

Design Report  
for  
*Northern and Butler Storm Drains*  
*Sub-Phase "A"*

Northern/Orangewood  
Storm Drain Project

**WOOD/PATEL**

Design Report  
for  
*Northern and Butler Storm Drains*  
*Sub-Phase "A"*

Northern/Orangewood  
Storm Drain Project  
Contract FCD - Phase II

Property of  
Flood Control District of MC Library  
Please Return to  
2801 W. Durango  
Phoenix, AZ 85009

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*Prepared for*

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February 24, 1998  
WP #94153.02



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February 24, 1998

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

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

Re: **Northern/Orangewood Storm Drain Project**  
Contract FCD - - Phase II  
Northern and Butler Storm Drains, Sub-Phase "A"  
WP #94153.02

Dear Mr. Shobe:

We are pleased to submit this data package in conjunction with the final plan submittal for the referenced project. The package includes:

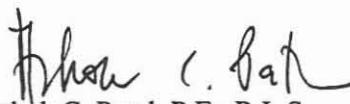
- Full size set of plans (original mylars) - 1 set (under separate cover)
- Half size set of plans (photocopy) - 2 sets (under separate cover)
- Design Report including Design Calculations - 12 sets
- Construction-Special Provisions including Cost Estimates - 4 sets (under separate cover)
- Diskette - ASCII Files
- Structural calculations - 6 sets

The 90% review comments are incorporated into this submittal. The 90% review comments and responses are included under separate cover.

Please feel free to call me if you have any questions.

Sincerely,

**WOOD, PATEL & ASSOCIATES, INC.**

  
Ashok C. Patel, P.E., R.L.S.  
Project Manager

ACP/ct

Gencor\94153-02-shobe-ltr-f24

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## 1.0 Introduction

This Report has been compiled to document significant matters relating to the design of the final plan for the Flood Control District of Maricopa County (District) Contract FCD 94-12 Phase II, Northern and Butler Storm Drains, Sub-Phase "A".

## 2.0 Project Background

On April 20, 1996, the *Concept/Routing Study Update* for the *Northern/Orangewood Project* was submitted by Wood, Patel & Associates, Inc. (Wood/Patel) to the District and the Cities of Glendale and Peoria.

The Study addressed a number of issues raised by the Area Drainage Master Plan Team (District, Glendale and Peoria) during the review process. A meeting was held with the team members on July 23, 1996, to discuss the *Concept/Routing Study Update* and to arrive at a consensus for the *Construction Phasing Plan* portion of this project.

Subsequently, the *Construction Phasing Plan* recommendation was prepared on August 14, 1996. The Plan was based on the July 23rd meeting and incorporated into other considerations including: capital improvement costs, fiscal year budgets, hydrologic impacts, hydraulic effectiveness and the impact of other projects.

Based upon the District's budgetary constraints, three separate construction phases were recommended. The first phase named Subphase "A" included implementation of Northern Avenue and Butler Drive storm drains. Wood/Patel initiated the design of Subphase "A" on February 25, 1997. The 30% plan submittal was made on July 8, 1997. The 60% plan submittal was made on November 12, 1997. The 90% plan submittal was made on January 12, 1998. This submittal represents the final plan, which accounts for all the requirements for the final plan submittal, including incorporation of all the review comments.

### 2.1 Butler Drive Storm Drain

The Butler Drive Storm Drain, which is scheduled for construction in FY 1998/1999, will include the installation of storm drain pipes in Butler Drive from the Agua Fria Freeway outfall to approximately 87th Avenue. This system will utilize pipe sized that range from 1220 mm to 910 mm.

### 2.2 Northern Avenue Storm Drain

This storm drain follows the Northern Avenue alignment from its beginning point, which is approximately 100 meters east of 91st Avenue and ends at about 100 meters west of 83rd Avenue. The District's portion of storm drain improvement should continue east to end at 83rd Avenue. However, the Maricopa County

#### 4.0 Utilities

Utilities shown on the final plan were initially derived from utility maps obtained from the utilities and from field surveys locating any visible surface facilities/appurtenances. An exception to this is the Northern Avenue utilities. Wood/Patel was supplied with a computer disk of the SFC Engineering Company (SFC) plan for a 21-inch sanitary sewer in Northern Avenue. The 21-inch sewer alignment was recently deleted from the Master Plan based on new sanitary sewer modeling by the City. The utilities shown on the SFC plan were checked against available utility plans and then used for the Wood/Patel Storm Drain Plan.

As part of the scope of work, the 90 percent plans were distributed to the affected utilities for their review. The following is a list of utilities that were supplied with plans:

AT&T	US West
MCI	Cox Cable
Southwest Gas	SRVWUA
Santa Fe Pacific Pipeline	City of Glendale Water & Sewer
El Paso Natural Gas	City of Peoria Water & Sewer
APS	SRP Electric

This submittal incorporates the utility comments from the 90% review.

Please note that ongoing right-of-way issues lead to changes in the horizontal alignments originally recommended in the 30% design. The alignment was subsequently modified. In view of this uncertainty, subsequently, potholing of utilities were postponed until verbal concurrence of an alignment was received. Potholing was performed in Northern Avenue for the 12- inch water line between 75th and 99th Avenues. Only two (2) test holes from this potholing are applicable to the storm drain design. Potholing was also performed on several test hole locations along Butler Drive Storm Drain. These locations were pre-approved by the District.

The final plan prepared with this Report is being submitted to all utility companies.

#### 5.0 Right-of-Way

Essentially, the entire recommended Butler Drive storm drain alignment will require new right-of way acquisition. This is mainly due to past development in the vicinity which has created a patchwork of existing rights-of-way. District/Peoria are currently looking into acquiring the needed right-of-way. A proposed future residential development fronting Butler Drive, on the south, between 87th Avenue and 85th Avenue, may impact acquisition decisions.

The portion of proposed storm drain within the Salt River Project (SRP) corridor was realigned per SRP's input. SRP requested that the alignment be placed 25 feet north of their south property line as now shown on the final plan. This alignment impacts existing SRP irrigation facilities.

The storm drain will require a permanent use license as well as a temporary construction use license from SRP. The City of Peoria is in contact with SRP regarding a license.

## **6.0 Survey**

The District provided Wood/Patel with several points with coordinates and elevations. Wood/Patel field verified the data then located existing monuments, utilities, etc., as well as cross-section data, based on the provided datum. Again, elevation checks were made on the SFC plan for Northern Avenue; then, the SFC plan information was used (after rotation) in the Wood/Patel plan.

## **7.0 Soils**

During November, 1994, Huntington Engineering & Environmental, Inc., performed a soils investigation along Northern Avenue for the 21 inch sanitary sewer (notes deleted by Peoria). This soils study has been used for the portion of the storm drain within Northern Avenue.

For this project, Ricker-Atkinson-McBee & Associates, Inc. (RAM) completed a soils investigation for the remainder of storm drain, as well as the proposed detention basin in April 1997. The results of the RAM Study have been utilized for the design of this project.

## **8.0 Northern Avenue Roadway Design and Impacts**

MCDOT has granted a contract to Stanley Consultants, Inc. (Stanley) to design Northern Avenue roadway improvements from Loop 101 (93rd Avenue Alignment) to 71st Avenue. Stanley has developed a Design Concept Report which was completed in August, 1997.

Currently, the intent is to have the entire Wood/Patel storm drain plan incorporated into the construction bid package for the Northern Avenue roadway improvements. In order to achieve consistency between plans, Wood/Patel was requested by the District to produce its plan in metric instead of english units as requested in the original Scope of Services.

During a meeting held on July 1, 1997, it was agreed that Wood/Patel would recommend catch basin stations along Northern Avenue in order to intercept the local runoff from the 2-year, 6-hour storm event. Stanley would size the catch basins and include them in their drawings. Stanley will address all pavement runoff within Northern Avenue based on the MCDOT requirements while not creating any adverse hydraulic condition for the District's storm drain. Catch basin maximum spacing requirement is 660 feet, per MCDOT regulations.

Since both firms will be using different stationing, Wood/Patel will provide station equations on the storm drain plan for Northern Avenue at the final design stage.

## **9.0 Traffic Impacts**

### **9.1 Butler Avenue Storm Drain**

Butler Drive is a residential collector street in the City of Peoria. Traffic volume data is not available. Because Butler Drive is functioning as a residential collector and because homes front directly on this section of Butler Drive, it may be possible and desirable to close Butler during storm drain construction to all but local traffic. The Butler Drive crossing of 91st Avenue will require that 91st Avenue remain open during construction with a single lane in each direction.

### **9.2 Northern Avenue Storm Drain**

This section of Northern Avenue has an average daily traffic volume of over 7,000 vehicles per day and has two traffic lanes (one lane in each direction). Two City of Peoria projects are listed in the current MAG Transportation Improvement Program which will widen this section of Northern Avenue from its current 2-lanes to 4-lanes. As mentioned in Section 8 of this Report, MCDOT will be preparing the Roadway Improvement Plans through Stanley. The improvement is scheduled for the year 2000. The storm drain will be constructed as part of the roadway improvements. Because Northern Avenue interchanges with the Agua Fria Freeway (SR 101L) it is not likely that this section of roadway can be closed for storm drain installation. The construction will need to maintain a single lane of travel in each direction, however, it may not be possible to maintain access off of Northern Avenue from both directions of travel to side streets and driveways. While construction is impacting the 83rd Avenue and Northern Avenue intersection it will be necessary to maintain, at a minimum, a single through lane in each direction at all times. Left turns may need to be prohibited. While construction activities are underway, it will be necessary to have a uniformed, off-duty police officer on-site to control the traffic signal during the peak traffic periods or to manually direct traffic if the traffic signal has to be taken out of service for short periods of time.

The construction of the short section of storm drain on 83rd Avenue will require the closing of the left turn lane from Butler Drive to Griswold Road. One lane of traffic will be maintained in each direction. The northbound left turn from 83rd Avenue to Las Palmaritas Drive will be prohibited.

For the construction of the Peoria Basin, a haul route plan will need to be developed when a determination has been made as to where the excess material is to be taken. The primary agencies impacted by this haul will be the District, MCDOT, and the City of Peoria.

#### **10.0 Partnering**

Due to the many agencies and consultants involved in the Northern/Orangewood Storm Drain Project, Corporate Advisors, an outside workshop consultant, was retained to help coordinate partnering workshops among the parties. The first partnering workshop was held June 4, 1997 at the offices of the District.

#### **11.0 Schedule**

Wood/Patel's schedule for plan completion is far ahead of Stanley's schedule. This, in conjunction with a much later planned construction start up, could create a need for Wood/Patel to update the plans just prior to advertising for bids. A delay occurred in the 60% plan submittal primarily because of the changes after the 30% submittal. Further time was lost due to SRP's demand of discharging the irrigation flows into the storm drain, consequently upsizing the pipe.

#### **12.0 Final Plan**

As mentioned previously, the final plan has been developed in metric, except for existing utility call outs. The plan layout is per examples of plans and sheets provided to us by the District.

The stormwater surge (detention) basin depicted on the final plan is based on the detailed design work and with input from the District and the City of Peoria.

Proposed new right-of-way and proposed temporary construction easements are indicated on the 90 percent plan.

