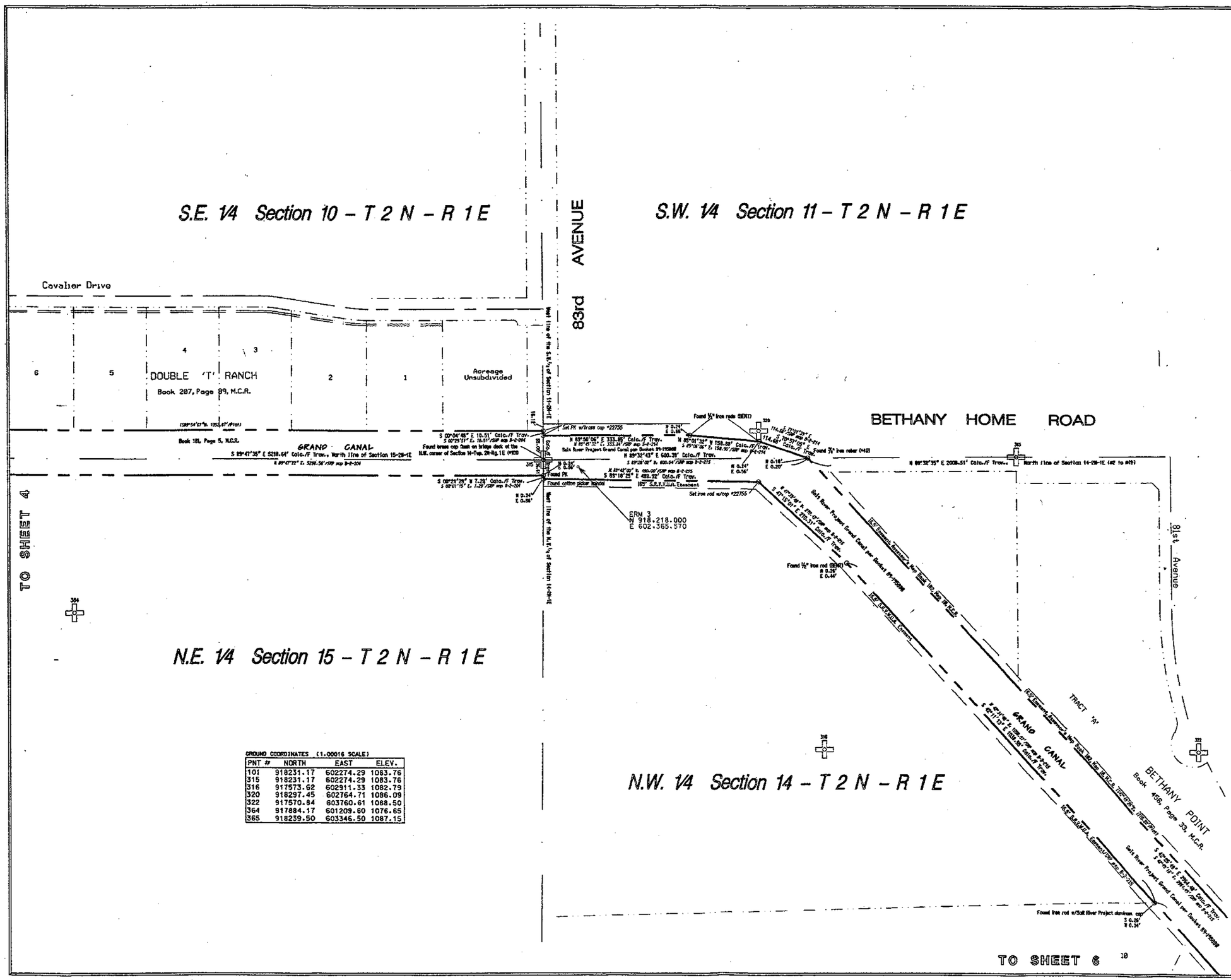
PROFESSIONAL LAND SURVEYOR CERTIFICATE NO. 22755 JOHN R. COLLINS 5/6/2000 ARIZONA U.S.A.

Collins/Pina
Phoenix - Tucson - Nogales

	BY	DATE
DESIGN	JRC	
DESIGN CHK.		05/03/2000
PLANS	OAH	
PLANS CHK.		3/01/2000

SHEET 1 of 1

GROUND CONTROL SURVEY DATA PROVIDED BY COLLINS - PINA ENGINEERING, INC.



GROUND COORDINATES (1.00016 SCALE)

PNT #	NORTH	EAST	ELEV.
101	918231.17	602274.29	1083.76
315	918231.17	602274.29	1083.76
316	917573.62	602911.33	1082.79
320	918297.45	602764.71	1086.09
322	917570.84	603760.61	1088.50
364	917884.17	601209.60	1076.65
365	918239.50	603346.50	1087.15

LEGEND

CANAL RIGHT OF WAY
SUBDIVISION AND LOT LINES
SECTION LINES
QUARTER SECTION LINES
EASEMENT LINES
PK - PARKER KAYLON NAIL
AERIAL PANEL

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929. CONVERSION FACTOR OF N.G.V.D. 1929 TO N.A.V.D. 1988 THE NORTH AMERICAN VERTICAL DATUM OF 1988 = + 1.9098

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 3	1088.75	3" ALUMINUM CAP LOCATED ON THE SW CORNER ON THE RADIAL GATE #2-21 FOR THE GRAND CANAL SITUATED ON THE EAST SIDE OF 83RD AVE. STAMPED "SALT RIVER PROJECT BM 93" AND "4.0E 10.0N".

NOTES

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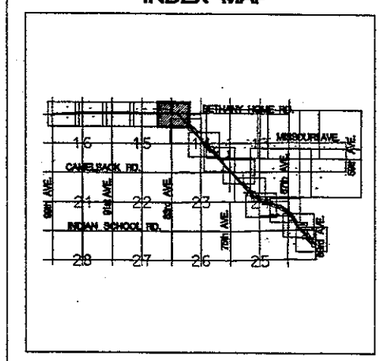
INDEX MAP



100 0 100 200
SCALE: 1"= 100 FEET

No.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

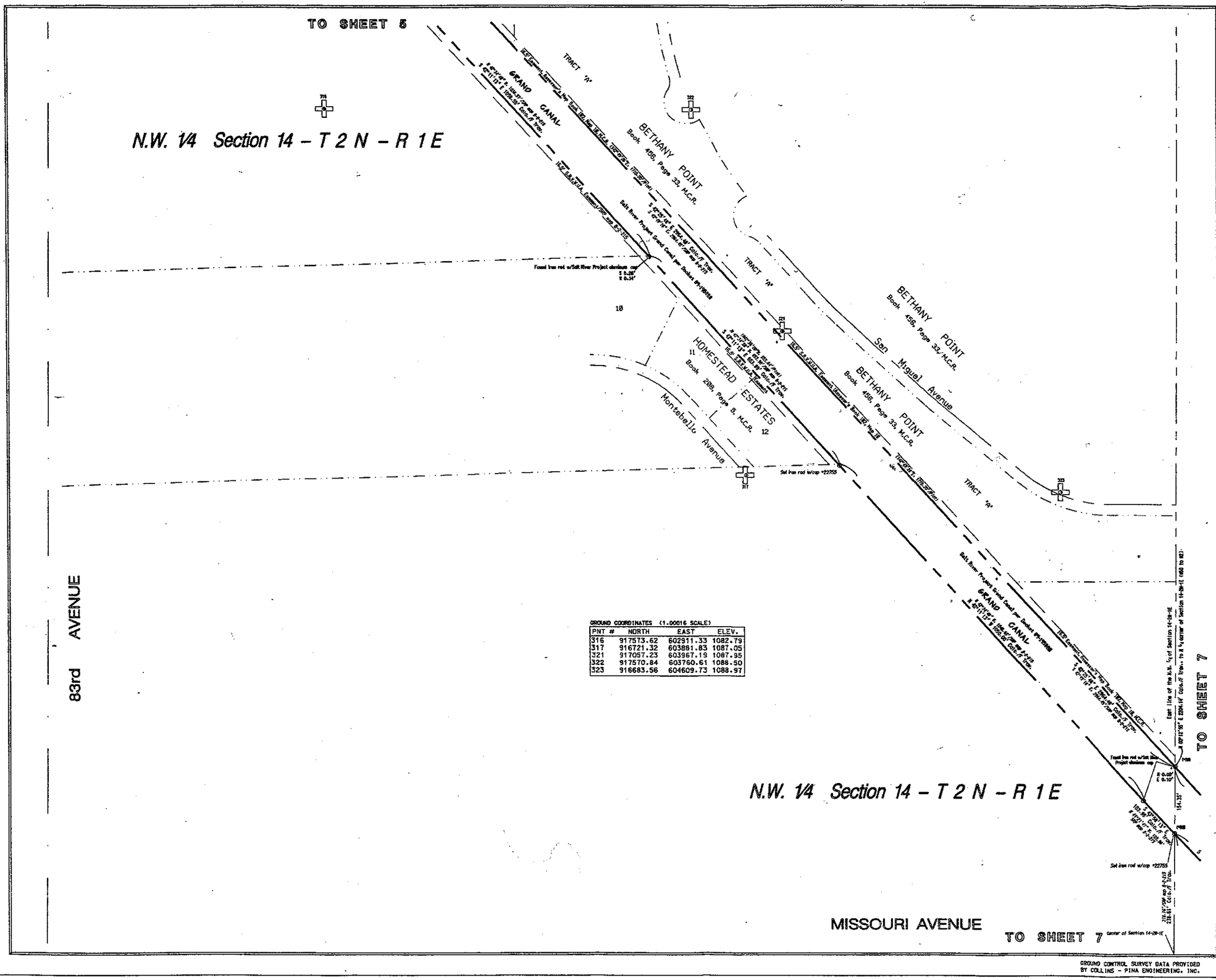
BETHANY HOME OUTFALL CHANNEL PHASE II
RESULTS OF SURVEY
F.C.D. CONTRACT No. 98-46

Collins/Pina
Phoenix - Tucson - Nogales

	BY	DATE
DESIGN	JRC	
DESIGN CHK.	DAG	05/03/2000
PLANS	CAH	
PLANS CHK.	JTC	5/01/2000

SHEET 43

GROUND CONTROL SURVEY DATA PROVIDED BY COLLINS - PINA ENGINEERING, INC.



GROUND COORDINATES (1.00016 SCALE)

PNT #	NORTH	EAST	ELEV.
316	917573.62	602911.33	1082.79
317	916721.32	603881.83	1087.05
321	917057.23	603967.19	1087.95
322	917570.84	603760.61	1088.50
323	916683.56	604609.73	1088.97

LEGEND

- CANAL RIGHT OF WAY
- SUBDIVISION AND LOT LINES
- SECTION LINES
- QUARTER SECTION LINES
- EASEMENT LINES
- PK - PARKER KAYLON NAIL
- AERIAL PANEL

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929. CONVERSION FACTOR OF N.G.V.D. 1929 TO N.A.V.D. 1988 THE NORTH AMERICAN VERTICAL DATUM OF 1988 = + 1.9098

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION

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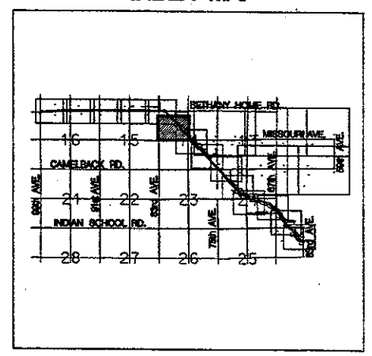
INDEX MAP



100 0 100 200
SCALE: 1" = 100 FEET

No.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

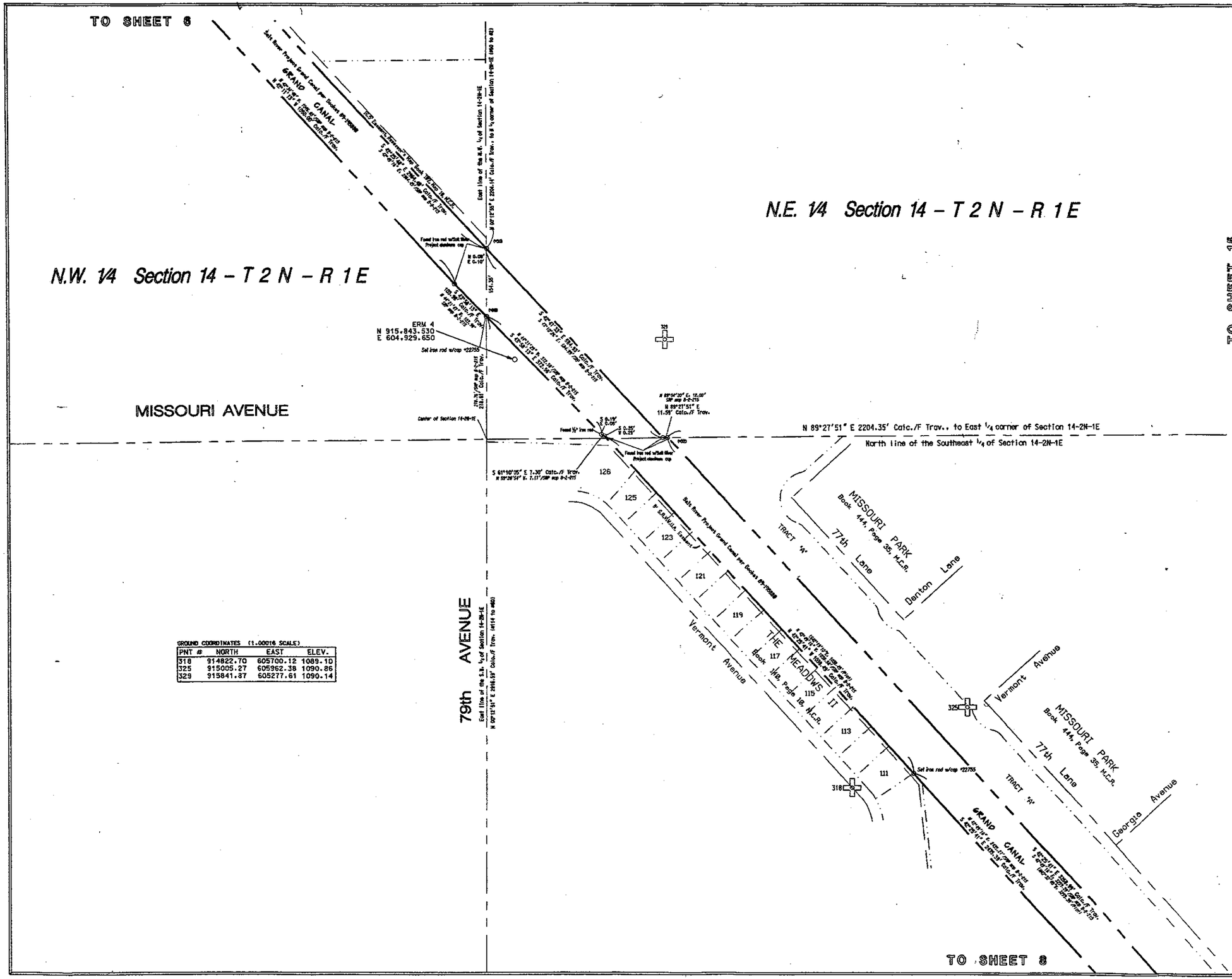
BETHANY HOME OUTFALL CHANNEL PHASE II
RESULTS OF SURVEY
F.C.D. CONTRACT No. 98-46

PROFESSIONAL LAND SURVEYOR CERTIFICATE NO. 22755 JOHN R. COLLINS ARIZONA U.S.A. 5/3/99

Collins/Pina
Phoenix - Tucson - Nogales

	BY	DATE
DESIGN	JRC	
DESIGN CHK.	JRC	05/04/2000
PLANS	CAH	
PLANS CHK.	JRC	05/04/2000

SHEET 4 of 4



GROUND COORDINATES (1.00016 SCALE)			
PNT #	NORTH	EAST	ELEV.
318	914822.70	605700.12	1089.10
325	915005.27	605962.38	1090.86
329	915841.87	605277.61	1090.14

LEGEND

CANAL RIGHT OF WAY
SUBDIVISION AND LOT LINES
SECTION LINES
QUARTER SECTION LINES
EASEMENT LINES
PK - PARKER KAYLON NAIL
AERIAL PANEL

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929. CONVERSION FACTOR OF N.G.V.D. 1929 TO N.A.V.D. 1988 THE NORTH AMERICAN VERTICAL DATUM OF 1988 = + 1.9098

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 4	1090.89	3" ALUMINUM CAP LOCATED ON THE S.E. CORNER OF THE WELL PAD SITUATED ON THE S. SIDE ON THE GRAND CANAL AND THE E. SIDE OF 79TH AVE., STAMPED "045095"

NOTES

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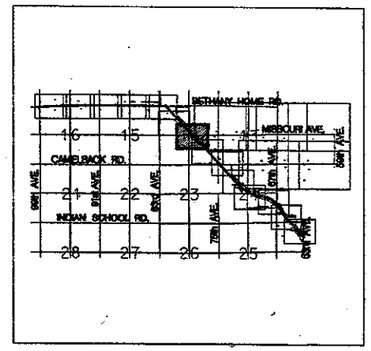
INDEX MAP



100 0 100 200
SCALE: 1" = 100 FEET

No.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

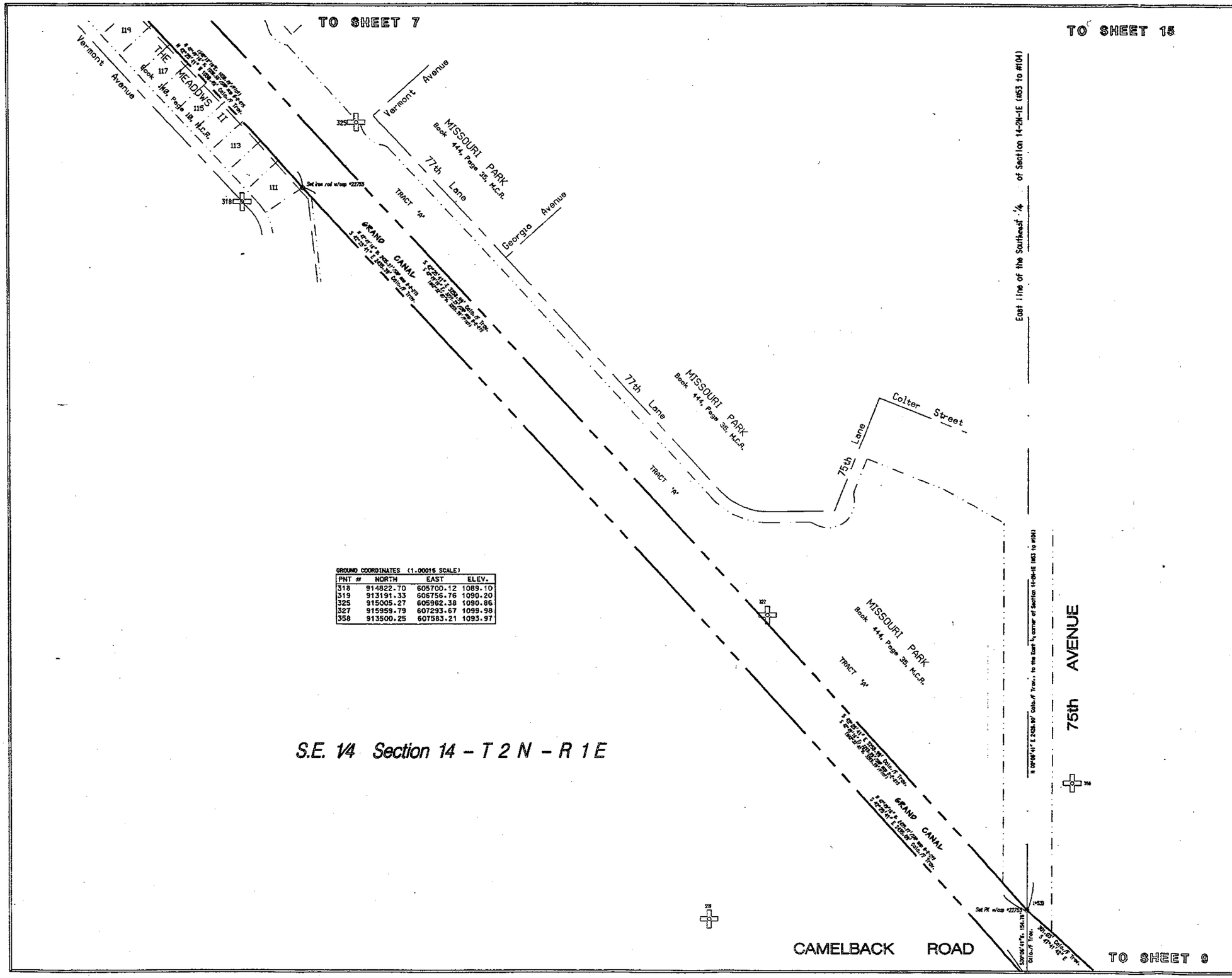
BETHANY HOME OUTFALL CHANNEL PHASE II
RESULTS OF SURVEY
F.C.D. CONTRACT No. 98-46

Collins/Pina
Phoenix - Tucson - Nogales

	BY	DATE
DESIGN	JRC	
DESIGN CHK.		5/18/2000
PLANS	CAH	
PLANS CHK.		5/21/2000

SHEET 4 5

GROUND CONTROL SURVEY DATA PROVIDED BY COLLINS - PINA ENGINEERING, INC.



GROUND COORDINATES (1.00015 SCALE)

PNT #	NORTH	EAST	ELEV.
318	914822.70	605700.12	1089.10
319	913191.33	606756.76	1090.20
325	915005.27	605962.38	1090.86
327	915959.79	607293.67	1099.98
358	913500.25	607583.21	1093.97

LEGEND

- CANAL RIGHT OF WAY
- SUBDIVISION AND LOT LINES
- SECTION LINES
- QUARTER SECTION LINES
- EASEMENT LINES
- PK - PARKER KAYLON NAIL
- AERIAL PANEL

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929. CONVERSION FACTOR OF N.G.V.D. 1929 TO N.A.V.D. 1988 THE NORTH AMERICAN VERTICAL DATUM OF 1988 = + 1.9098

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION

NOTES

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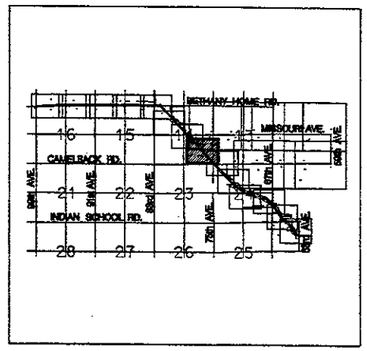
The original instrument signed and sealed by a registered professional shall take precedence over any similar instrument not signed and sealed, including computer storage medium. Any reproductions in whole or in part shall bear or refer to this signature and seal.