## **APPENDIX I**

### **STORM DRAIN HYDRAULIC ANALYSIS**

- **Northern Avenue Storm Drain**
- **Butler Avenue Storm Drain**

## **APPENDIX II**

### **CATCH BASIN INLET HYDRAULICS**

- **Catch Basin Hydraulics**
- **Catch Basin Connector Pipe Hydraulics**

**APPENDIX III**

**CORRESPONDENCE AND MINUTES OF MEETINGS**



## **APPENDIX I**

### **STORM DRAIN HYDRAULIC ANALYSIS**

- **Northern Avenue Storm Drain**
- **Butler Avenue Storm Drain**



**STORM DRAIN HYDRAULIC GRADE LINE COMPUTATION WORKSHEET**

Project: Northern/Orangewood Storm Drain Phase IIA - City of Peoria

Engineer: JGT File Name: q:\northern\_phi\hydraulics\90\plans\butterm.xls Date: 2/17/98

Description: Computation of EGL and HGL for storm drain system

Reference: Drainage Design Manual for Maricopa County, Arizona  
Volume II, Hydraulics, January, 1996

Last Revised: August 22, 1997

**Notes:**

- This spreadsheet is developed to compute storm drain hydraulic grade line based on the above mentioned reference. All Equations used and minor loss coefficients shall be referred to this reference.
- The blue areas are user input blocks, the grey areas are computed values, and the dark grey areas are check cells.
- The recommended flow type for storm drain systems by the reference is pressure flow. Therefore, open channel flow computation is only an approximation here. The hydraulic grade line at the outfall is assumed to be the invert elevation plus the pipe diameter. If the tailwater elevation is different from this value, the user should change this number manually.
- The station is located at the immediate downstream of a change point.
- If the number of rows of the spreadsheet is not enough for a project, the user can copy more rows to the bottom of the spreadsheet.
- Column F are the suggested pipe diameters computed by the spreadsheet with increment of 6 inches. User can select different values than the suggested.
- Manning's n values in Column H can be selected from Table 4.1.
- Column M are the summation of Kt values for each section, and the individual Kt values are from Tables 4.2 to 4.4 based on the transition types: a) gradual enlargement, b) sudden enlargement, c) contraction, the D2/D1 ratio in Column R, the velocity in Column S, and other related information on these tables.
- Column N are the summation of Kb values for each section, and the individual Kb values are from Figure 4.7.
- Columns O, P and Q are input data for computation of junction losses: Q3 is the lateral flow, D3 is the pipe diameter of the lateral flow, and theta is the angle between the main flow pipe and the lateral flow pipe.
- Column AC are minor losses other than the types considered in the spreadsheet. The user should input these values directly.
- If users find any error or have any suggestion, please contact Wood/Patel & Associates.

**Butler Drive - Agua Fria freeway outfall channel to 87th Avenue**

Storm Sewer Line Station Location	Pipe #	Const Centerline Station	Pipe Length	Pipe Diameter		n	Natural Ground Elevation (m)	Invert Elev. (m)	Pipe Slope (m/m)	Design Q (cms)	Transition Loss Coeff. Sum(Kt)	Bend Losses Angles & Manholes	Bend Loss Coeff. Sum(Kb)	Junction Losses			Vel. (m/s)	Full Area (m²)	Length (m)	Losses					Total Losses (m)	Hydraulic Grade Line Elevation (m)	Energy Grade Line Elevation (m)	Pressure Flow Check	"Overflow" Check	Comments	Depth to Hydraulic Grade Line (m)	Depth to Invert (m)
				Sheet Suggested (mm)	User Selected (mm)									Q3 (cms)	D3 (mm)	Theta (deg.)				hf (m)	ht (m)	hb (m)	hj (m)	Others (m)								
Outfall @ AFF Channel	-	0+252.0	0	1070	1219	0.012	335.890	331.933		2.209	0.00	-	0.00	0.00	0	0	1.19	1.86		-	0.00	0.01	0.00	0.000	-	333.15	333.22	-	-	-	-	-
AFF Channel to 91st Avenue	1 - 2	0+502.0	250	1070	1219	0.012	336.133	333.283	0.0054	2.209	0.00	2mh	0.10	0.20	460	90	1.89	1.17	250.00	0.63	0.00	0.11	0.12	0.018	0.65	334.50	334.68	Open	OK	Reduce D	1.6	2.9
91st Ave to 89th Ave	3 - 8	0+893.0	409	1680	1067	0.012	337.048	333.479	0.0005	2.010	0.10	4mh+2-15*	0.23	0.85	610	90	2.25	0.89	408.50	1.66	0.02	0.03	0.34	0.037	1.92	335.54	335.79	OK	OK	-	1.5	3.6
89th Ave	9	0+909.0	16	1370	1067	0.012	337.048	333.489	0.0006	1.161	0.10	1mh + 1-15*	0.13	0.25	610	90	1.30	0.89	16.00	0.02	0.01	0.01	0.19	0.037	0.44	336.15	336.24	OK	OK	-	0.9	3.6
89th Ave to 87th Ave	10 - 14	1+290.0	381	910	914	0.012	337.414	334.632	0.0030	0.906	0.10	5mh+2-20*	0.49	0.00	0	0	1.38	0.66	381.00	0.75	0.01	0.00	0.00	0.015	1.15	337.11	337.20	OK	OK	-	0.3	2.8



## **APPENDIX II**

### **CATCH BASIN INLET HYDRAULICS**

- **Catch Basin Hydraulics**
- **Catch Basin Connector Pipe Hydraulics**

PROJECT NORTHERN / ORANGEWOOD Storm DrainPROJECT NO. 93153 SHEET NO. 1 OF 1CALCULATED BY FKS DATE 12-23-97 CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_

### Calculation of THE HGL For Catch Basin Connector Pipes From the Mainline Storm Drain to the Catch Basin

---

1. USING THE Hydraulic Calculation FOR THE MAINLINE Storm Drain, Calculate THE HGL @ Catch Basin Connection Point.
2. BASED ON TOP of Curb Elevation at CATCH BASIN, Calculate invert of Connector Pipe AND Gutter @ Catch BASIN.
3. Calculate slope of pipe, pipe diameter + pipe length.
4. Calculate the Tailwater Based on the HGL - connector pipe outlet invert.
5. USING Dodson's pipe program, Calculate the Headwater required FOR THE pipe to convey this flow.
6. Determine "Control Type" (inlet or outlet)

Inlet = invert elevation @ CB plus inlet HW.

Outlet = invert elevation @ Connector pipe outlet plus outlet HW

"Control TYPE" the larger number between these two

7. Compare largest number to Gutter elevation. THE MINIMUM Difference = 0.50 ft (152MM)

8. ADJUST Pipe Size, slope + invert AS REQUIRED.

PROJECT NORTHERN/ORANGEWOOD  
PROJECT NO. 94153.02 SHEET NO. 1 OF 2  
CALCULATED BY FES DATE 2-11-98 CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_

CALCULATE THE CORRECTION FACTOR TO ADJUST BETWEEN ADOT & CITY OF PHOENIX CATCH BASIN LENGTHS :

$$(\text{Clogging Factor})(\text{opening length}) = \text{effective length}$$

$$(\text{ADJUSTED Clogging Factor})(\text{ADOT opening length}) = \text{effective length}$$

⇒ THE effective length is same in both equations, calculate the ADJUSTED Clogging Factor. Clogging Factor = 0.8 per FCDMC Manual

3 Foot opening

$$(0.8)(3.0) = 2.4 \text{ ft}$$

$$(?)(3.083) = 2.4 \text{ ft}$$

$$\text{ADJUSTED Clogging Factor} = \underline{\underline{0.778}}$$

6 FOOT OPENING

$$(0.8)(6) = 4.8 \text{ ft}$$

$$(?)(6.583) = 4.8 \text{ ft}$$

$$\text{ADJUSTED Clogging Factor} = \underline{\underline{0.729}}$$

9 Foot opening

$$(0.8)(9) = 7.2 \text{ ft}$$

$$(?)(9.583) = 7.2 \text{ ft}$$

$$\text{ADJUSTED Clogging Factor} = \underline{\underline{0.751}}$$

PROJECT NORTHERN/ORANGEWOOD  
PROJECT NO. 94153.02 SHEET NO. 2 OF 2  
CALCULATED BY FLS DATE 2-11-98 CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_

### 13 FOOT opening

$$(0.8)(13) = 10.4 \text{ ft}$$
$$(?) (13.583) = 0.766$$

ADJUSTED Clogging Factor =

### 20 FOOT opening

$$(0.8)(20) = 16 \text{ ft}$$
$$(?) (20.583) = 0.777$$

ADJUSTED Clogging Factor =

### SUMMARY TABLE

Catch BASIN OPENING LENGTH	FCDMC Rec. Clogging Factor	w/P ADJUSTED Clogging Factor
3	0.8	0.778
6	0.8	0.729
9	0.8	0.751
13	0.8	0.766
20	0.8	0.777

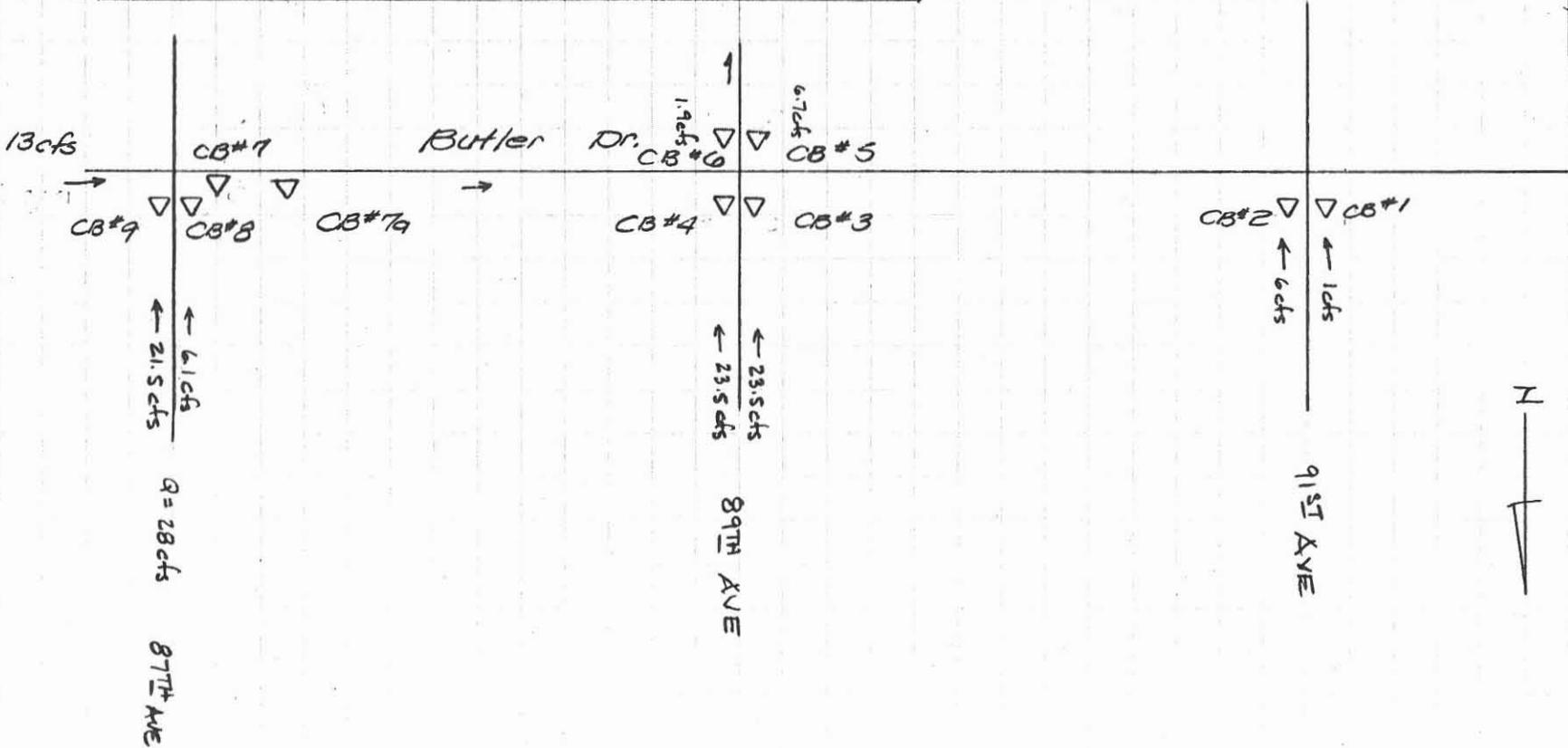
PROJECT Northern/Butler

PROJECT NO. 94153.02 SHEET NO. \_\_\_\_\_ OF \_\_\_\_\_

CALCULATED BY VGT DATE \_\_\_\_\_ CHECKED BY PKS DATE 1/5/98

Butler Dr.  
Catch Basin Schematic

CB#	Flow	Captured	Flowby	Flowby to CB#
9	21.5	15.1	6.4	7
8	6.1	4.0	1.5	7
7	$13 + 6.4 + 1.5 = 20.7$	9.3	11.0	7a
7a	11.0	7.3	4.3	5
6	Local	1.9	-	1
4	23.5	21.8	1.7	5
3	23.5	21.8	1.7	5
5	$4.3 + 1.7 + 1.7 = 7.7$	7.5	0.2	1
2	6	5.4	0.6	1
1	1	0.92	0.08	1



CB#1

ARIZONA DEPARTMENT OF TRANSPORTATION  
DRAINAGE DESIGN SECTION

02-11-1998

PROJECT NAME- Northern/Butler TRACS NO.- \_\_\_\_\_  
HIGHWAY NAME- \_\_\_\_\_ DESIGNER - FKS  
LOCATION - 915<sup>th</sup> Ave & Butler NW CHECKER - JGT PAGE \_\_\_\_\_  
Ver 3.40: December 1995

CURB OPENING INLET -- ON GRADE

GUTTER FLOW HYDRAULICS  
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G = 0.060  
Roadway Cross-Slope-Ft./Ft.--Sx = 0.020  
Shoulder Width-Ft.-- = 10.000  
Shoulder Slope-Ft./Ft.--Ss = 0.020  
Gutter Width-Ft.--W = 1.420  
Gutter Slope-Ft./Ft.--Sw = 0.056  
Gutter Depression-Inches-- = 0.954  
Manning's 'N = 0.016

Flow-CFS--Q = 1.000  
SPREAD-Ft.--T = 11.961  
Average Velocity-V-fps = 0.682

FLOW in Gutter-CFS--Q = 0.325  
% Flow in Gutter-CFS = 32.485  
Velocity of Flow in Gutter-fps = 0.913  
Depth at Curb Line-Inches--d = 3.484

CURB OPENING--ADOT STD. C-15.20

Flow-CFS--Q = 1.000  
Gutter Velocity at INLET-fps = 1.086  
GUTTER FLOW at INLET-CFS--Q = 0.484

Depth at INLET Curb Line-Inches--d = 5.243  
Local Gutter Depression-Inches = 2.000

Length of opening: TOTAL Intercept--Ft. = 4.108  
Capture Ratio -- CURB OPENING = 0.778

LENGTH	Efficiency	Q (Captured)	Q (By-Pass)
-----	-----	-----	-----
3.083	0.918	0.918	0.082
6.583	1.000	1.000	0.000
9.583	1.000	1.000	0.000
13.583	1.000	1.000	0.000
20.583	1.000	1.000	0.000

CB#2

ARIZONA DEPARTMENT OF TRANSPORTATION  
DRAINAGE DESIGN SECTION

02-11-1998

PROJECT NAME- Northern Butler TRACS NO. - \_\_\_\_\_  
 HIGHWAY NAME- \_\_\_\_\_ DESIGNER - FKS  
 LOCATION - 91st Ave & Butler NE CHECKER - JGT PAGE \_\_\_\_\_  
 Ver 3.40: December 1995

CURB OPENING INLET -- ON GRADE

GUTTER FLOW HYDRAULICS  
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G = 0.060  
 Roadway Cross-Slope-Ft./Ft.--Sx = 0.020  
 Shoulder Width-Ft.-- = 10.000  
 Shoulder Slope-Ft./Ft.--Ss = 0.020  
 Gutter Width-Ft.--W = 1.420  
 Gutter Slope-Ft./Ft.--Sw = 0.056  
 Gutter Depression-Inches-- = 0.954  
 Manning's 'N = 0.016  
 Flow-CFS--Q = 6.000  
 SPREAD-Ft.--T = 23.790  
 Average Velocity-V-fps = 1.053  
 FLOW in Gutter-CFS--Q = 0.980  
 % Flow in Gutter-CFS = 16.340  
 Velocity of Flow in Gutter-fps = 1.417  
 Depth at Curb Line-Inches--d = 6.323

CURB OPENING--ADOT STD. C-15.20

Flow-CFS--Q = 6.000  
 Gutter Velocity at INLET-fps = 1.569  
 GUTTER FLOW at INLET-CFS--Q = 1.251  
 Depth at INLET Curb Line-Inches--d = 8.212  
 Local Gutter Depression-Inches = 2.000  
 Length of opening: TOTAL Intercept--Ft. = 12.907  
 Capture Ratio -- CURB OPENING = 0.751

LENGTH	Efficiency	Q(Captured)	Q(By-Pass)
-----	-----	-----	-----
3.083	0.388	2.329	3.671
6.583	0.723	4.339	1.661
9.583	0.913	5.478	0.522
13.583	1.000	6.000	0.000
20.583	1.000	6.000	0.000

CB#3

ARIZONA DEPARTMENT OF TRANSPORTATION  
HIGHWAY DEVELOPMENT GROUP  
BRIDGE DRAINAGE SERVICES

12-16-1997

PROJECT NAME- Northern/Oranewood TRACS NO. - \_\_\_\_\_  
HIGHWAY NAME- \_\_\_\_\_ DESIGNER - ABS  
LOCATION - 89th Ave & Butter NWC CHECKER - JGT  
VER 2.23 May 1992

GUTTER FLOW HYDRAULICS  
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G = 0.250  
Roadway Cross-Slope-Ft./Ft.--Sx = 0.015  
Shoulder Width-Ft.-- = 10.000  
Shoulder Slope-Ft./Ft.--Ss = 0.015  
Gutter Width-Ft.--W = 1.420  
Gutter Slope-Ft./Ft.--Sw = 0.056  
Gutter Depression-Inches-- = 0.954  
Manning's 'N = 0.016  
  
Flow-CFS--Q = 23.500  
SPREAD-Ft.--T = 36.427  
Average Velocity-V-fps = 2.352  
  
FLOW in Gutter-CFS--Q = 2.560  
% Flow in Gutter-CFS--Eo = 10.895  
Velocity of Flow in Gutter-fps = 3.192  
Depth at Curb Line-Inches--d = 7.256

CB#4

ARIZONA DEPARTMENT OF TRANSPORTATION  
HIGHWAY DEVELOPMENT GROUP  
BRIDGE DRAINAGE SERVICES

12-16-1997

PROJECT NAME- Northern/Butler TRACS NO. - \_\_\_\_\_  
HIGHWAY NAME- \_\_\_\_\_ DESIGNER - PLS  
LOCATION - 89th Ave & Butler NE Cor CHECKER - JST  
VER 2.23 May 1992

GUTTER FLOW HYDRAULICS  
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G = 0.250  
Roadway Cross-Slope-Ft./Ft.--Sx = 0.015  
Shoulder Width-Ft.-- = 10.000  
Shoulder Slope-Ft./Ft.--Ss = 0.015  
Gutter Width-Ft.--W = 1.420  
Gutter Slope-Ft./Ft.--Sw = 0.056  
Gutter Depression-Inches-- = 0.954  
Manning's 'N = 0.016  
  
Flow-CFS--Q = 23.500  
SPREAD-Ft.--T = 36.427  
Average Velocity-V-fps = 2.352  
  
FLOW in Gutter-CFS--Q = 2.560  
% Flow in Gutter-CFS--Eo = 10.895  
Velocity of Flow in Gutter-fps = 3.192  
Depth at Curb Line-Inches--d = 7.256

CB #5  
 ARIZONA DEPARTMENT OF TRANSPORTATION  
 DRAINAGE DESIGN SECTION

02-11-1998

PROJECT NAME- Northern/Butter TRACS NO.- \_\_\_\_\_  
 HIGHWAY NAME- \_\_\_\_\_ DESIGNER - JKS  
 LOCATION - 89th Ave & Butter SW Cor CHECKER - JGT PAGE \_\_\_\_\_  
 Ver 3.40: December 1995

CURB OPENING INLET -- ON GRADE

Q = 1.7 cfs (Flow by CB#3)  
 1.7 cfs (Flow by CB#4)  
 4.3 cfs (Flow by CB#2a)  
 7.7 cfs

GUTTER FLOW HYDRAULICS  
 GUTTER DESCRIPTION

Roadway Grade-% Per cent--G = 0.250  
 Roadway Cross-Slope-Ft./Ft.--Sx = 0.010  
 Shoulder Width-Ft.-- = 10.000  
 Shoulder Slope-Ft./Ft.--Ss = 0.010  
 Gutter Width-Ft.--W = 1.420  
 Gutter Slope-Ft./Ft.--Sw = 0.056  
 Gutter Depression-Inches-- = 0.954  
 Manning's 'N = 0.016

Flow-CFS--Q = 7.700  
 SPREAD-Ft.--T = 30.736  
 Average Velocity-V-fps = 1.614

FLOW in Gutter-CFS--Q = 1.063  
 % Flow in Gutter-CFS = 13.800  
 Velocity of Flow in Gutter-fps = 2.248  
 Depth at Curb Line-Inches--d = 4.472

CURB OPENING--ADOT STD. C-15.20

Flow-CFS--Q = 7.700  
 Gutter Velocity at INLET-fps = 2.613  
 GUTTER FLOW at INLET-CFS--Q = 1.516

Depth at INLET Curb Line-Inches--d = 6.379  
 Local Gutter Depression-Inches = 2.000

Length of opening: TOTAL Intercept--Ft. = 24.101  
 Capture Ratio -- CURB OPENING = 0.777

LENGTH	Efficiency	Q (Captured)	Q (By-Pass)
3.083	0.218	1.681	6.019
6.583	0.437	3.364	4.336
9.583	0.598	4.608	3.092
13.583	0.775	5.969	1.731
20.583	0.969	7.459	0.241

CB#6  
 ARIZONA DEPARTMENT OF TRANSPORTATION  
 DRAINAGE DESIGN SECTION

02-11-1998

PROJECT NAME- Northern/Butler TRACS NO.- \_\_\_\_\_  
 HIGHWAY NAME- \_\_\_\_\_ DESIGNER - FKS  
 LOCATION - 89th Ave & Butler SE cor CHECKER - JGT PAGE \_\_\_\_\_  
 Ver 3.40: December 1995

CURB OPENING INLET -- ON GRADE

GUTTER FLOW HYDRAULICS  
 GUTTER DESCRIPTION

Roadway Grade-% Per cent--G = 0.250  
 Roadway Cross-Slope-Ft./Ft.--Sx = 0.010  
 Shoulder Width-Ft.-- = 10.000  
 Shoulder Slope-Ft./Ft.--Ss = 0.010  
 Gutter Width-Ft.--W = 1.420  
 Gutter Slope-Ft./Ft.--Sw = 0.056  
 Gutter Depression-Inches-- = 0.954  
 Manning's 'N = 0.016

Flow-CFS--Q = 1.900  
 SPREAD-Ft.--T = 17.889  
 Average Velocity-V-fps = 1.154

FLOW in Gutter-CFS--Q = 0.474  
 % Flow in Gutter-CFS = 24.922  
 Velocity of Flow in Gutter-fps = 1.631  
 Depth at Curb Line-Inches--d = 2.930

CURB OPENING--ADOT STD. C-15.20

Flow-CFS--Q = 1.900  
 Gutter Velocity at INLET-fps = 2.038  
 GUTTER FLOW at INLET-CFS--Q = 0.790

Depth at INLET Curb Line-Inches--d = 4.753  
 Local Gutter Depression-Inches = 2.000

Length of opening: TOTAL Intercept--Ft. = 9.870  
 Capture Ratio -- CURB OPENING = 0.729

LENGTH	Efficiency	Q(Captured)	Q(By-Pass)
-----	-----	-----	-----
3.083	0.490	0.932	0.968
6.583	0.862	1.637	0.263
9.583	0.998	1.897	0.003
13.583	1.000	1.900	0.000
20.583	1.000	1.900	0.000

CB #7  
 ARIZONA DEPARTMENT OF TRANSPORTATION  
 DRAINAGE DESIGN SECTION

02-11-1998

PROJECT NAME- Northern/Butler TRACS NO.- \_\_\_\_\_  
 HIGHWAY NAME- \_\_\_\_\_ DESIGNER - FKS  
 LOCATION - 87th Ave & Butler NW CHECKER - UGT PAGE \_\_\_\_\_  
 Ver 3.40: December 1995

CURB OPENING INLET -- ON GRADE

Q = 13 cfs (Butler East)  
 6.4 cfs (CB#9 Flow by)  
 1.5 cfs (CB#8 Flow by)  
 20.9 cfs

GUTTER FLOW HYDRAULICS  
 GUTTER DESCRIPTION

Roadway Grade-% Per cent--G = 0.210  
 Roadway Cross-Slope-Ft./Ft.--Sx = 0.021  
 Shoulder Width-Ft.-- = 10.000  
 Shoulder Slope-Ft./Ft.--Ss = 0.021  
 Gutter Width-Ft.--W = 1.420  
 Gutter Slope-Ft./Ft.--Sw = 0.056  
 Gutter Depression-Inches-- = 0.954  
 Manning's 'N = 0.016

Flow-CFS--Q = 20.900  
 SPREAD-Ft.--T = 29.194  
 Average Velocity-V-fps = 2.326

FLOW in Gutter-CFS--Q = 2.762  
 % Flow in Gutter-CFS = 13.216  
 Velocity of Flow in Gutter-fps = 3.122  
 Depth at Curb Line-Inches--d = 7.953