FIELD SURVEY CERTIFICATION

The intent of this field survey is to provide ground elevation and horizontal control reference data to be utilized in the preparation of photogrammetric mapping. Field verification of photogrammetric data was conducted using cross sect., profile and cross-section elevations obtained by Global Positioning Systems (GPS) and conventional surveying methods. This map is not intended for use as an American Land Title Association (ALTA) boundary or facilities location survey. The ground coordinates/bearings shown are based on the North American Datum of 1983 State Plane Coordinate System, Arizona Central Zone, as published by the Arizona Department of Transportation.

INDEX MAP



100 0 100 200
SCALE: 1"= 100 FEET

No.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

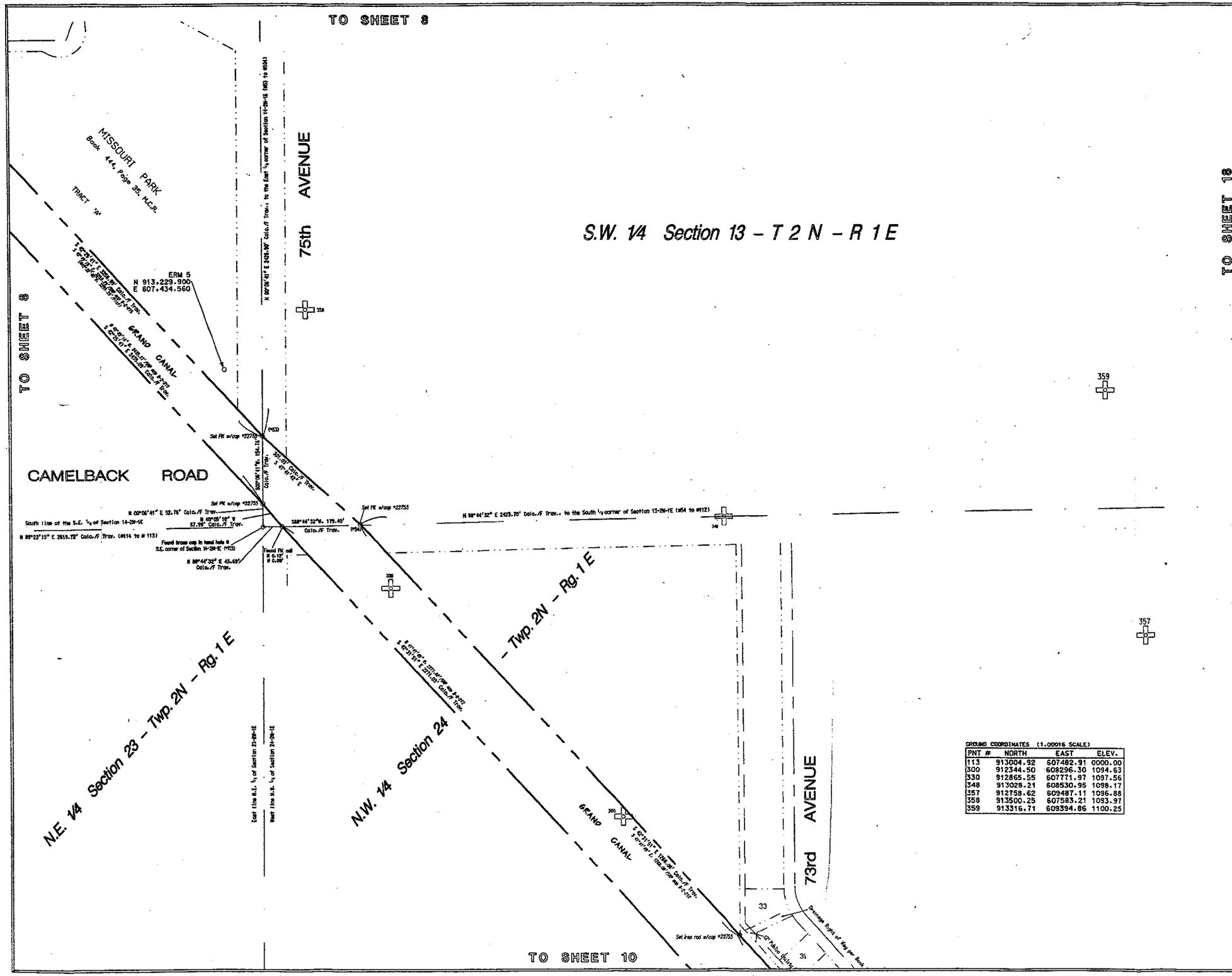
BETHANY HOME OUTFALL CHANNEL PHASE II
RESULTS OF SURVEY
F.C.D. CONTRACT No. 98-46

Collins/Pina
Phoenix - Tucson - Nogales

	BY	DATE
DESIGN	JRC	
DESIGN CHK.	DW	05/03/2000
PLANS	CAH	
PLANS CHK.	JRC	5/01/2000

SHEET 4 of 6

GROUND CONTROL SURVEY DATA PROVIDED BY COLLINS - PINA ENGINEERING, INC.



GROUND COORDINATES (1.00016 SCALE)

PNT #	NORTH	EAST	ELEV.
113	913004.92	607482.91	0000.00
300	912344.50	608296.30	1094.63
330	912865.55	607771.97	1097.56
348	913028.21	608530.95	1098.17
357	912758.62	609487.11	1096.88
358	913500.25	607583.21	1093.97
359	913316.71	609394.86	1100.25

GROUND CONTROL SURVEY DATA PROVIDED BY COLLINS - PINA ENGINEERING, INC.

LEGEND

CANAL RIGHT OF WAY
SUBDIVISION AND LOT LINES
SECTION LINES
QUARTER SECTION LINES
EASEMENT LINES
PK - PARKER KAYLON NAIL
AERIAL PANELS

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929. CONVERSION FACTOR OF N.G.V.D. 1929 TO N.A.V.D. 1988 THE NORTH AMERICAN VERTICAL DATUM OF 1988 = + 1.9098

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 5	1096.36	3" ALUMINUM CAP LOCATED AT THE N. SIDE OF THE GRAND CANAL AND THE W. SIDE OF 75TH AVE., STAMPED "ARIZONA D.O.T. HWY. DIV." AND "1986 GEODETIC SURVEY" AND "BACK".

NOTES

Use of the information contained in this instrument for other than the specific purpose for which it was intended is forbidden unless expressly permitted in writing in advance by Collins/Pina Consulting Engineers, Inc., and Collins/Pina Consulting Engineers, Inc. shall take no liability to any person or entity for any use of this information without their written consent.
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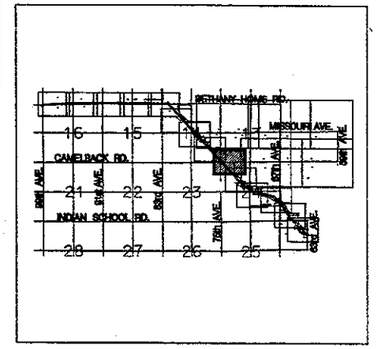
FIELD SURVEY CERTIFICATION

The intent of this field survey is to provide ground elevation and horizontal control reference data, to be utilized in the preparation of photogrammetric mapping. Field verification of photogrammetric data was conducted using spot shots, profile and cross-section elevations obtained by Global Positioning Systems (GPS) and conventional surveying methods. This map is not intended for use as an American Land Title Association (ALTA) boundary or facilities location survey. The ground coordinates/bearings shown, are based on the North American Datum of 1983 State Plane Coordinate System, Arizona Central zone, as published by the Arizona Department of Transportation.

INDEX MAP



100 0 100 200
SCALE: 1" = 100 FEET

No.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

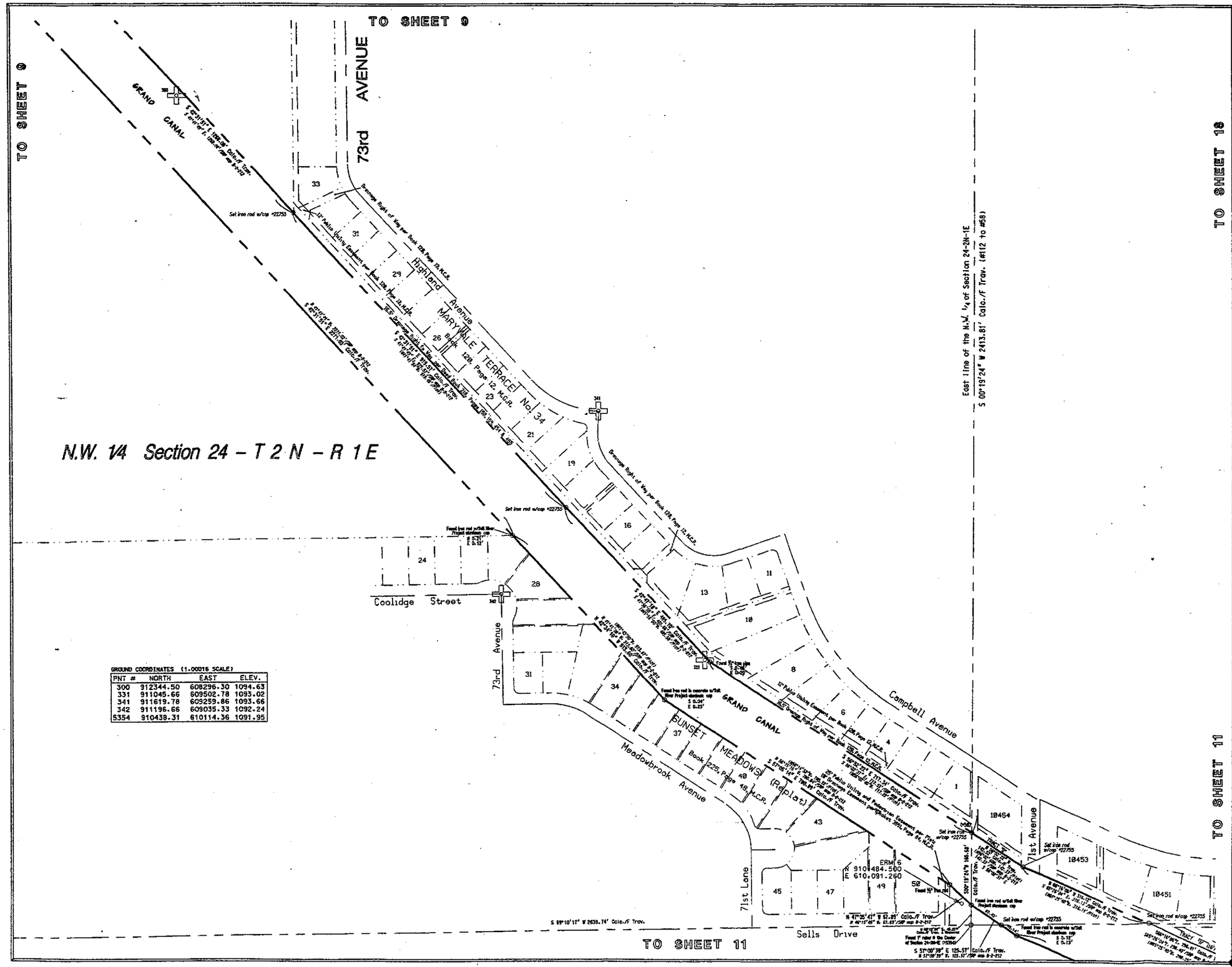
BETHANY HOME OUTFALL CHANNEL PHASE II
RESULTS OF SURVEY
F.C.D. CONTRACT No. 98-46

PROFESSIONAL LAND SURVEYOR CERTIFICATE NO. 22755 JOHN R. COLLINS ARIZONA U.S.A.

Collins/Pina
Phoenix - Tucson - Nogales

	BY	DATE
DESIGN	JRC	
DESIGN CHK.	CAH	05/12/2000
PLANS	CAH	
PLANS CHK.	JRC	5/01/2000

SHEET 47



GROUND COORDINATES (1.00015 SCALE)

PNT #	NORTH	EAST	ELEV.
300	912344.50	608296.30	1094.63
331	911045.66	609502.78	1093.02
341	911619.78	609259.86	1093.66
342	911196.66	609035.33	1092.24
5354	910438.31	610114.36	1091.95

LEGEND

CANAL RIGHT OF WAY
SUBDIVISION AND LOT LINES
SECTION LINES
QUARTER SECTION LINES
EASEMENT LINES
PK - PARKER KAYLON NAIL
AERIAL PANEL

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929. CONVERSION FACTOR OF N.G.V.D. 1929 TO N.A.V.D. 1988 THE NORTH AMERICAN VERTICAL DATUM OF 1988 = + 1.9098

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 6	1097.06	3" ALUMINUM CAP LOCATED ON THE N.E. CORNER OF THE WELL PAD SITUATED ON THE S. SIDE OF THE GRAND CANAL AND W. OF 67TH AVE. NEAR 71ST DR. AND SELLS DR., STAMPED "055085".

NOTES

Use of the information contained in this instrument for other than the specific purpose for which it was intended is forbidden unless expressly permitted in writing in advance by Collins/Pina Consulting Engineers, Inc., and Collins/Pina Consulting Engineers, Inc. shall have no liability to any person or entity for any use of this information without their written consent.
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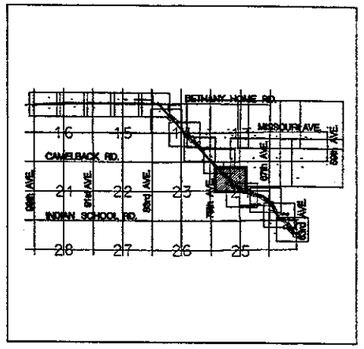
FIELD SURVEY CERTIFICATION

The intent of this field survey is to provide ground elevation and horizontal control reference data, to be utilized in the preparation of photogrammetric mapping. Field verification of photogrammetric data was conducted using spot elev., profile and cross-section elevations obtained by Global Positioning Systems (GPS) and conventional surveying methods. This map is not intended for use as an American Land Title Association (ALTA) boundary or facilities location survey. The ground coordinates/bearings shown are based on the North American Datum of 1983 State Plane Coordinate System, Arizona Central Zone as published by the Arizona Department of Transportation.

INDEX MAP



100 0 100 200
SCALE: 1"= 100 FEET

No.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

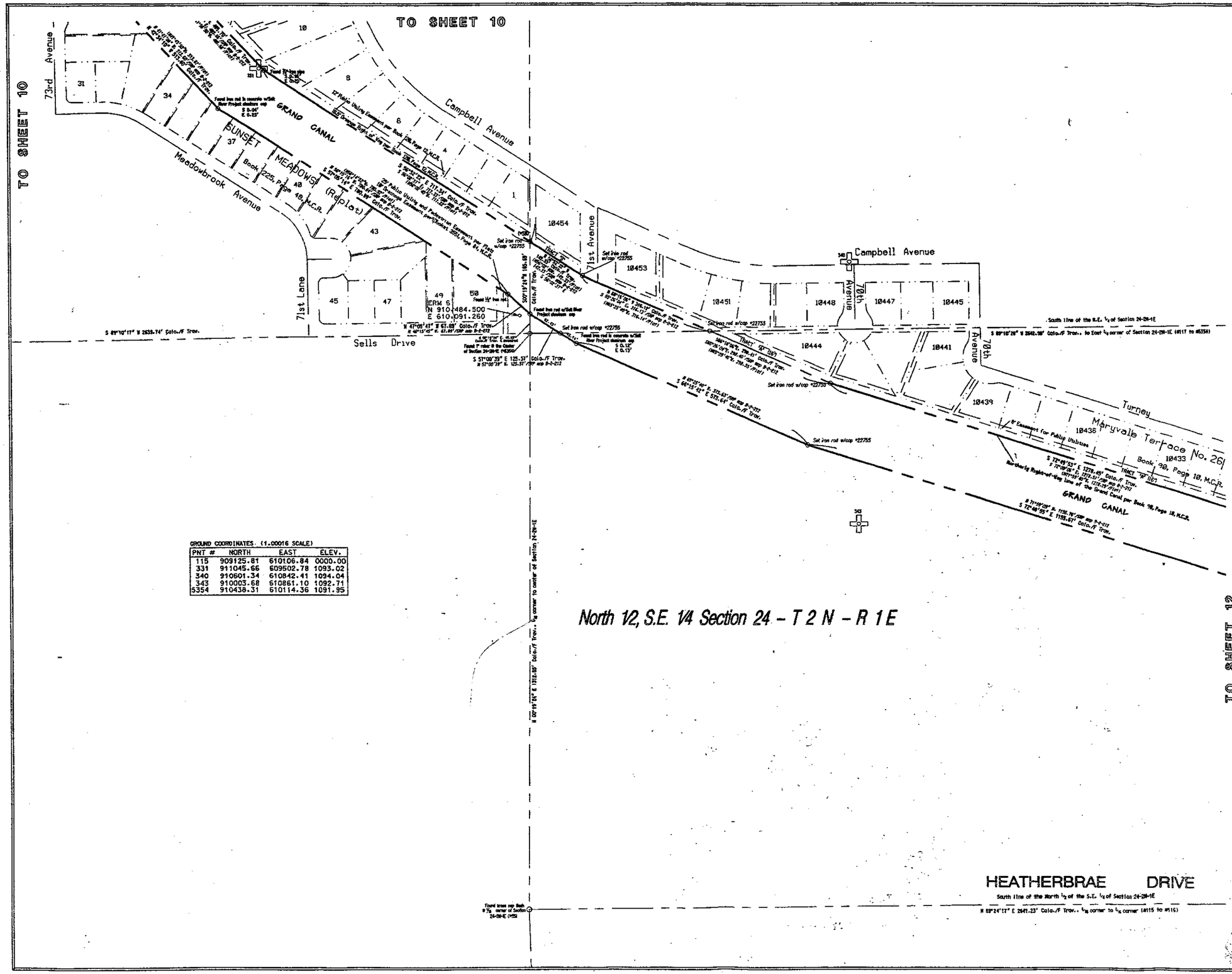
BETHANY HOME OUTFALL CHANNEL PHASE II RESULTS OF SURVEY F.C.D. CONTRACT No. 98-46

Collins/Pina
Phoenix - Tucson - Nogales

	BY	DATE
DESIGN	JRC	
DESIGN CHK.	CAH	05/05/2000
PLANS	CAH	
PLANS CHK.	JRC	5/01/2000

SHEET 4-8

GROUND CONTROL SURVEY DATA PROVIDED BY COLLINS - PINA ENGINEERING, INC.



GROUND COORDINATES (1.00016 SCALE)

PNT #	NORTH	EAST	ELEV.
115	909125.81	610106.84	0000.00
331	911045.66	609502.78	1093.02
340	910601.34	610842.41	1094.04
343	910003.68	610861.10	1092.71
5354	910438.31	610114.36	1091.95

LEGEND

CANAL RIGHT OF WAY
SUBDIVISION AND LOT LINES
SECTION LINES
QUARTER SECTION LINES
EASEMENT LINES
PK - PARKER KAYLON NAIL
PK - PARKER KAYLON NAIL

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929. CONVERSION FACTOR OF N.G.V.D. 1929 TO N.A.V.D. 1988 THE NORTH AMERICAN VERTICAL DATUM OF 1988 = + 1.9098

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 6	1097.06	3" ALUMINUM CAP LOCATED ON THE N.E. CORNER OF THE WELL PAD SITUATED ON THE S. SIDE OF THE GRAND CANAL AND W. OF 67TH AVE. NEAR 71ST DR. AND SELLS DR., STAMPED "055085".

NOTES

Use of the information contained in this instrument for other than the specific purpose for which it was intended is forbidden unless expressly permitted in writing in advance by Collins/Pina Consulting Engineers, Inc., and Collins/Pina Consulting Engineers, Inc. shall have no liability to any person or entity for any use of this information without their written consent.
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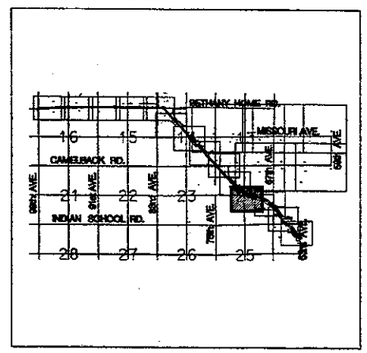
FIELD SURVEY CERTIFICATION

The intent of this field survey is to provide ground elevation and horizontal control reference data, to be utilized in the preparation of photogrammetric mapping. Field verification of photogrammetric data was conducted using spot shot, profile and cross-section elevations obtained by Global Positioning Systems (GPS) and conventional surveying methods. This map is not intended for use as an American L.A.T.M. and Title Association (A.L.T.A) boundary of topo-linear location survey. Grid coordinates/bearings shown are based on the North American Datum of 1983 State Plane Coordinate System, Arizona Central Zone, as published by the Arizona Department of Transportation.