CURB OPENING--ADOT STD. C-15.20

Flow-CFS--Q = 20.900  
 Gutter Velocity at INLET-fps = 3.388  
 GUTTER FLOW at INLET-CFS--Q = 3.363

Depth at INLET Curb Line-Inches--d = 9.865  
 Local Gutter Depression-Inches = 2.000

Length of opening: TOTAL Intercept--Ft. = 34.377  
 Capture Ratio -- CURB OPENING = 0.751

LENGTH	Efficiency	Q (Captured)	Q (By-Pass)
-----	-----	-----	-----
3.083	0.156	3.252	17.648
6.583	0.318	6.645	14.255
9.583	0.445	9.294	11.606
13.583	0.595	12.444	8.456
20.583	0.807	16.861	4.039

CB # 79  
 ARIZONA DEPARTMENT OF TRANSPORTATION  
 DRAINAGE DESIGN SECTION

02-11-1998

PROJECT NAME- Northern / Butler TRACS NO. - \_\_\_\_\_  
 HIGHWAY NAME- \_\_\_\_\_ DESIGNER - FKS  
 LOCATION - 87th Ave & Butler West of CHECKER - CGT PAGE \_\_\_\_\_  
 Ver 3.40: December 1995 Intersection

CURB OPENING INLET -- ON GRADE

*Q = 11.6 (Flow by From CB#7)*

GUTTER FLOW HYDRAULICS  
 GUTTER DESCRIPTION

Roadway Grade-% Per cent--G = 0.170  
 Roadway Cross-Slope-Ft./Ft.--Sx = 0.023  
 Shoulder Width-Ft.-- = 10.000  
 Shoulder Slope-Ft./Ft.--Ss = 0.023  
 Gutter Width-Ft.--W = 1.420  
 Gutter Slope-Ft./Ft.--Sw = 0.056  
 Gutter Depression-Inches-- = 0.954  
 Manning's 'N = 0.016

Flow-CFS--Q = 11.600  
 SPREAD-Ft.--T = 22.981  
 Average Velocity-V-fps = 1.900

FLOW in Gutter-CFS--Q = 1.933  
 % Flow in Gutter-CFS = 16.661  
 Velocity of Flow in Gutter-fps = 2.541  
 Depth at Curb Line-Inches--d = 6.905

CURB OPENING--ADOT STD. C-15.20

Flow-CFS--Q = 11.600  
 Gutter Velocity at INLET-fps = 2.788  
 GUTTER FLOW at INLET-CFS--Q = 2.413

Depth at INLET Curb Line-Inches--d = 8.792  
 Local Gutter Depression-Inches = 2.000

Length of opening: TOTAL Intercept--Ft. = 22.671  
 Capture Ratio -- CURB OPENING = 0.751

LENGTH	Efficiency	Q (Captured)	Q (By-Pass)
-----	-----	-----	-----
3.083	0.231	2.684	8.916
6.583	0.461	5.344	6.256
9.583	0.628	7.285	4.315
13.583	0.807	9.362	2.238
20.583	0.986	11.441	0.159

CB # 8  
 ARIZONA DEPARTMENT OF TRANSPORTATION  
 DRAINAGE DESIGN SECTION

02-11-1998

PROJECT NAME- Northern / Butler TRACS NO.- \_\_\_\_\_  
 HIGHWAY NAME- \_\_\_\_\_ DESIGNER - FKS  
 LOCATION - 87th Ave @ Butler NW COR CHECKER - JGT PAGE \_\_\_\_\_  
 Ver 3.40: December 1995

CURB OPENING INLET -- ON GRADE

GUTTER FLOW HYDRAULICS  
 GUTTER DESCRIPTION

Roadway Grade-% Per cent--G = 0.500  
 Roadway Cross-Slope-Ft./Ft.--Sx = 0.008  
 Shoulder Width-Ft.-- = 10.000  
 Shoulder Slope-Ft./Ft.--Ss = 0.008  
 Gutter Width-Ft.--W = 1.420  
 Gutter Slope-Ft./Ft.--Sw = 0.056  
 Gutter Depression-Inches-- = 0.954  
 Manning's 'N = 0.016

Flow-CFS--Q = 6.100  
 SPREAD-Ft.--T = 28.301  
 Average Velocity-V-fps = 1.876

FLOW in Gutter-CFS--Q = 0.964  
 % Flow in Gutter-CFS = 15.806  
 Velocity of Flow in Gutter-fps = 2.665  
 Depth at Curb Line-Inches--d = 3.535

CURB OPENING--ADOT STD. C-15.20

Flow-CFS--Q = 6.100  
 Gutter Velocity at INLET-fps = 3.229  
 GUTTER FLOW at INLET-CFS--Q = 1.510

Depth at INLET Curb Line-Inches--d = 5.428'  
 Local Gutter Depression-Inches = 2.000

Length of opening: TOTAL Intercept--Ft. = 24.961  
 Capture Ratio -- CURB OPENING = 0.766

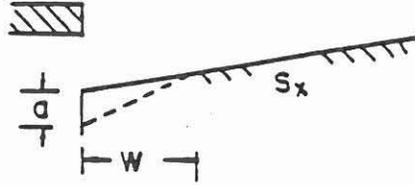
LENGTH	Efficiency	Q (Captured)	Q (By-Pass)
-----	-----	-----	-----
3.083	0.211	1.289	4.811
6.583	0.424	2.584	3.516
9.583	0.582	3.549	2.551
13.583	0.757	4.617	1.483
20.583	0.956	5.834	0.266

$Q = 21.5 \text{ cfs}$   
 $S = 0.0056$   
 $S_x = 0.008$   
 $n = 0.016$   
 $L = 37 \text{ ft}$   
 $E_{ff} = 0.8$   
 $L_{eff} = 30 \text{ ft}$

$$S'_w = \frac{0.167'}{1.42'} = 0.1176$$

$$S_e = 0.009 + (0.1176)(0.095)$$

$$S_e = 0.020$$



$$L_T = 0.6Q^{0.42}S^{0.3}(1/nS_x)^{0.6}$$

FOR COMPOSITE CROSS SLOPES, USE  $S_0$  FOR  $S_x$ .

$$S_0 = S_x + S'_w E_0 ; S'_w = a/W$$

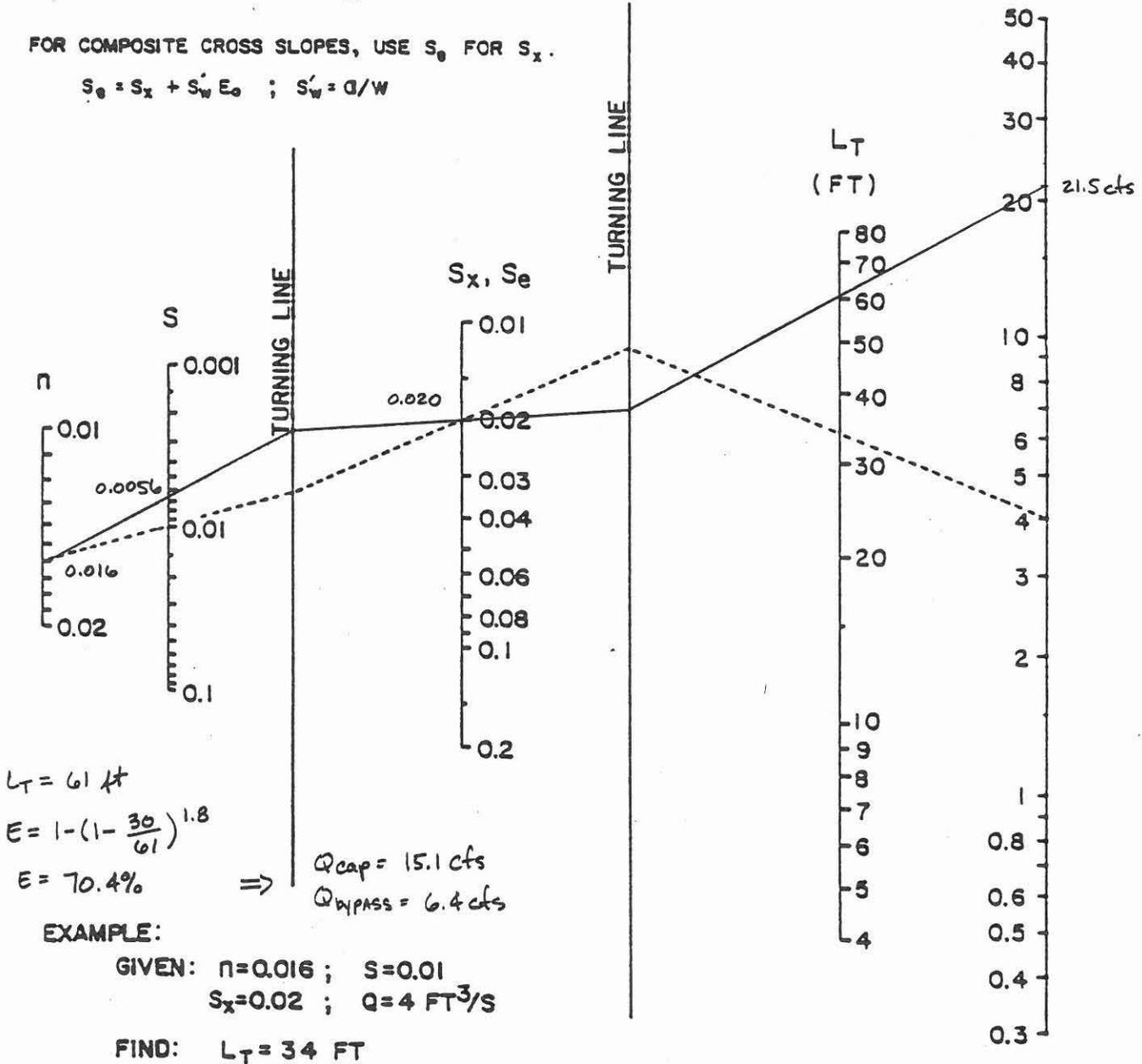


Figure 3.20  
 Curb Opening and Slotted Drain Inlet Length for Total Interception  
 (USDOT, FHWA, 1984, HEC-12, Chart 9)

CB#9

ARIZONA DEPARTMENT OF TRANSPORTATION  
HIGHWAY DEVELOPMENT GROUP  
BRIDGE DRAINAGE SERVICES

12-16-1997

PROJECT NAME- Northern/Butler TRACS NO. - \_\_\_\_\_  
HIGHWAY NAME- \_\_\_\_\_ DESIGNER - FKS  
LOCATION - 87th Ave & Butler NE Cor CHECKER - JGT  
VER 2.23 May 1992

GUTTER FLOW HYDRAULICS  
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.560
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.008
Shoulder Width-Ft.--	=	10.000
Shoulder Slope-Ft./Ft.--Ss	=	0.008
Gutter Width-Ft.--W	=	1.420
Gutter Slope-Ft./Ft.--Sw	=	0.056
Gutter Depression-Inches--	=	0.954
Manning's 'N	=	0.016
Flow-CFS--Q	=	21.500
SPREAD-Ft.--T	=	44.789
Average Velocity-V-fps	=	2.663
FLOW in Gutter-CFS--Q	=	2.040
% Flow in Gutter-CFS--Eo	=	9.488
Velocity of Flow in Gutter-fps	=	3.715
Depth at Curb Line-Inches--d	=	5.118

CB #10

ARIZONA DEPARTMENT OF TRANSPORTATION  
DRAINAGE DESIGN SECTION

02-11-1998

PROJECT NAME- Northern/Butler TRACS NO.- \_\_\_\_\_  
 HIGHWAY NAME- - DESIGNER - FKS  
 LOCATION - 83rd Ave & Griswold Aves CHECKER - JGT PAGE \_\_\_\_\_  
 Ver 3.40: December 1995

CURB OPENING INLET -- ON GRADE

GUTTER FLOW HYDRAULICS  
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G = 0.110  
 Roadway Cross-Slope-Ft./Ft.--Sx = 0.020  
 Shoulder Width-Ft.-- = 10.000  
 Shoulder Slope-Ft./Ft.--Ss = 0.020  
 Gutter Width-Ft.--W = 1.420  
 Gutter Slope-Ft./Ft.--Sw = 0.056  
 Gutter Depression-Inches-- = 0.954  
 Manning's 'N = 0.016  
 Flow-CFS--Q = 7.000  
 SPREAD-Ft.--T = 22.484  
 Average Velocity-V-fps = 1.375  
 FLOW in Gutter-CFS--Q = 1.211  
 % Flow in Gutter-CFS = 17.301  
 Velocity of Flow in Gutter-fps = 1.850  
 Depth at Curb Line-Inches--d = 6.009