INDEX MAP



100 0 100 200
SCALE: 1"= 100 FEET

No.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

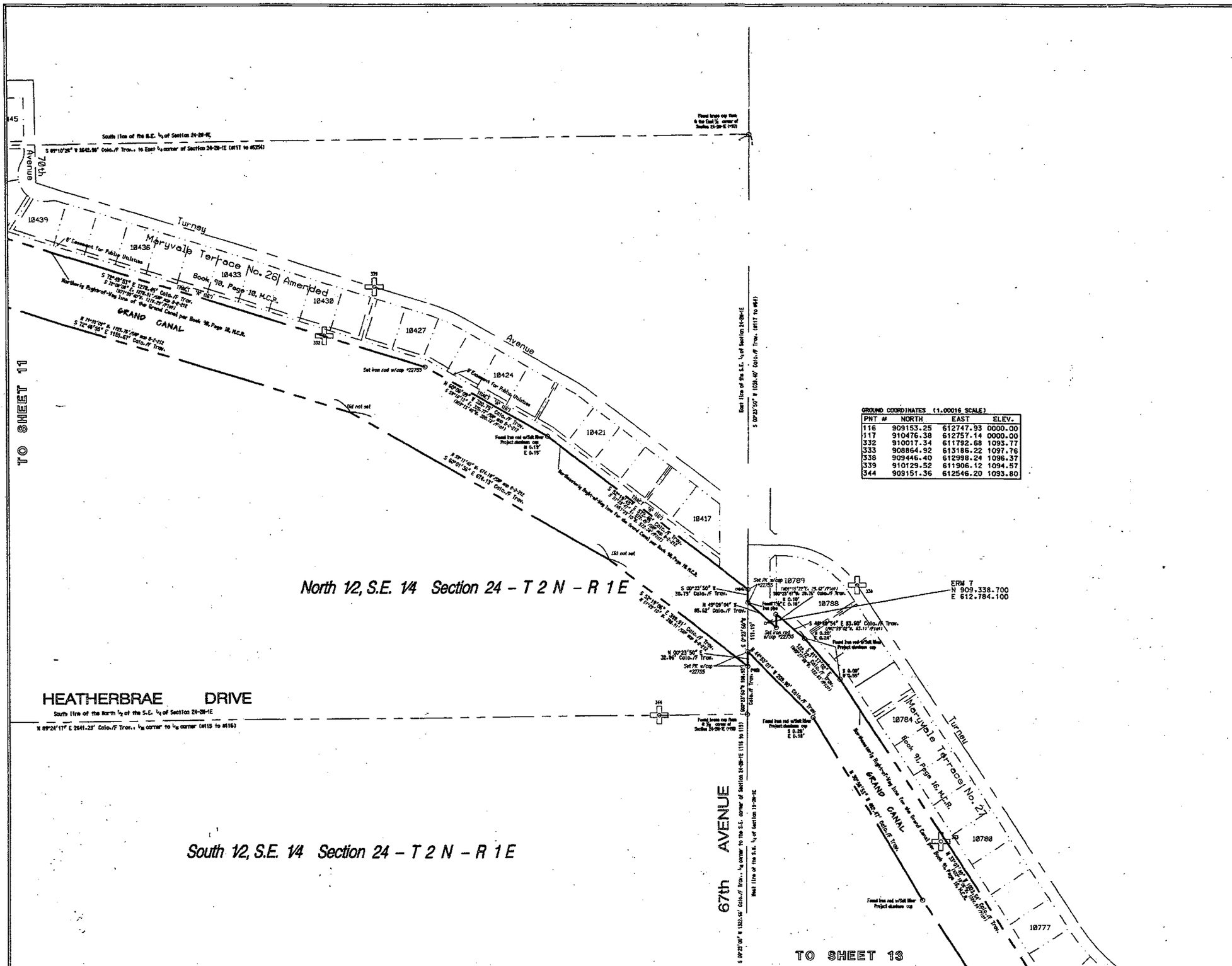
BETHANY HOME OUTFALL CHANNEL PHASE II RESULTS OF SURVEY F.C.D. CONTRACT No. 98-46

Collins/Pina
Phoenix - Tucson - Nogales

	BY	DATE
DESIGN	JRC	
DESIGN CHK.	JRC	05/03/2000
PLANS	CAH	
PLANS CHK.	JRC	5/01/2000

SHEET 49

GROUND CONTROL SURVEY DATA PROVIDED BY COLLINS - PINA ENGINEERING, INC.



GROUND COORDINATES (1.00016 SCALE)

PNT #	NORTH	EAST	ELEV.
116	909153.25	612747.93	0000.00
117	910476.38	612757.14	0000.00
332	910017.34	611792.68	1093.77
333	908864.92	613186.22	1097.76
338	909445.40	612998.24	1096.37
339	910129.52	611906.12	1094.57
344	909151.36	612546.20	1093.80

LEGEND

CANAL RIGHT OF WAY
SUBDIVISION AND LOT LINES
SECTION LINES
QUARTER SECTION LINES
EASEMENT LINES
PK - PARKER KAYLON NAIL
AERIAL PANEL

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929. CONVERSION FACTOR OF N.G.V.D. 1929 TO N.A.V.D. 1988 THE NORTH AMERICAN VERTICAL DATUM OF 1988 = + 1.9058

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 7	1099.41	3" BRASS CAP LOCATED ON THE CURBING AT THE N.E. CORNER OF THE 67TH AVE. BRIDGE OVER THE GRAND CANAL. STAMPED "CITY OF PHOENIX 19".

NOTES

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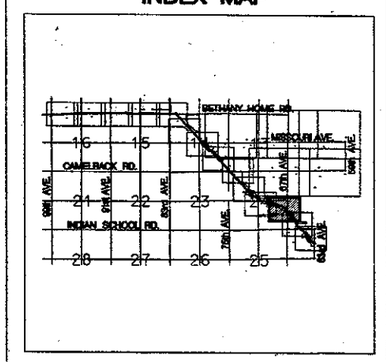
FIELD SURVEY CERTIFICATION

The intent of this field survey is to provide ground elevation and horizontal control reference data, to be utilized in the preparation of photogrammetric mapping. Field verification of photogrammetric data, has consisted using spot shots, profile and cross-section elevations obtained by Global Positioning Systems (GPS) and conventional surveying methods. This map is not intended for use as an American Land Title Association (ALTA) boundary or facilities location survey. The ground coordinates/bearings shown, are based on the North American Datum of 1983 State Plane Coordinate System, Arizona Central Zone, as published by the Arizona Department of Transportation.

INDEX MAP



100 0 100 200
SCALE: 1" = 100 FEET

No.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

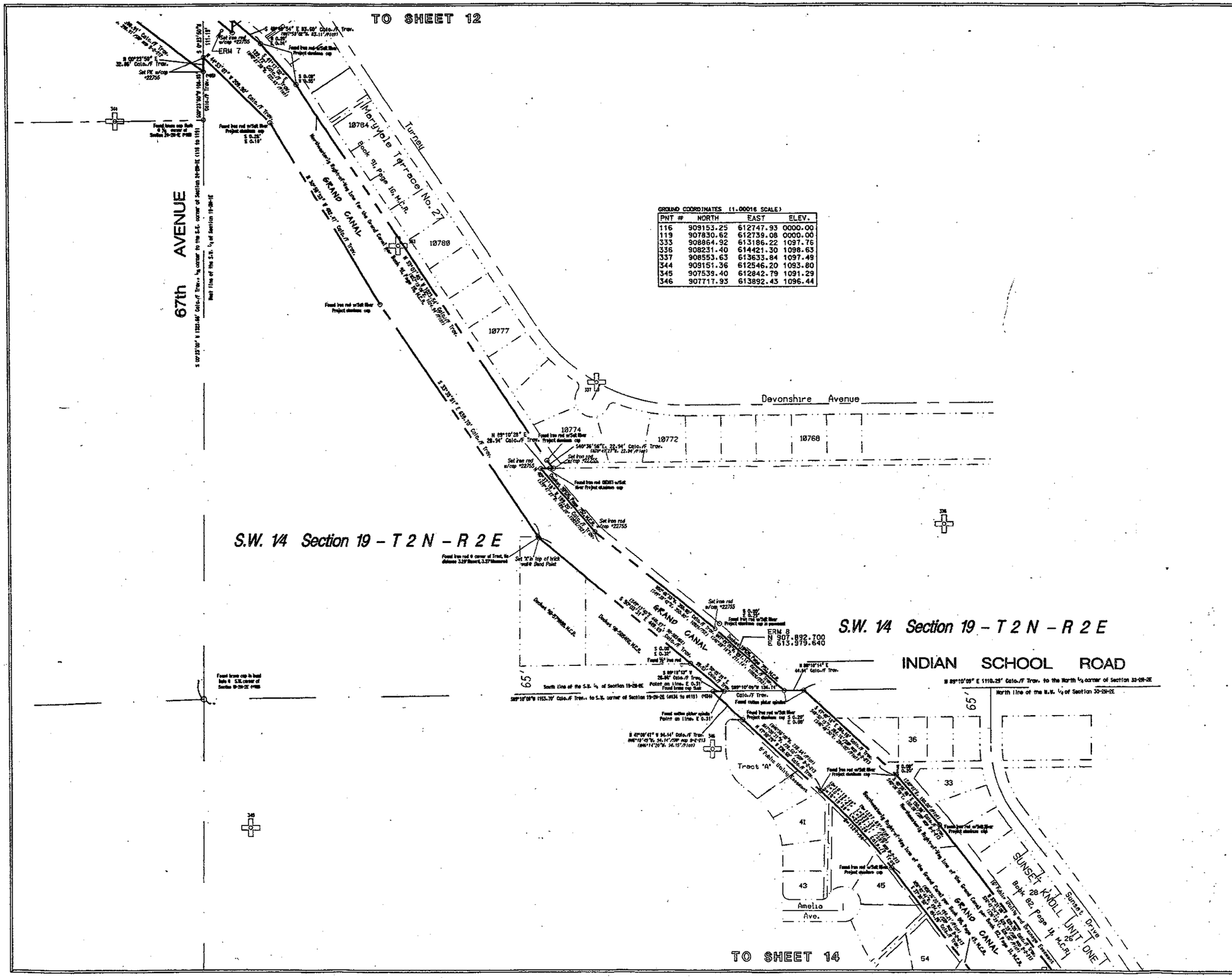
BETHANY HOME OUTFALL CHANNEL PHASE II
RESULTS OF SURVEY
F.C.D. CONTRACT No. 98-46

Collins/Pina
Phoenix - Tucson - Nogales

	BY	DATE
DESIGN	JRC	
DESIGN CHK.	MCJ	08/03/2000
PLANS	CAH	
PLANS CHK.	JRC	8/01/2000

SHEET 50

GROUND CONTROL SURVEY DATA PROVIDED BY COLLINS - PINA ENGINEERING, INC.



GROUND COORDINATES (1.00016 SCALE)

PNT #	NORTH	EAST	ELEV.
116	909153.25	612747.93	0000.00
119	907830.62	612739.08	0000.00
333	908864.92	613186.22	1097.76
336	908231.40	614421.30	1098.63
337	908553.63	613633.84	1097.49
344	909151.36	612546.20	1093.80
345	907539.40	612842.79	1091.29
346	907717.93	613892.43	1096.44

LEGEND

CANAL RIGHT OF WAY
SUBDIVISION AND LOT LINES
SECTION LINES
QUARTER SECTION LINES
EASEMENT LINES
PK - PARKER KAYLON NAIL
AERIAL PANEL

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929. CONVERSION FACTOR OF N.G.V.D. 1929 TO N.A.V.D. 1988 THE NORTH AMERICAN VERTICAL DATUM OF 1988 =+ 1.9098

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 8	1098.88	3" BRASS CAP LOCATED ON THE WINGWALL AT THE N.E. CORNER OF THE INDIAN SCHOOL RD. BRIDGE OVER THE GRAND CANAL. STAMPED "CITY OF PHOENIX 19".

NOTES

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INDEX MAP

100 0 100 200
SCALE: 1"= 100 FEET

No.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

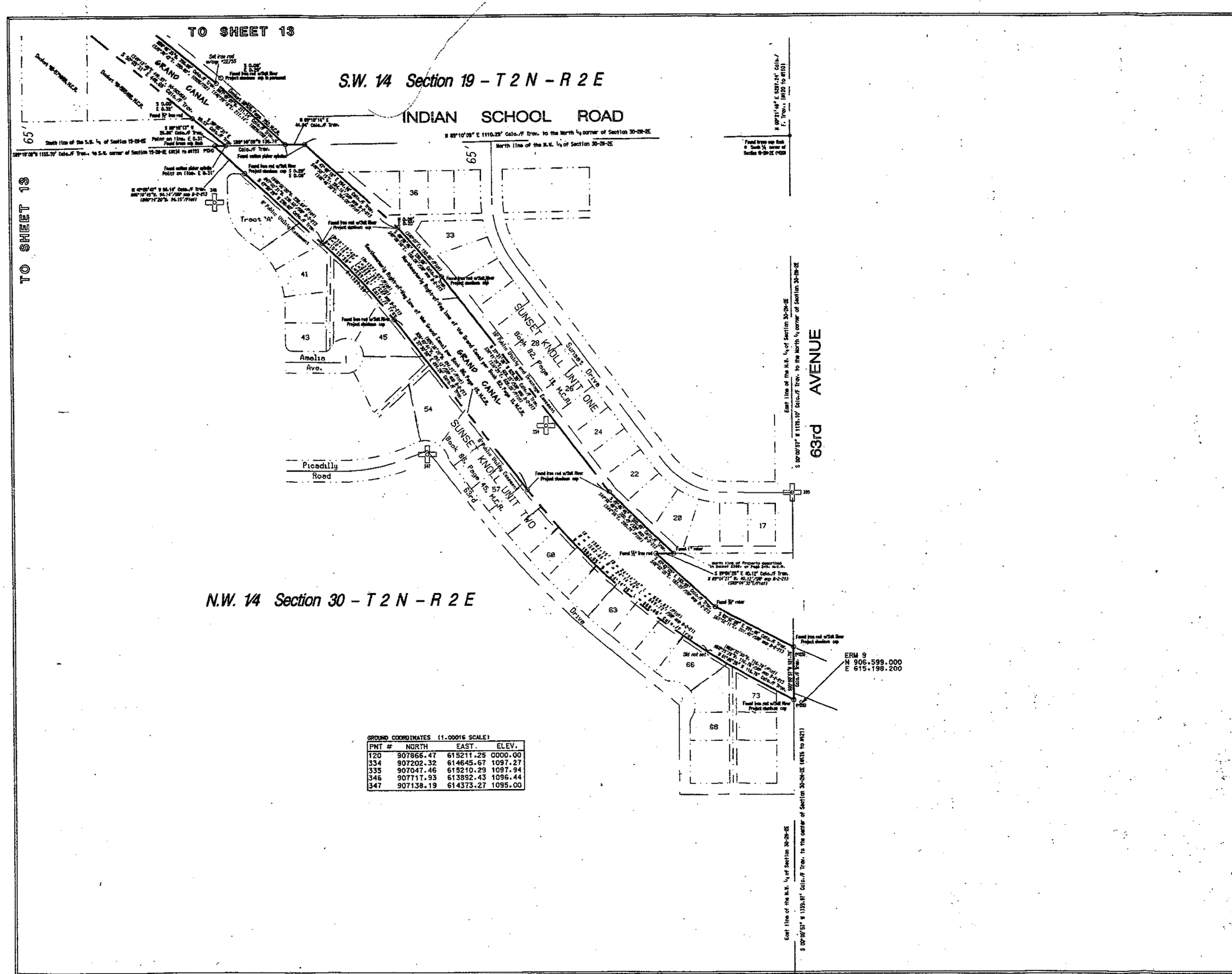
BETHANY HOME OUTFALL CHANNEL PHASE II RESULTS OF SURVEY F.C.D. CONTRACT No. 98-46

Collins/Pina
Phoenix - Tucson - Nogales

	BY	DATE
DESIGN	JRC	
DESIGN CHK.	DMJ	05/05/2000
PLANS	CAH	
PLANS CHK.	JRC	5/11/2000

SHEET 21

GROUND CONTROL SURVEY DATA PROVIDED BY COLLINS - PINA ENGINEERING, INC.



GROUND COORDINATES (1.00016 SCALE)

PNT #	NORTH	EAST.	ELEV.
120	907866.47	615211.25	0000.00
334	907202.32	614645.67	1097.27
335	907047.46	615210.29	1097.94
346	907717.93	613892.43	1096.44
347	907138.19	614373.27	1095.00

LEGEND

CANAL RIGHT OF WAY
SUBDIVISION AND LOT LINES
SECTION LINES
QUARTER SECTION LINES
EASEMENT LINES
PK - PARKER KAYLON NAIL
AERIAL PANEL

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929. CONVERSION FACTOR OF N.G.V.D. 1929 TO N.A.V.D. 1988 THE NORTH AMERICAN VERTICAL DATUM OF 1988 = + 1.9098

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 9	1098.56	3" ALUMINUM CAP LOCATED OF THE S. SIDE OF THE GRAND CANAL IN LINE WITH 63RD AVE. TO THE S. ON AN ABANDONDED HEADWALL. STAMPED "SALT RIVER PROJECT BM 93"AND "6.5E 7.8N".

NOTES

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FIELD SURVEY CERTIFICATION

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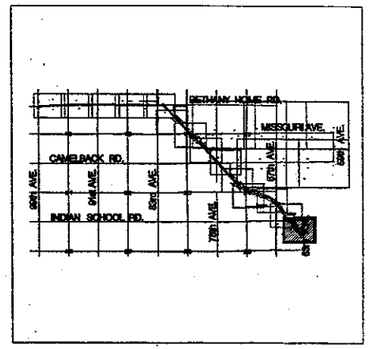
INDEX MAP



100 0 100 200
SCALE: 1"= 100 FEET

No.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

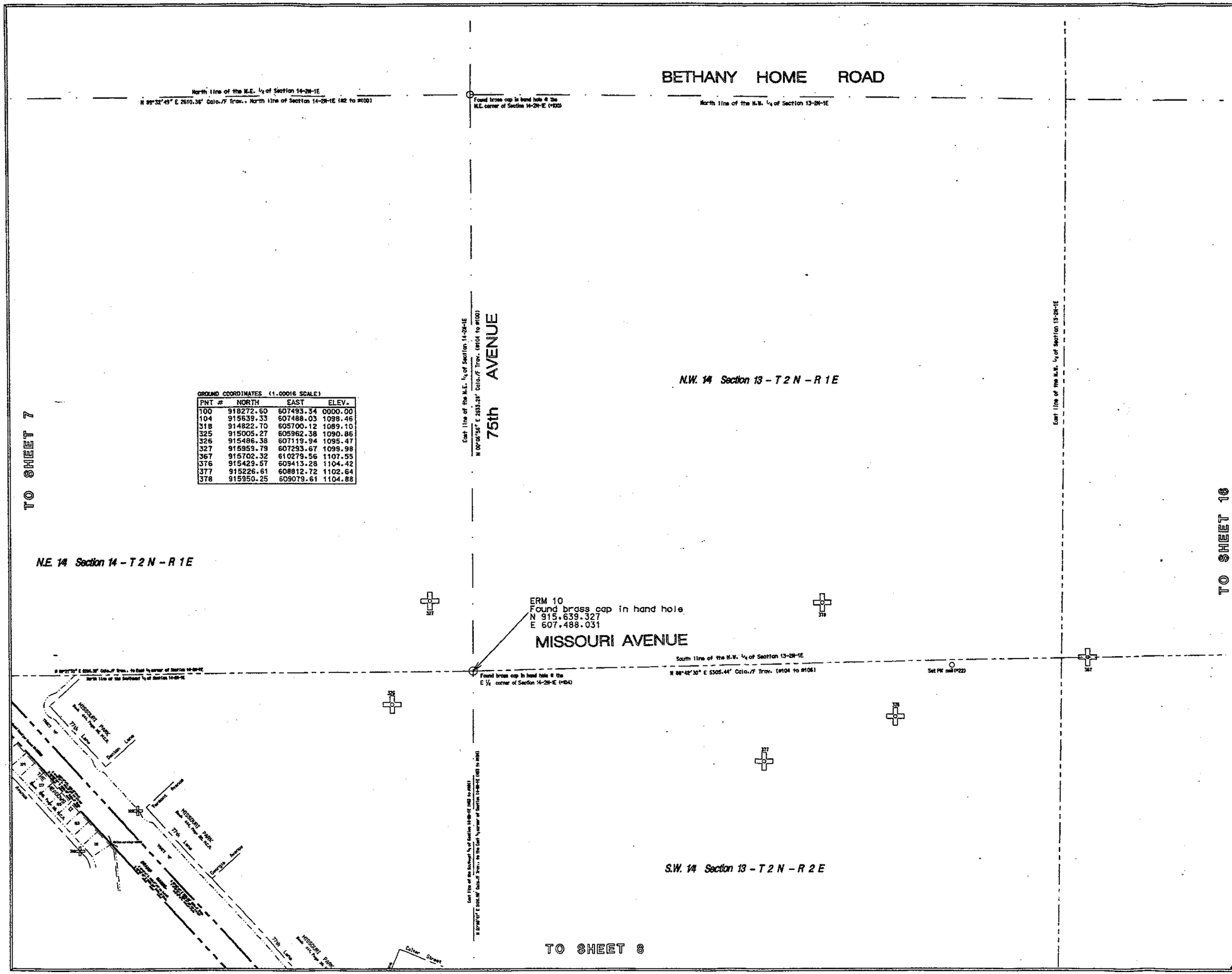
BETHANY HOME OUTFALL CHANNEL PHASE II
RESULTS OF SURVEY
F.C.D. CONTRACT No. 98-46

Collins/Pina
Phoenix - Tucson - Nogales

	BY	DATE
DESIGN	JRC	
DESIGN CHK.		4/06/2000
PLANS	CAH	
PLANS CHK.		3/01/2000

SHEET 52

GROUND CONTROL SURVEY DATA PROVIDED BY COLLINS - PINA ENGINEERING, INC.



GROUND COORDINATES (1.00016 SCALE)

PNT #	NORTH	EAST	ELEV.
100	918272.60	607493.34	0000.00
104	915639.33	607488.03	1098.46
318	914822.70	605700.12	1089.10
325	915005.27	605962.38	1090.86
326	915486.38	607119.94	1095.47
327	915959.79	607293.67	1099.98
367	915702.32	610279.56	1107.55
376	915429.57	609413.28	1104.42
377	915226.61	608812.72	1102.64
378	915950.25	609079.61	1104.88

LEGEND

CANAL RIGHT OF WAY
SUBDIVISION AND LOT LINES
SECTION LINES
QUARTER SECTION LINES
EASEMENT LINES
PK - PARKER KAYLON NAIL
AERIAL PANEL

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929. CONVERSION FACTOR OF N.G.V.D. 1929 TO N.A.V.D. 1988 THE NORTH AMERICAN VERTICAL DATUM OF 1988 = + 1.9098

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 10	1098.46	E¼ CORNER 14-2N-1E N 915,639.327 E 607,488.031

NOTES

Use of the information contained in this instrument for other than the specific purpose for which it was intended is forbidden unless expressly permitted in writing in advance by Collins/Pina Consulting Engineers, Inc., and Collins/Pina Consulting Engineers, Inc. shall have no liability to any person or entity for any use of this information without their written consent.
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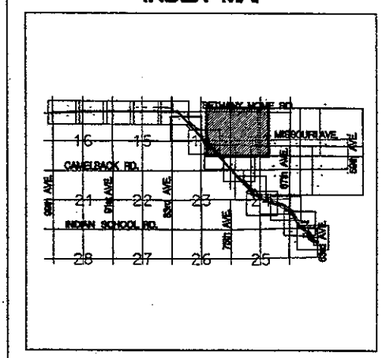
FIELD SURVEY CERTIFICATION

The intent of this field survey is to provide ground elevation and horizontal control references sufficient to be utilized on the preparation of photogrammetric mapping. Field verification of photogrammetric data was conducted using spot shots, profile and cross-section elevations obtained by Global Positioning Systems (GPS) and conventional surveying methods. This map is not intended for use as an American Land Title Association (ALTA) boundary or topographic location survey. The ground coordinates/soetings shown are based on the North American Datum of 1983 State Plane Coordinates, Arizona Central Zone, as published by the Arizona Department of Transportation.