CURB OPENING--ADOT STD. C-15.20

Flow-CFS--Q = 7.000  
 Gutter Velocity at INLET-fps = 2.059  
 GUTTER FLOW at INLET-CFS--Q = 1.563  
 Depth at INLET Curb Line-Inches--d = 7.892  
 Local Gutter Depression-Inches = 2.000  
 Length of opening: TOTAL Intercept--Ft. = 15.783  
 Capture Ratio -- CURB OPENING = 0.766

LENGTH	Efficiency	Q (Captured)	Q (By-Pass)
-----	-----	-----	-----
3.083	0.324	2.266	4.734
6.583	0.621	4.350	2.650
9.583	0.814	5.698	1.302
13.583	0.971	6.798	0.202
20.583	1.000	7.000	0.000

PIPE CULVERT ANALYSIS  
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 24, 1998  
Catch Basin #1  
Connector Pipe Hydraulics  
Northern/Orangewood Storm Drain Project

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	1.25
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	35.0
Culvert Slope (feet per foot).....	0.1315

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater Inlet Control	Headwater Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
0.9	0.00	0.50	-3.77	0.16	0.37	0.16	9.73
0.9	0.37	0.50	-3.77	0.16	0.37	0.16	9.73

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PIPE CULVERT ANALYSIS  
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 24, 1998  
Catch Basin #2  
Connector Pipe Hydraulics  
Northern/Orangewood Storm Drain Project

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	1.25
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	42.1
Culvert Slope (feet per foot).....	0.1098

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
5.4	0.00	1.62	-2.83	0.42	0.94	0.42	14.92
5.4	0.94	1.62	-2.83	0.42	0.94	0.42	14.92

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PIPE CULVERT ANALYSIS  
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 24, 1998  
Catch Basin #3  
Connector Pipe Hydraulics  
Northern/Orangewood Storm Drain Project

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	2.50
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	62.3
Culvert Slope (feet per foot).....	0.0492

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater Inlet Control (ft)	Headwater Outlet Control (ft)	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
43.6	6.26	4.81	5.63	1.16	2.20	2.50	8.88

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PIPE CULVERT ANALYSIS  
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 24, 1998  
Catch Basin #4  
Connector Pipe Hydraulics  
Northern/Orangewood Storm Drain Project

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	2.50
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	41.8
Culvert Slope (feet per foot).....	0.0069

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater Inlet Control (ft)	Outlet Control (ft)	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
21.8	3.54	2.46	3.81	1.38	1.59	2.50	4.44

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PIPE CULVERT ANALYSIS  
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 24, 1998  
Catch Basin #5  
Connector Pipe Hydraulics  
Northern/Orangewood Storm Drain Project

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	1.50
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	42.7
Culvert Slope (feet per foot).....	0.0206

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater Inlet Control (ft)	Headwater Outlet Control (ft)	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
7.5	3.13	1.73	2.85	0.71	1.06	1.50	4.24

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PIPE CULVERT ANALYSIS  
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 24, 1998  
Catch Basin #6  
Connector Pipe Hydraulics  
Northern/Orangewood Storm Drain Project

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PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	2.00
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	65.5
Culvert Slope (feet per foot).....	0.0609

=====

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater Inlet Control	Headwater Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
9.4	8.23	1.62	4.55	0.53	1.10	2.00	2.99

=====

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PIPE CULVERT ANALYSIS  
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 24, 1998  
Catch Basin #7  
Connector Pipe Hydraulics  
Northern/Orangewood Storm Drain Project

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PROGRAM INPUT DATA:

DESCRIPTION	VALUE
-----	-----
Culvert Diameter (feet).....	2.00
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	42.6
Culvert Slope (feet per foot).....	0.0050

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PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater Inlet Control	Headwater Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
-----	-----	-----	-----	-----	-----	-----	-----
9.3	2.94	1.61	2.99	1.04	1.09	2.00	2.96

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=====
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PIPE CULVERT ANALYSIS  
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 24, 1998  
Catch Basin #7a  
Connector Pipe Hydraulics  
Northern/Orangewood Storm Drain Project

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	2.00
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	42.6
Culvert Slope (feet per foot).....	0.0050

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater Inlet Control (ft)	Normal Outlet Control (ft)	Critical Depth (ft)	Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
7.3	3.22	1.39	3.17	0.89	0.96	2.00	2.32

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PIPE CULVERT ANALYSIS  
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 24, 1998  
Catch Basin #8  
Connector Pipe Hydraulics  
Northern/Orangewood Storm Drain Project

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	1.50
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	66.1
Culvert Slope (feet per foot).....	0.0039

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater Inlet Control (ft)	Headwater Outlet Control (ft)	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
4.6	2.79	1.22	2.80	0.87	0.82	1.50	2.60

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PIPE CULVERT ANALYSIS  
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 24, 1998  
Catch Basin #9  
Connector Pipe Hydraulics  
Northern/Orangewood Storm Drain Project

```
=====
```

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	2.50
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	134.5
Culvert Slope (feet per foot).....	0.0050

```
=====
```

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater Inlet Control	Headwater Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
15.1	2.83	1.92	2.53	1.23	1.31	2.50	3.08

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=====
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PIPE CULVERT ANALYSIS  
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 24, 1998  
Catch Basin #10  
Connector Pipe Hydraulics  
Northern/Orangewood Storm Drain Project

=====

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	1.25
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	32.6
Culvert Slope (feet per foot).....	0.0053

=====

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater Inlet Control	Headwater Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
6.8	0.00	2.06	2.00	1.25	1.05	1.25	5.54
6.8	1.25	2.06	2.10	1.25	1.05	1.25	5.54

=====

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Catch Basin Connector Pipe Hydraulics

Lateral	Pipe No.	Q (cfs)	Q (cms)	Pipe Dia. (mm)	Pipe Dia. (in)	Invert at Catch Basin (m)	Invert (ft)	Slope (m/m)	Top of Curb (m)	Top of Curb (ft)	Gutter (m)	Gutter (ft)	D/S HGL Control	D/S HGL Elev. (m)	D/S HGL Elev. (ft)	D/S Invert based on Slope (m)	D/S Invert based on Slope (ft)	Normal/ Critical Depth (ft)	D/S Invert Elev+Normal/ Critical Depth (ft)	Length of Pipe (m)	Length of Pipe (ft)	Tailwater (ft)	Tailwater (m)	Inlet Control HW (ft)	Outlet Control HW (ft)	Inlet Control HW Elev (ft)	Outlet Control HW Elev (ft)	Controlling HW	Difference (gutter-HW elev) (ft)	Difference (gutter-HW elev) (m)	CB #
1	L1	0.9	0.025	381	15	335.038	1099.21	0.1315	336.105	1102.71	335.953	1102.21	Pipe	333.150	1093.01	333.635	1094.60	0.37	1094.97	10.669	35.00	-1.59	-0.522	0.50	-3.77	1099.71	Not Valid	Inlet Control	2.50	0.763	1
2	L2	5.4	0.153	381	15	335.038	1099.21	0.1098	336.105	1102.71	335.953	1102.21	Pipe	333.150	1093.01	333.630	1094.59	0.94	1095.53	12.829	42.09	-1.57	-0.517	1.62	-2.83	1100.83	Not Valid	Inlet Control	1.38	0.421	2
3	L3	43.6	1.235	762	30	334.567	1097.66	0.0492	336.876	1105.24	336.724	1104.74	Pipe	335.540	1100.85	333.632	1094.59	2.20	1096.79	18.997	62.33	6.26	2.054	4.81	5.63	1102.47	1103.29	Outlet Control	1.45	0.441	3
4	L4	21.8	0.617	762	30	335.291	1100.04	0.0069	336.876	1105.24	336.724	1104.74	CB #3	336.283	1103.29	335.203	1099.75	1.59	1101.34	12.731	41.77	3.54	1.163	2.46	3.81	1102.50	1103.85	Outlet Control	0.89	0.272	4
5	L5	7.5	0.212	457	18	335.557	1100.91	0.0206	336.776	1104.91	336.624	1104.41	CB #6	336.243	1103.16	335.288	1100.03	1.06	1101.09	13.029	42.75	3.13	1.028	1.73	2.85	1102.64	1103.76	Outlet Control	0.65	0.198	5
6	L6	9.4	0.266	610	24	334.856	1098.61	0.0609	336.780	1104.92	336.628	1104.42	Pipe	336.150	1102.85	333.641	1094.62	1.10	1095.72	19.954	65.47	8.23	2.701	1.62	4.55	1100.23	1103.16	Outlet Control	1.26	0.385	6
7	L7	9.3	0.263	610	24	336.249	1103.18	0.0050	337.479	1107.21	337.327	1106.72	Pipe	337.080	1105.91	336.184	1102.97	1.09	1104.06	12.976	42.57	2.94	0.964	1.61	2.99	1104.79	1106.17	Outlet Control	0.55	0.167	7
7a	L7a	7.3	0.207	610	24	336.119	1102.75	0.0050	337.467	1107.18	337.315	1106.68	Pipe	337.037	1105.76	336.054	1102.54	0.96	1103.50	12.976	42.57	3.22	1.058	1.39	3.17	1104.14	1105.92	Outlet Control	0.75	0.230	7a
8	L8	4.6	0.130	457	18	336.347	1103.50	0.0039	337.566	1107.50	337.414	1107.00	Pipe	337.120	1106.04	336.268	1103.24	0.87	1104.11	20.136	66.06	2.79	0.917	1.22	2.8	1104.72	1106.30	Outlet Control	0.70	0.214	8
9	L9	15.1	0.428	762	30	336.461	1103.87	0.0050	337.680	1107.87	337.528	1107.38	MH	337.120	1106.04	336.256	1103.20	1.31	1104.51	41.000	134.51	2.83	0.930	1.92	2.53	1105.79	1106.40	Outlet Control	0.97	0.296	9
10	L10	6.8	0.193	381	15	336.116	1102.74	0.0053	337.335	1106.74	337.183	1106.24	MH	334.818	1098.48	336.063	1102.57	1.25	1103.82	9.930	32.58	-4.09	-1.341	2.06	2.1	1104.80	1104.84	Outlet Control	1.40	0.427	10

PROJECT Northern/OrangewoodPROJECT NO. 94153.02 SHEET NO. \_\_\_\_\_ OF \_\_\_\_\_CALCULATED BY JGT DATE 2/33/98 CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_

RIP RAP AT NE corner of Basin (PER US DOT HEC No.14)

$$Q = 3.738 \text{ cms} - 0.538 \text{ cms} = 3.2 \text{ cms} \\ = 113 \text{ cfs}$$

Pipe Diameter = 1676 mm = 66 in  
 normal depth = 4.4'  
 TW Depth = 1'

$$Q/10^{2.5} = 113/55^{2.5} = 1.59 \\ TW/D = 1/55 = 0.182 \\ Y_0/D = 0.42$$

$$Y_0 = 0.42(55) = 2.31$$

$$TW/Y_0 = 1/2.31 = 0.43 < 0.75 \text{ ok}$$

Brink AREA for  $Y_0/D = 0.42$ 

$$A = 0.313(55)^2 = 9.47 \text{ sq ft}$$

$$V_0 = Q/A = 113/9.47 = 11.9 \text{ fps}$$

$$Y_e = A^{1/2} = (9.47/2)^{1/2} = 2.176 \text{ ft}$$

$$Fr = V_0 / [32.2(Y_e)]^{1/2} = 11.9 / [(32.2)(2.176)]^{1/2} = 1.42$$

$$\text{Try } d_{50}/Y_e = 0.25, \quad d_{50} = 0.25(2.176) = 0.54'$$

$$h_s/Y_e = 0.75, \quad h_s = 0.75(2.176) = 1.63'$$

$$h_s/d_{50} = 1.63/0.54 = 3.01 \quad 2 < h_s/d_{50} < 4 \quad \text{ok}$$

$$d_{50} = 6.5'' = 165 \text{ mm} \text{ plans } \div d_{50} = 305 \text{ mm} \quad \text{ok}$$

PROJECT Northern/Orange wood

PROJECT NO. 94153.02 SHEET NO. \_\_\_\_\_ OF \_\_\_\_\_

CALCULATED BY JGT DATE 2/27/98 CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_

Rip Rap At SE corner of Basin (PER US DOT HEC No. 14)

$$Q = 6.428 + 0.538 - 0.34 = 6.626$$

$$= 224 cfs$$

Pipe Diameter = 1829 mm = 72"

normal Depth = 6'