INDEX MAP



200 0 200 400
SCALE: 1"= 200 FEET

No.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BETHANY HOME OUTFALL CHANNEL PHASE II RESULTS OF SURVEY F.C.D. CONTRACT No. 98-46

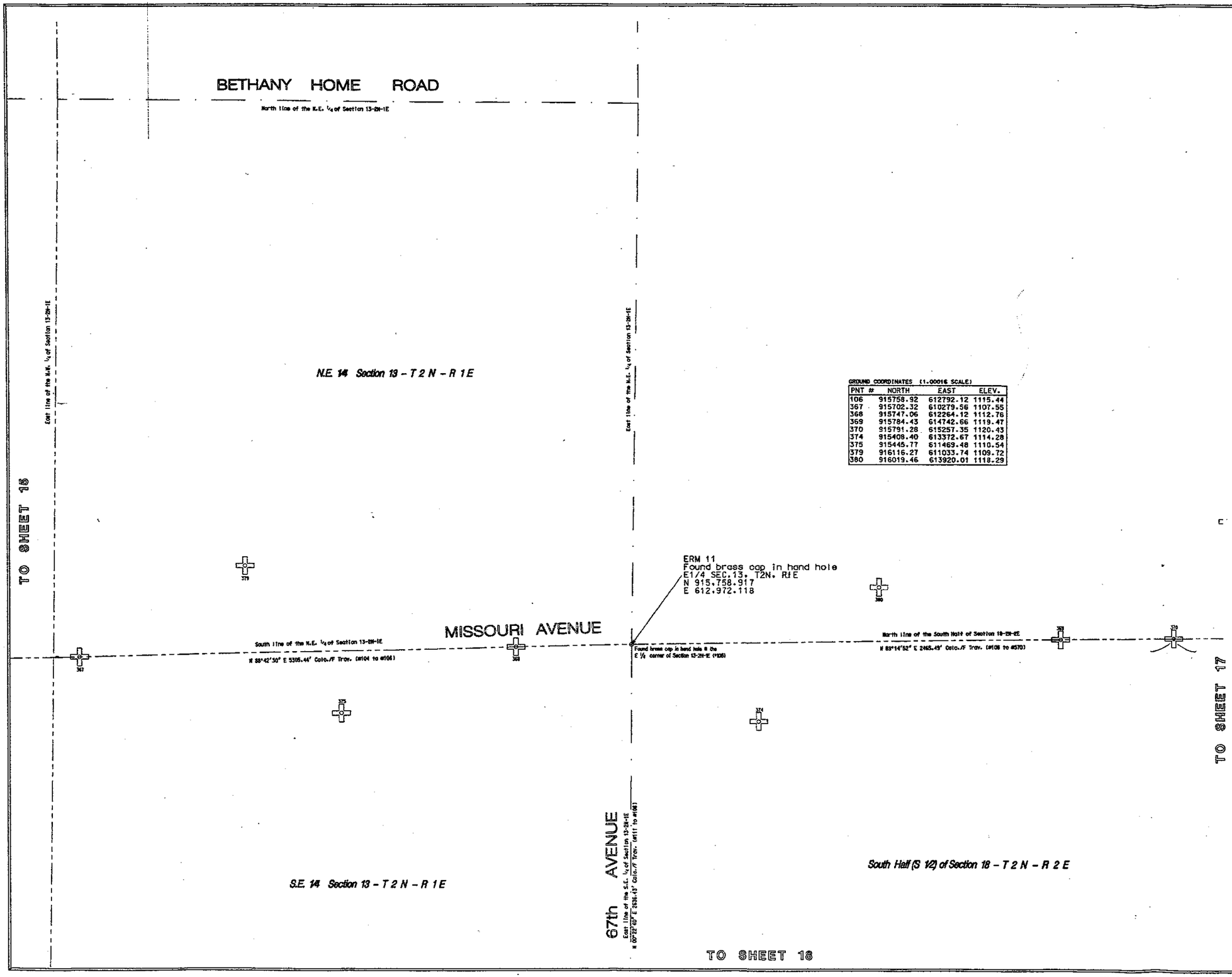
PROFESSIONAL LAND SURVEYOR CERTIFICATE NO. 22755 JOHN H. COLLINS Date Signed 5/3/00 ARIZONA, U.S.A.

Collins/Pina
Phoenix - Tucson - Nogales

	BY	DATE
DESIGN	JRC	
DESIGN CHK.	[illegible]	05/03/2000
PLANS	CAH	
PLANS CHK.	[illegible]	5/01/2000

SHEET 53

GROUND CONTROL SURVEY DATA PROVIDED BY COLLINS - PINA ENGINEERING, INC.



GROUND COORDINATES (1.00016 SCALE)

PNT #	NORTH	EAST	ELEV.
106	915758.92	612792.12	1115.44
367	915702.32	610279.56	1107.55
368	915747.06	612264.12	1112.76
369	915784.43	614742.66	1119.47
370	915791.28	615257.35	1120.43
374	915408.40	613372.67	1114.28
375	915445.77	611469.48	1110.54
379	916116.27	611033.74	1109.72
380	916019.46	613920.01	1118.29

LEGEND

CANAL RIGHT OF WAY
SUBDIVISION AND LOT LINES
SECTION LINES
QUARTER SECTION LINES
EASEMENT LINES
PK - PARKER KAYLON NAIL
AERIAL PANEL

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929. CONVERSION FACTOR OF N.G.V.D. 1929 TO N.A.V.D. 1988 THE NORTH AMERICAN VERTICAL DATUM OF 1988 = + 1.9098

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 11	1115.44	FND BRASS CAP IN HAND HOLE, E1/4 SECTION 13 T2N, R1E N 915,758.917 E 612,792.118

NOTES

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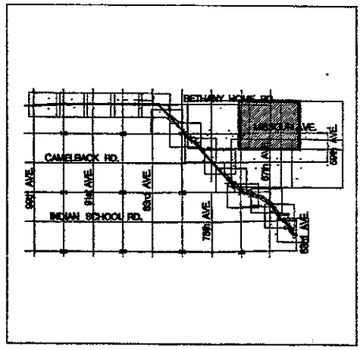
FIELD SURVEY CERTIFICATION

The intent of this field survey is to provide ground elevation and horizontal control reference data, to be utilized on the preparation of photogrammetric mapping. Field verification of photogrammetric data was conducted using spot shots, profile and cross-section elevations obtained by Global Positioning Systems (GPS) and conventional surveying methods. This map is not intended for use as an American Land Title Association (ALTA) boundary or facilities location survey. The ground coordinates/bearings shown are based on the North American Datum of 1983 State Plane Coordinate System, Arizona Central Zone, as published by the Arizona Department of Transportation.

INDEX MAP



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SCALE: 1"= 200 FEET

No.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BETHANY HOME OUTFALL CHANNEL PHASE II RESULTS OF SURVEY F.C.D. CONTRACT No. 98-46

Collins/Pina
Phoenix - Tucson - Nogales

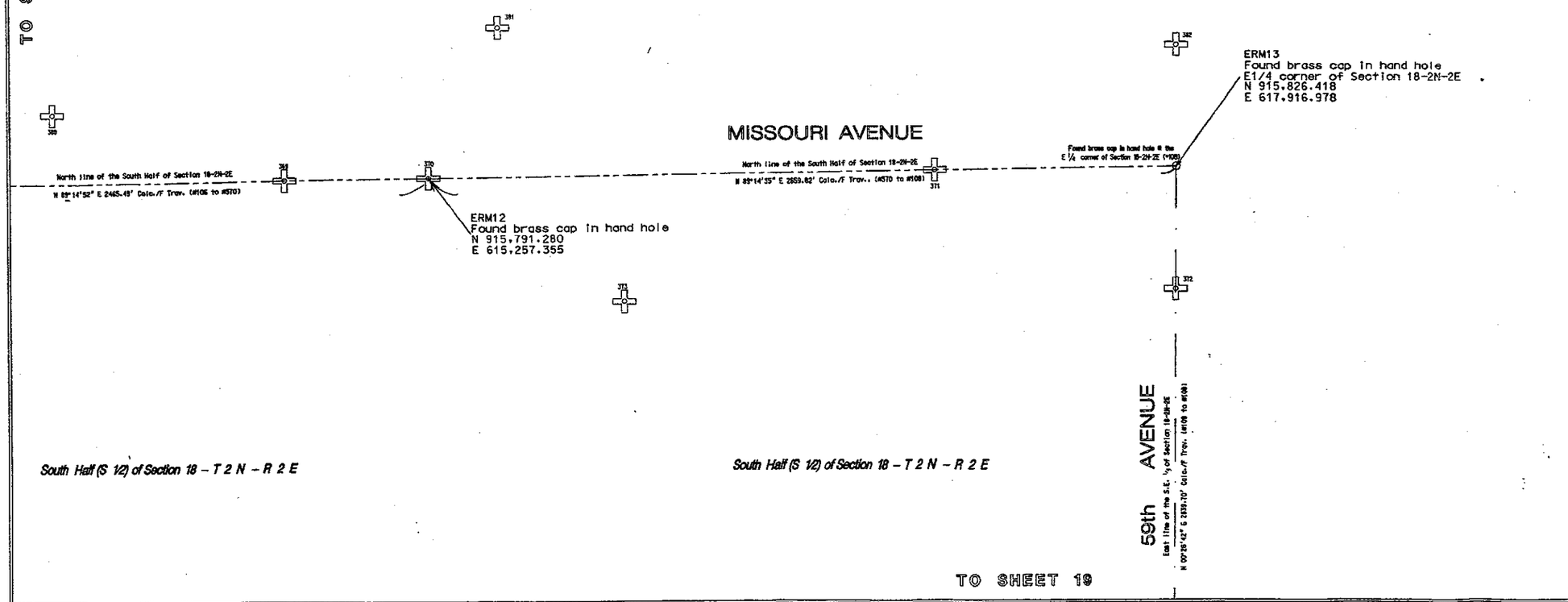
	BY	DATE
DESIGN	JRC	
DESIGN CHK.	CAH	5/03/2000
PLANS	CAH	
PLANS CHK.	JRC	5/01/2000

SHEET 54

GROUND CONTROL SURVEY DATA PROVIDED BY COLLINS - PINA ENGINEERING, INC.

TO SHEET 18

GROUND COORDINATES (1.00018 SCALE)			
PNT #	NORTH	EAST	ELEV.
108	915826.42	617916.98	1127.75
369	915784.43	614742.66	1119.47
370	915791.28	615257.35	1120.43
371	915814.86	617058.57	1125.55
372	915388.74	617913.42	1127.48
373	915349.50	615948.80	1121.11
380	916018.46	613920.01	1118.29
381	916327.01	615506.88	1122.42
382	916258.30	617918.62	1130.28



GROUND CONTROL SURVEY DATA PROVIDED BY COLLINS – PINA ENGINEERING, INC.