TW Depth = 2.5

$$Q/P^{2.5} = 224/6^{2.5} = 2.54$$

$$TW/D = 2.5/6 = 0.42$$

$$Y_0/D = 0.56$$

$$Y_0 = 0.56(6) = 3.36$$

$$TW/Y_0 = 2.5/3.36 = 0.74 < 0.75 \text{ OK}$$

Brink Area for  $Y_0/D =$

$$0.4526 (36) = 16.3 \text{ SF}$$

$$V_0 = Q/A = 224/16.3 = 13.75 \text{ FPS}$$

$$y_e = (A/2)^{1/2} = (13.75/2)^{1/2} = 2.62 \text{ ft}$$

$$Fr = V_0 / [32.2 (y_e)]^{1/2} = 13.75 / [32.2 \cdot 2.62]^{1/2} = 1.50$$

$$Teq \ d_{50}/y_e = 0.3 \quad , \quad d_{50} = 0.3 (2.62) = 0.79'$$

$$h_s/y_e = 1.2 \quad h_s = 1.2 (2.62) = 3.14'$$

$$h_s/d_{50} = 3.14 / 0.8 = 3.9$$

$$2 < h_s/d_{50} < 4 \quad \text{OK}$$

$$d_{50} = 10" \quad \text{USE } d_{50} = 12" \ 305 \text{ mm} \ \text{OK}$$



**APPENDIX III**

**CORRESPONDENCE AND MINUTES OF MEETINGS**

WOOD/PATEL

fax transmittal

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PAGE 1 OF 2

DATE: 2/4/98

TIME:

TO: Olin Suttan

FAX NO: 506-4601

COMPANY:

FCDMC

FROM: JAMES TAILLON

JOB NO.: 94153.02

PROJECT: Northern/Orangewood

COMMENTS:

Olin,

Attached is a copy of contacts for this project. You should also be receiving a copy of the 90% review meeting minutes in the mail within the next day or so.

If you require any additional information, please let me know.

Thank you:

James Tailon

copy to:

hard copy to follow in mail

# **Northern and Butler Storm Drains Sub Phase "A"**

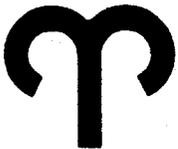
Contract FCD 94-12 Phase II

## ***List of Contacts***

W/P JOB NO.: 02/04/98  
94153.0

<b>Company</b>	<b>Contact</b>	<b>Phone Number</b>	<b>Address</b>
Arizona Public Service CO	Ms. Phyllis Stuart	602-493-4401	P.O. Box 53933 Mail Station 4618 Phoenix, Az 85072
AT&T	CHC Engineering Inquiry		2535 E. 40th Ave Room C-18 Denver, CO 80205
Cox Communications	Ms. Angie Hardesty	602-352-5860	115 N. 51st Ave Phoenix, Az 85043
El Paso Natural Gas	Mr. Bill Ward	602-438-4221	7815 S. 48th Street Phoenix, Az 85044
MCDOT	Kent McLain	602-506-8623	2901 W. Durango St. Phoenix, Az 85009
Salt River Project	Rosalie Quintana	602-236-0695	P.O. Box 52025 Mail Station WVS208 Phoenix, Az 85042
Southwest Gas Corporation	Robert Sprague	602-484-5343	9 S. 43rd Ave Mail Station 52075 Phoenix, Az 85072
SRVWUA	Mr. Bob Maurer	602-236-2962	P.O.Box 52025 Mail Station PAB106 Phoenix, Az 85072
US West Communications	Bob Friess	602-630-5473	10220 N. 25th Ave, Ste.110 Phoenix, Az 85021

q:\northernPhl\contacts.wb2



R·A·M

RICKER • ATKINSON • MCBEE & ASSOCIATES, INC.

RECEIVED

Geotechnical Engineering • Construction Materials Testing

FEB 6 - 1998

WOOD, PATEL & ASSOCIATES

February 2, 1998

To: Warren - FCDMC

From: Kenneth L. Ricker, P.E./Ricker, Atkinson, McBee & Associates, Inc.

Fax: 506-4720

Subject: Use of Cast-In-Place Concrete Pipes  
Northern/Orangewood Storm Drain Project  
Phase IIA

R.A.M. Project No. G01522

We understand that cast-in-place concrete pipe may be considered for use in the area of our Test Borings 11, B3, 12, 13 and 14. Some of these test borings encountered a layer of silty sand which may cave if cut steeper than 1H:1V. The clayey sand deposit encountered at or somewhat above anticipated invert grade contains gravel and cobble size material and is moderately cemented. The presence of gravel and cobble size material will make the excavation along the bottom of the pipe irregular. The cementation and the cobble content may make excavations with the round bottom backhoe bucket slow and difficult to accomplish.

If you have any questions, please do not hesitate to call.

Respectfully submitted,  
RICKER, ATKINSON, MCBEE & ASSOCIATES, INC.



By: Kenneth L. Ricker, P.E.

Reviewed by: Charles H. Atkinson, P.E.

/nk  
cc: Wood-Patel (1)

**MEETING MINUTES**

Darrel E. Wood, P.E., R.L.S.  
Ashok C. Patel, P.E., R.L.S.  
James S. Campbell, P.E.  
Gordon W. R. Wark, P.E.  
Thomas R. Gettings, R.L.S.  
Bruce Friedhoff, P.E.  
Scott A. Nelson, R.L.S.  
Richard L. Hiner, P.E.  
Fredrick K. Schneider, P.E.  
Timothy A. Huval, P.E.  
Michael J. Sexton, R.L.S.  
Jack K. Moody, P.E.  
Leslie J. Kland, P.E.  
Carl Sitterley, R.L.S.  
Curtis L. Brown, P.E.

**DATE:** February 2, 1998

**SUBJECT:** Northern/Orangewood Phase II  
Northern & Butler Storm Drains, Sub-Phase "A"  
WP#94153.02

**ATTENDEES:** RW Shobe, FCDMC  
Olin Sutton, FCDMC  
Richard Harris, FCDMC  
Ash Patel, Wood/Patel  
James Taillon, Wood/Patel

**RE:** 90% Review Comments

JST

1. Olin Sutton presented Wood/Patel with his comments and they were reviewed. There are a number of utilities on the plans which call for relocation by others. RW indicated that Olin was to contact the relevant utilities to coordinate these relocations. Wood/Patel is to provide Olin with contacts for utilities in the area. Wood/Patel will also provide a sketch for recommended relocation of SRP irrigation lines and Olin will present those to SRP for their plan preparation. RW also indicated that Olin was to contact El Paso Natural Gas and indicate that any measures required to protect their 16" gas line in Northern Avenue during this construction will be their responsibility. Whether those measures are to occur prior to construction or during construction is up to El Paso.
2. Richard Harris presented his comments. He indicated that the water lines in previous projects have had line breaks in the construction area. There were also locations where valve spacing was excessive for the project construction limits, so additional valves were required. It was decided that Wood/Patel would add valves that may be required and indicated that these are potential valve shut off locations. Wood/Patel will also need to add to this item to the special provisions. Also any water line shut-downs need to be made by the affected municipality. The Contractor is not to shut-down water lines at any time.
3. Richard Harris indicated that he had arrived at pipe costs that were higher than those which Wood/Patel was showing on the bid tabs. Wood/Patel will review these numbers and verify them with contractors.
4. There is a potential for ADOT to utilize the excavated basin material. If this is the case, ADOT will stockpile the top two feet of topsoil onsite and utilize the remaining excavation. Wood/Patel will adjust their quantities of excavated material to allow for additional over-excavation of two feet in the basin bottom so the topsoil can be re-utilized on the basin bottom.

5. Wood/Patel will need to submit these plans to ADOT for review and approval for a permit and ADOT will be asked if any additional safety requirements for the outlets into the channel will be required.
6. RW Shobe will provide Wood/Patel with a new flood control district contract number which will need to be modified on all sheets. The structural plans for the junction structures will require an additional cross section. Wood/Patel will coordinate this issue. RW Shobe will provide any additional comments to Wood/Patel as they become available. Wood/Patel indicated that they have received verbal comments from the City of Peoria on a 90% review plans.

cc: Attendees

MEMOS94153.02-f3

**MEETING MINUTES**

Darrel E. Wood, P.E., R.L.S.  
Ashok C. Patel, P.E., R.L.S.  
James S. Campbell, P.E.  
Gordon W. R. Wark, P.E.  
Thomas R. Gettings, R.L.S.  
Bruce Friedhoff, P.E.  
Scott A. Nelson, R.L.S.  
Richard L. Hiner, P.E.  
Fredrick K. Schneider, P.E.  
Timothy A. Huval, P.E.  
Michael J. Sexton, R.L.S.  
Jack K. Moody, P.E.  
Leslie J. Kland, P.E.  
Carl Sitterley, R.L.S.  
Curtis L. Brown, P.E.

**DATE:** January 30, 1998

**SUBJECT:** Northern/Orangewood Phase II  
Northern & Butler Storm Drains, Sub-Phase "A"  
WP#94153.02

**ATTENDEES:** Mike Lopez, FCDMC  
Richard Harris, FCDMC  
RW Shobe, FCDMC  
Ash Patel, Wood/Patel  
James Taillon, Wood/Patel

**RE:** Peoria Basin & Butler Avenue Storm Drain

JGT

**Peoria Detention (Surge) Basin**

1. The District asked Wood/Patel to explain the modeling of the Peoria Basin. They are concerned with whether or not the storm drain model is using the peak elevation in the basin for storage. Wood/Patel's response was that a number of analysis of this basin were performed at the early stages of the system analysis with input from Amir Motamedi of the FCDMC. Based on this analysis and discussions, it was determined that the basin would be modeled as an offline basin. Wood/Patel verified that the water surface elevation shown on the plans for the basin is the peak elevation based on the storm drain hydraulics.

**Conclusion:** The District was satisfied with Wood/Patel's explanation and that there was no need to do any additional work. Mike may look into available literature for his curiosity.

2. The District's second comment was concerning the 87<sup>th</sup> Avenue and Butler. There are several inlets, each with their own storm drain lateral pipe tying into the proposed system. The FCDMC was concerned that these storm drains could be combined to reduce the number of laterals. Wood/Patel indicated that there are several reasons for these laterals. The hydraulic gradeline is very close to the surface and there are two existing sanitary sewer lines that the laterals have to avoid. This provides very little cover for the laterals. In order to combine them, the laterals would have to be up-sized, either creating a conflict with the existing sanitary sewer or resulting in a hydraulic gradeline which is about the gutter elevation. The District would like Wood/Patel to check and see if it could possibly be eliminated one of those laterals by up-sizing one of the laterals. Wood/Patel will review this option.

3. The third item of concern is that Wood/Patel had indicated a cast-in-place pipe adjacent to the basin and along the SRP transmission line corridor. The District would like the plans to reflect RGRCP pipe in these locations and for the specs to indicate cast-in-place pipe as an alternative. The space should also require up-sizing the lines in these locations by 6" to account for a higher value with cast-in-place pipe. Wood/Patel will make this revision.

cc: Attendees  
MEMOS\94153.02\30

WOOD, PATEL & ASSOC., INC.

LETTER OF TRANSMITTAL

Civil Engineers, Hydrologists, Land Surveyors

1550 East Missouri, Suite 203

Phoenix, AZ 85014

(602) 234-1344 • FAX 234-1322

TO: Flood Control District of Maricopa County

2801 West Durango Street

Phoenix, Az 85009

DATE: January 27, 1998	JOB NO. 94153.02
ATTENTION: Richard Harris	
RE: Northern/Orangewood Storm Drain	
Northern & Butler Sub-Phase A	
90% Storm Drain Hydraulics	

WE ARE SENDING YOU  Attached  Under separate cover via PICK-UP the following items:

- Conceptual drawings
- Design Plans (11x17)
- Plans (Full Size)
- Bluelines
- Specifications
- Copy of letter
- Drainage Report
- Other : See Below

COPIES	DATE	NO.	DESCRIPTION
1		1	Diskette with Storm Drain Hydraulics & Catch Basin Hydraulics
1			60% Review Comment Responses
1			Bluelines of Existing Northern Avenue Storm Drain Downstream

THESE ARE TRANSMITTED as checked below:

- For approval
- For your use
- Approved as submitted
- As requested
- Approved as noted
- For review and comment

REMARKS:.

COPY TO: Project File

SIGNED: James Taillon

WOOD, PATEL & ASSOC., INC.

LETTER OF TRANSMITTAL

Civil Engineers, Hydrologists, Land Surveyors

1550 East Missouri, Suite 203

Phoenix, AZ 85014

(602) 234-1344 • FAX 234-1322

TO: Flood Control District of Maricopa County

2801 West Durango Street

Phoenix, Az 85009

DATE: January 21, 1998

JOB NO. 94153.04

ATTENTION: Richard Harris

RE: Northern/Orangewood Storm Drain

Northern & Butler Sub-Phase A

90% Storm Drain Hydraulics

WE ARE SENDING YOU  Attached  Under separate cover via PICK-UP the following items:

- Conceptual drawings
- Design Plans (11x17)
- Plans (Full Size)
- Bluelines
- Specifications
- Copy of letter
- Drainage Report
- Other : See Below

COPIES	DATE	NO.	DESCRIPTION
1		1	Diskette with Storm Drain Hydraulics
1			60% Review Comment Responses

THESE ARE TRANSMITTED as checked below:

- For approval
- For your use
- Approved as submitted
- As requested
- Approved as noted
- For review and comment

REMARKS:

COPY TO: Project File

SIGNED: James Taillon

WOOD, PATEL & ASSOC., INC.

LETTER OF TRANSMITTAL

Civil Engineers, Hydrologists, Land Surveyors

1550 East Missouri, Suite 203

Phoenix, AZ 85014

(602) 234-1344 • FAX 234-1322

TO: City of Glendale

5850 W Glendale Ave

Glendale, Az 85301

DATE: January 14, 1998

JOB NO. 94153.02

ATTENTION: Dan Sherwood

RE: Northern/Orangewood Storm Drain

Northern and Butler Storm Drains Sub-Phase A

90% Plan Submittal

WE ARE SENDING YOU  Attached  Under separate cover via PICK-UP the following items:

- Conceptual drawings
- Design Plans (11x17)
- Plans (Full Size)
- Blueines
- Specifications
- Copy of letter
- Drainage Report
- Other : Special Provisions , Cost Estimate, Bid Schedule

COPIES	DATE	NO.	DESCRIPTION
1		34	90% Full Size Blueine Plans
1			Half Size Plans
1			Drainage Report
1			Special Provisions
1			Cost Estimate
			Bid Schedule

THESE ARE TRANSMITTED as checked below:

- For approval
- For your use
- Approved as submitted
- As requested
- Approved as noted
- For review and comment

REMARKS:.

COPY TO: Project File, FCDMC

SIGNED: James Taillon

WOOD, PATEL & ASSOC., INC.

LETTER OF TRANSMITTAL

Civil Engineers, Hydrologists, Land Surveyors

1550 East Missouri, Suite 203

Phoenix, AZ 85014

(602) 234-1344 • FAX 234-1322

TO: City of Peoria

8401 W Monroe Street

Peoria, Az 85345

DATE: January 14, 1998

JOB NO. 94153.02

ATTENTION: Burton Charron

RE: Northern/Orangewood Storm Drain

Northern and Butler Storm Drains Sub-Phase A

90% Plan Submittal

WE ARE SENDING YOU ● Attached ○ Under separate cover via PICK-UP the following items:

- Conceptual drawings ● Design Plans (11x17) ● Plans (Full Size) ● Bluelines ● Specifications
- Copy of letter ● Drainage Report ● Other : Special Provisions , Cost Estimate, Bid Schedule

COPIES	DATE	NO.	DESCRIPTION
1		34	90% Full Size Blueline Plans
1		34	Half Size Plans
1			Drainage Report
1			Special Provisions
1			Cost Estimate
1			Bid Schedule

THESE ARE TRANSMITTED as checked below:

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REMARKS:.

COPY TO: Project File, FCDMC

SIGNED: James Taillon

WOOD, PATEL & ASSOC., INC.

LETTER OF TRANSMITTAL

Civil Engineers, Hydrologists, Land Surveyors

1550 East Missouri, Suite 203

Phoenix, AZ 85014

(602) 234-1344 • FAX 234-1322

TO: Flood Control District of Maricopa County

2801 West Durango Street

Phoenix, Az 85009

DATE: January 14, 1998

JOB NO. 94153.02

ATTENTION: RW Shobe

RE: Northern/Orangewood Storm Drain

Northern and Butler Storm Drains Sub-Phase A

90% Plan Submittal

WE ARE SENDING YOU ● Attached ○ Under separate cover via PICK-UP the following items:

- Conceptual drawings ● Design Plans (11x17) ● Plans (Full Size) ● Bluelines ● Specifications
- Copy of letter ● Drainage Report ● Other : See Below

COPIES	DATE	NO.	DESCRIPTION
6		34	Full Size Bluelines
2		34	Half Size Plans
6			Design Report
4			Special Provisions
4			Bid Tabs & Engineers Estimate
1			Northern Ave Downstream Plans (per review comment)
1			60% Review Comments and Responses

THESE ARE TRANSMITTED as checked below:

- For approval ○ Approved as submitted ○ Approved as noted
- For your use ● As requested ● For review and comment

REMARKS:..

Separate submittals have been made to the cities of Peoria and Glendale.

COPY TO: Project File

SIGNED: James Taillon

**MEMORANDUM**

Darrel E. Wood, P.E., R.L.S.  
Ashok C. Patel, P.E., R.L.S.  
James S. Campbell, P.E.  
Gordon W. R. Wark, P.E.  
Thomas R. Gettings, R.L.S.  
Bruce Friedhoff, P.E.  
Scott A. Nelson, R.L.S.  
Richard L. Hiner, P.E.  
Fredrick K. Schneider, P.E.  
Timothy A. Huval, P.E.  
Michael J. Sexton, R.L.S.  
Jack K. Moody, P.E.  
Leslie J. Kland, P.E.  
Carl Sitterley, R.L.S.  
Curtis L. Brown, P.E.

**DATE:** January 5, 1998  
**TO:** R. W. Shobe, P.E.  
FCDMC  
**FROM:** Ash Patel, P.E.  
Wood, Patel & Associates, Inc.   
**RE:** Northern-Butler Storm Drain  
Sub-Phase "A"  
60% Submittal Comments  
Project #94153.02  
Contract FCD 94-12, Phase II

**Hydraulics**

*Comment No. 2. For segments of the storm drain which are not flowing full, the estimation of flow velocity (and related head losses) in the hydraulic analysis should be revised. To simplify the velocity estimation, the equivalent depth derived from a diameter which has been calculated to create full flow, and related equivalent area, can be applied to the continuity equation to obtain velocity.*

**Responses:** The recommended flow type for storm drain is pressure flow by Drainage Design Manual for Maricopa County, AZ, Volume II - Hydraulics. However, two open flow situations exist in the Northern-Butler storm drain system.

The first one is located in the Northern Avenue system between the AFF Outfall Channel and 91<sup>st</sup> Avenue. The reason why this open flow occurs is that the capacity of the existing pipe (1524 mm diameter) is significantly larger than the design flow. Accordingly, the existing pipe is kept significantly under-utilized. This condition was intentionally created based on value engineering and cost effectiveness in the Concept/Routing Phase of this project. The hydraulic grade line for open channel flow is assumed to be the sum of the invert elevation plus the pipe diameter, which is a conservative estimation.

The second open flow situation is located in the Butler Drive system between the AFF Outfall Channel and 87<sup>th</sup> Avenue. In order to avoid upstream utilities conflicts, the downstream storm drain pipe is oversized (1219 mm diameter) to keep the hydraulic grade line below certain elevation which causes open channel flow in the pipe of the AFF Outfall Channel to 91<sup>st</sup> Avenue. Again, an oversize pipe was intentionally selected during the Concept/Routing Phase of this project.

For these reasons, it is recommended that Wood/Patel continually use the approach to analyze storm drain hydraulics previously approved by the District for this Sub-phase "A".

**FAX TRANSMITTAL**

**WOOD/PATEL  
ASSOCIATES**

Civil Engineers  
Hydrologists  
Land Surveyors

PAGE 1 OF 3

DATE: January 2, 1998

TIME: 9:07 AM

TO: RW Shobe

COMPANY: FCDMC

FAX NO.: 506-4601

FROM: James Taillon

PROJECT: Northern/Orangewood Ph II

JOB NO.: 94153.02

SUBJECT: Temporary construction Easement

COMMENTS:

RW,

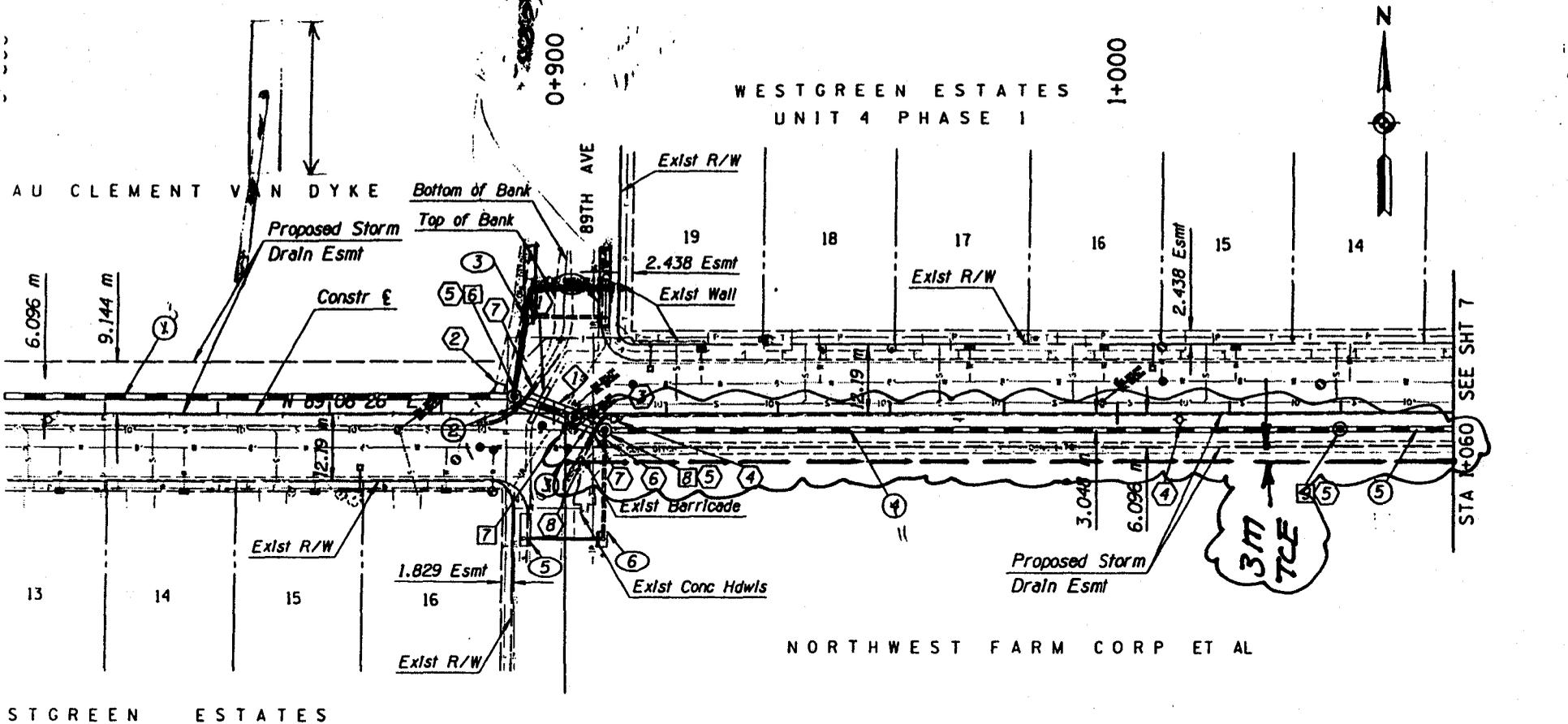
Per our discussion this morning, I am sending you a copy of the sheets for Butler Drive between 89<sup>th</sup> Ave. and 87<sup>th</sup> Ave. As shown on plans, we are requesting a 6.096 m (30 foot) Storm Drain Easement.

In order to remove and replace the existing concrete lined irrigation "v" ditch which parallels this alignment, we will need an additional 3 m (10 foot) Temporary Construction Easement immediately to the south of the storm drain easement.