LEGEND

CANAL RIGHT OF WAY
SUBDIVISION AND LOT LINES
SECTION LINES
QUARTER SECTION LINES
EASEMENT LINES
PK – PARKER KAYLON NAIL
AERIAL PANEL

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929. CONVERSION FACTOR OF N.G.V.D. 1929 TO N.A.V.D. 1988 THE NORTH AMERICAN VERTICAL DATUM OF 1988 = + 1.9098

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 12	1120.44	N 915,791.280 E 615,257.355
ERM 13	1127.75	N 915,826.418 E 617,916.978

NOTES

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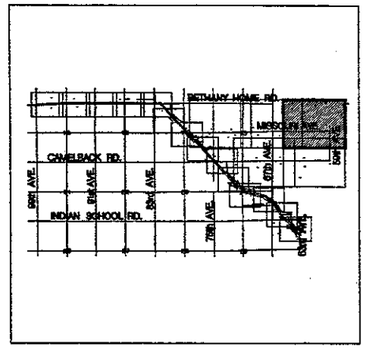
FIELD SURVEY CERTIFICATION

The intent of this field survey is to provide ground elevation and horizontal control reference data, to be utilized on the preparation of photogrammetric mapping. Field verification of photogrammetric data was conducted using spot shots, profile and cross-section elevations obtained by Global Positioning Systems (GPS) and conventional surveying methods. This map is not intended for use as an American Land Title Association (ALTA) boundary or rectified location survey. The ground coordinates/bearings shown are based on the North American Datum of 1983 State Plane Coordinate System, Arizona Central Zone, as published by the Arizona Department of Transportation.

INDEX MAP



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SCALE: 1"= 200 FEET

No.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BETHANY HOME OUTFALL CHANNEL PHASE II
RESULTS OF SURVEY
F.C.D. CONTRACT No. 98-46

PROFESSIONAL LAND SURVEYOR CERTIFICATE NO. 22755 JOHN R. COLLINS ARIZONA U.S.A. 5/31/00

Collins/Pina
Phoenix – Tucson – Nogales

	BY	DATE
DESIGN	JRC	
DESIGN CHK.	CAH	06/02/2000
PLANS	CAH	
PLANS CHK.	JRC	5/01/2000

SHEET 55

TO SHEET 16

S.E. 14 Section 13 - T 2 N - R 1E

67th AVENUE

East line of the S.E. ¼ of Section 13-2N-1E
N 00°22'40" E 2636.43' Calc./F Trav. (#111 to #106)

South Half (S 1/2) of Section 13 - T 2 N - R 2 E

GROUND COORDINATES (1.00016 SCALE)

PNT #	NORTH	EAST	ELEV.
111	913122.55	612774.73	1107.79
112	913063.02	610129.07	0000.00
349	913066.25	610284.18	1101.47
350	913110.03	612227.17	1106.37
351	913145.96	614634.82	1112.40
355	912831.57	613488.32	1107.40
356	912542.44	611457.64	1102.14
360	913392.68	611328.33	1104.44
361	913442.82	613411.92	1109.42

ERM 14
Found brass cap in hand hole
N 913,122.546
E 612,774.730

CAMELBACK ROAD

South line of the S.E. ¼ of Section 13-2N-1E
N 88°42'40" E 2646.33' Calc./F Trav. (#112 to #111)

Found brass cap in hand hole @ the S.E. corner of Section 13-2N-1E (#112)

South line of the S.W. ¼ of Section 18-2N-2E (#211 to #110)
N 89°16'47" E 2470.24' Calc./F Trav.

TO SHEET 19

TO SHEET 10

N.E. 14 Section 24 - T 2 N - R 1E

West line of the N.W. ¼ of Section 19-2N-2E (#117 to #111)
S 00°22'50" E 2613.49' Calc./F Trav.

N.W. 14 Section 19 - T 2 N - R 2 E

TO SHEET 10

LEGEND

CANAL RIGHT OF WAY
SUBDIVISION AND LOT LINES
SECTION LINES
QUARTER SECTION LINES
EASEMENT LINES
PK - PARKER KAYLON NAIL
AERIAL PANEL

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929. CONVERSION FACTOR OF N.G.V.D. 1929 TO N.A.V.D. 1988 THE NORTH AMERICAN VERTICAL DATUM OF 1988 = + 1.9098

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 14	1107.78	FND. BRASS CAP IN HAND HOLE N 913,122.546 E 612,774.730

NOTES

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FIELD SURVEY CERTIFICATION

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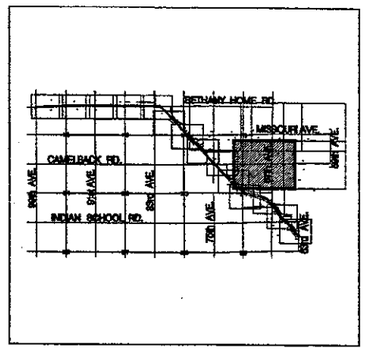
INDEX MAP



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SCALE: 1"= 200 FEET

No.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BETHANY HOME OUTFALL CHANNEL PHASE II
RESULTS OF SURVEY
F.C.D. CONTRACT No. 98-46

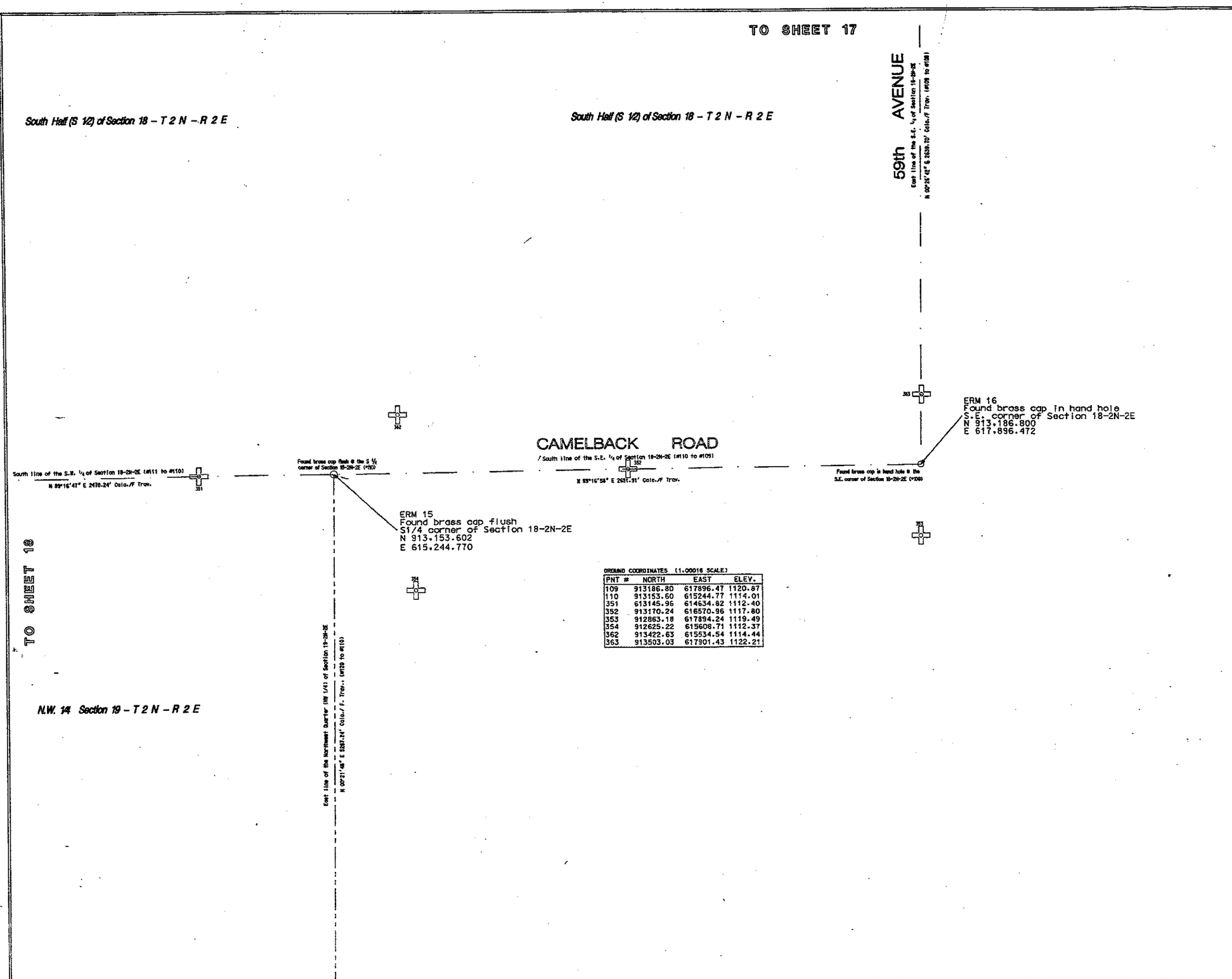
PROFESSIONAL LAND SURVEYOR CERTIFICATE NO. 22755 JOHN R. COLLINS ARIZONA U.S.A.

Collins·Pina
Phoenix - Tucson - Nogales

	BY	DATE
DESIGN	JRC	
DESIGN CHK.	CAH	05/05/00
PLANS	CAH	
PLANS CHK.	JRC	5/01/2000

SHEET 56

GROUND CONTROL SURVEY DATA PROVIDED BY COLLINS - PINA ENGINEERING, INC.



GROUND COORDINATES (1.00016 SCALE)

PNT #	NORTH	EAST	ELEV.
109	913186.80	617896.47	1120.87
110	913153.60	615244.77	1114.01
351	913145.96	614634.82	1112.40
352	913170.24	616570.96	1117.80
353	912863.18	617894.24	1119.49
354	912625.22	615608.71	1112.37
362	913422.63	615534.54	1114.44
363	913503.03	617901.43	1122.21

LEGEND

CANAL RIGHT OF WAY
SUBDIVISION AND LOT LINES
SECTION LINES
QUARTER SECTION LINES
EASEMENT LINES
PK – PARKER KAYLON NAIL
AERIAL PANEL

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929. CONVERSION FACTOR OF N.G.V.D. 1929 TO N.A.V.D. 1988 THE NORTH AMERICAN VERTICAL DATUM OF 1988 = + 1.8098

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 15	1114.01	N 913,153.602 E 615,244.770
ERM 16	1120.87	N 913,186.800 E 617,896.472

NOTES

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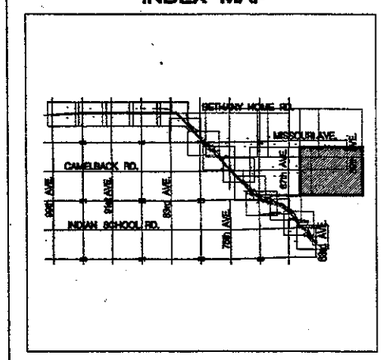
INDEX MAP



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SCALE: 1"= 200 FEET

No.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BETHANY HOME OUTFALL CHANNEL PHASE II RESULTS OF SURVEY F.C.D. CONTRACT No. 98–46

PROFESSIONAL LAND SURVEYOR CERTIFICATE NO. 22759 JOHN R. COLLINS ARIZONA U.S.A.

Collins Pina
Phoenix – Tucson – Nogales

	BY	DATE
DESIGN	JRC	
DESIGN CHK.	DMJ	05/03/2000
PLANS	CAH	
PLANS CHK.	JRC	5/01/2000

SHEET 57

GROUND CONTROL SURVEY DATA PROVIDED BY COLLINS – PINA ENGINEERING, INC.