Thank You,

James Taillon

CC: File



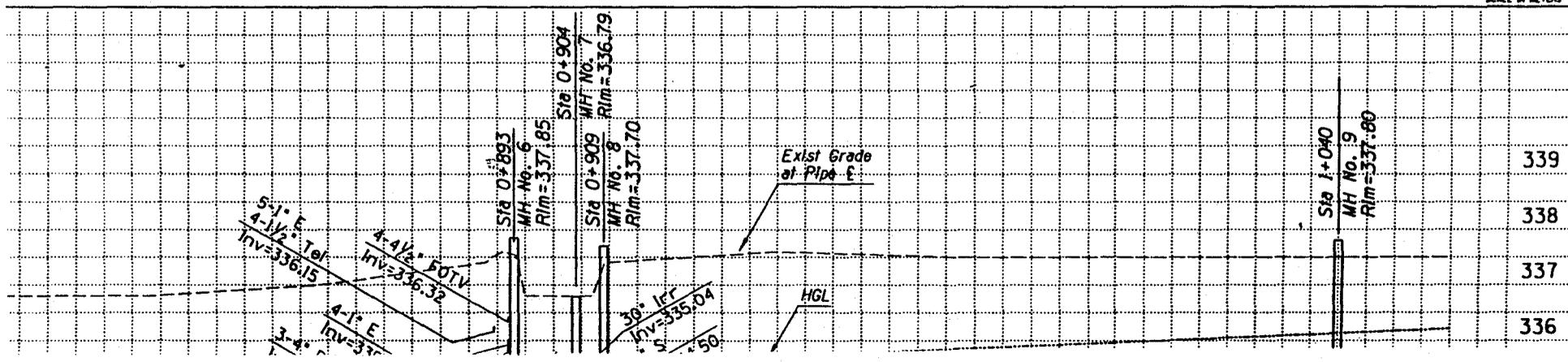
WESTGREEN ESTATES  
UNIT 4 PHASE 1

NORTHWEST FARM CORP ET AL

BUTLER DRIVE



SCALE: Hor=1:500  
Ver=1:50  
5 0 5 10  
SCALE IN METERS



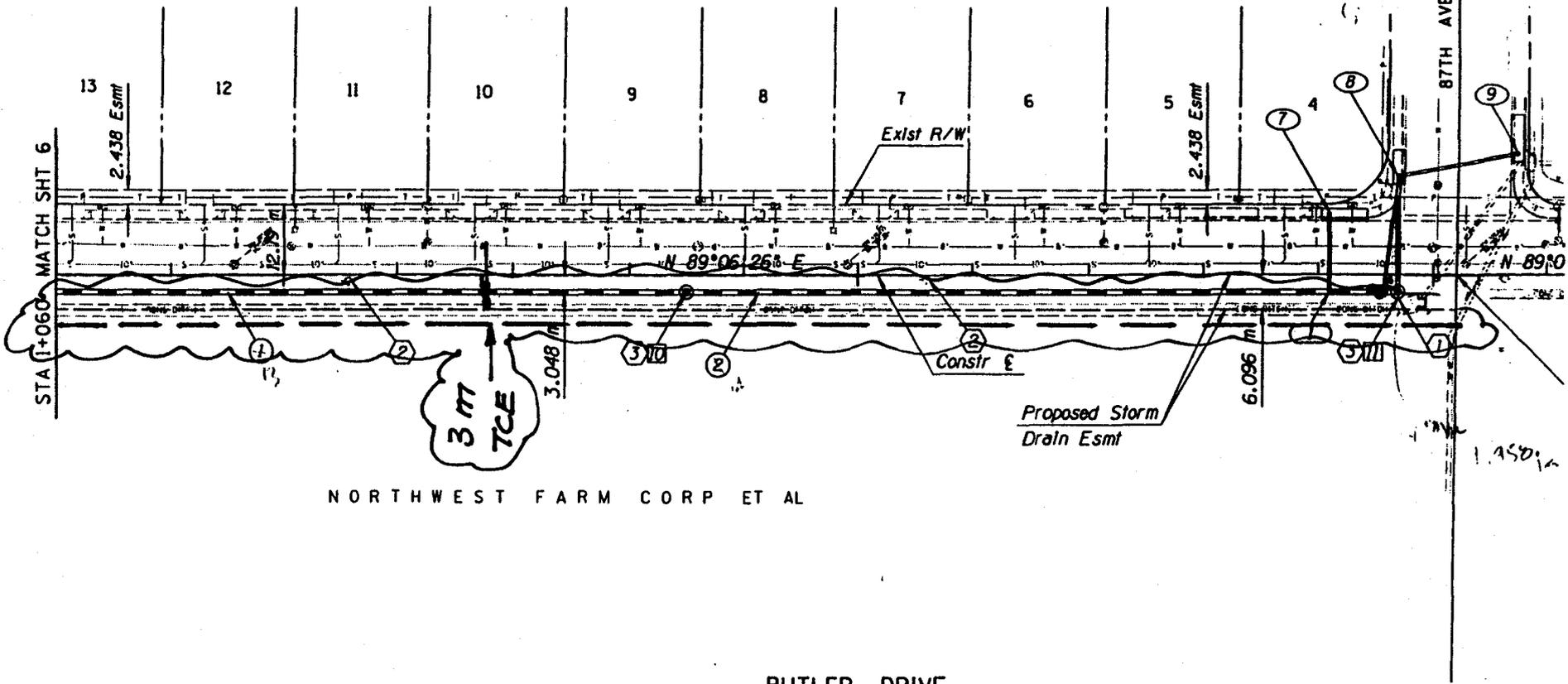
- NO. 1
- NO. 2
- NO. 3
- NO. 4
- NO. 5
- NO. 6
- NO. 7
- NO. 8
- NO. 9
- FU
- NO. 3
- NO. 4
- NO. 5
- NO. 6
- F
- NO. 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8

1+100

1+200

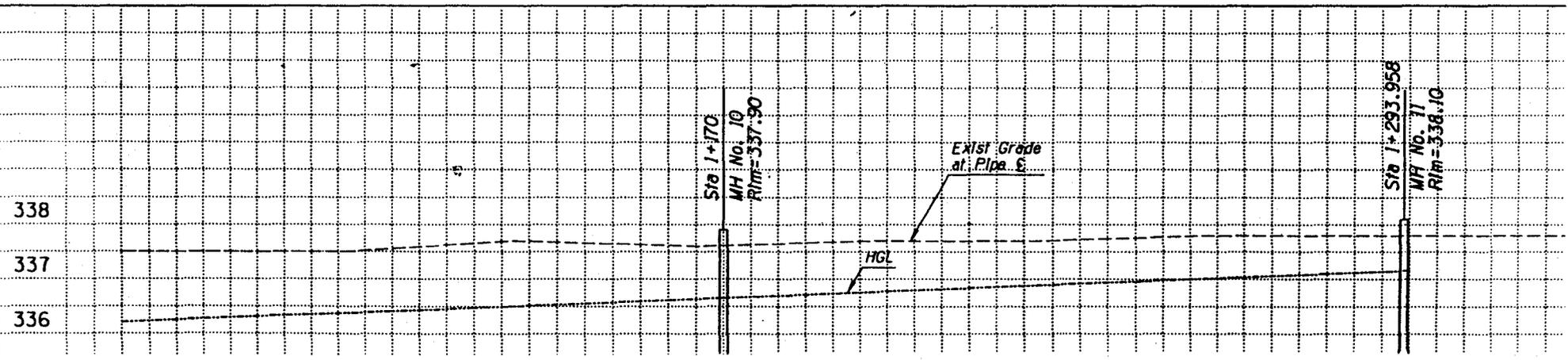
1+300

WESTGREEN ESTATES  
UNIT 4 PHASE 1



NORTHWEST FARM CORP ET AL

BUTLER DRIVE



338  
337  
336

Sta 1+170  
MH No. 10  
Rlm=337.90

Exist Grade  
at Pipe E

HGL

Sta 1+293.958  
MH No. 11  
Rlm=336.10

WOOD/PATEL

fax transmittal

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PAGE 1 OF

DATE: 12/22/97

TIME:

TO: RW SHOBE

FAX NO: 506-4601

COMPANY: FCDMC

FROM: JAMES TAYLOR

JOB NO.: 94153.02

PROJECT: Northern/Oringewood PA11

COMMENTS:

RW,

Attached are special provisions for CIPP included for your review.

Thank You,

James T.

copy to: File

hard copy to follow in mail

**WOOD/PATEL**

**COMMUNICATION RECORD**

(602) 234-1344  
Fax 234-1322

CLIENT FCOMG

JOB # 94153.02

CONTACT Burton Charron - City of Peoria

PROJECT Northern/Butler

SUBJECT 60% REVIEW COMMENTS

DATE 12/18/97

City would like stub out to East @ 89<sup>th</sup> Ave & Butler.  
Wood/Patel will comply.

At 30% the city requested turf in the bottom of the  
Basin. This item was not part of original scope; therefore  
the city has eliminated this request as part of this  
project.

There were no other comment on 60% submittal Plans  
from the city of Peoria.



# City of Peoria

8401 West Monroe Street, Peoria, Arizona 85345

## FAX COVER SHEET

DATE: 12/16/97

TOTAL NUMBER OF PAGES BEING SENT (INCLUDING COVER SHEET): 2

DELIVER TO: James Taylor

FIRM NAME: Wood/Patel

FAX NUMBER: 234 1322

SENDER NAME: Dan Nissen

PHONE NUMBER: (602) 412-7210

FAX NUMBER: (602) 412-7211

COMMENTS: James - We want to use the Defol Sealed Utility markers

Northern/Orangewood S.D.

IF THIS DOCUMENT IS INCOMPLETE OR ILLEGIBLE, PLEASE CONTACT THE SENDER

Harding Lawson Associates  
Infrastructure, Inc.

LETTER OF TRANSMITTAL

Engineering, Planning &  
Construction Services

RECEIVED

DEC 08 1997

WOOD, PATEL &  
ASSOCIATES

To: James Taillon  
WOOD/PATEL  
1550 East Missouri, Suite 203  
Phoenix, AZ 85014

Date: December 5, 1997  
Project: Northern/Orangewood  
Our No: 40049.1  
VIA: Delivery

We are enclosing:

No. of Copies	DWG. or Other Number	Title or Description, Remarks
1	2 Sheets	1/2 Size plans for the junction structures.

Remarks:

Copies to: file

  
Fadi Jalaghi, P.E.

234 North Central Ave., Suite 600  
Phoenix, Arizona 85004  
Tel: (602) 252-4105  
Fax: (602) 252-4162

DEC 05 1997

December 2, 1997

WOOD, PATEL &  
ASSOCIATES

Mr. Quenton Lindstrom  
Wood, Patel & Associates, Inc.  
1550 East Missouri, Suite 203  
Phoenix, Arizona 85014

Re: R/W 970441 - Encroachment: Maricopa  
County Flood Control District-Northern/  
Orangewood Storm Drain; Agua Fria  
Line (2215) M.P. 3, Maricopa County, AZ

Dear Mr. Lindstrom:

We have completed our review of the plans for the captioned project. The Maricopa County Flood Control District is proposing to construct its Northern/Orangewood storm drain paralleling our 16-inch high pressure natural gas pipeline from 91<sup>st</sup> Avenue to 83<sup>rd</sup> Avenue. The construction of the storm drain will affect our facilities in the S½ of Section 34, Township 3 North, Range 1 East.

We have no objection to the County's storm drain being installed as shown on the plans, provided, however, the County or its contractor(s) adhere to the safety construction requirements concerning our facilities which are as follows:

1. The drawings show the construction of the storm drain to be from 2 to 3 meters from our gas pipeline. Because of the depth of the ditch for the new drain and the proximity of El Paso's gas pipeline, we require that trench boxes be used to prevent any movement of the gas pipeline during construction.
2. Mr. Bill Ward, our Phoenix District Manager, must be notified at 438-4221 at least 48 hours in advance of any construction activity in the vicinity of our facilities.
- ✓ 3. Page 12 of 31 shows a 2 inch water line between the two manholes on the elevation view. Unless we are mistaken, we think that it is mislabeled and should be our 16 inch gas pipeline. If so, we have no objection to the 12 inch distance between the bottom of the gas pipeline and the top of the drain provided the 12 inches is maintained.

Mr. Quenton Lindstrom  
December 2, 1997  
R/W 970441  
Page 2

4. The invert of the aforementioned water line shows it to be 331 meters, and that doesn't appear to be correct. We feel it should be more like 332 meters. However, we also feel that this should be verified and corrected if necessary, prior to construction.

If you have any questions, please don't hesitate to phone Mr. Bill Ward or the undersigned at 915/496-2099.

Very truly yours,



Robert L. Starks  
Contract ROW Analyst  
Securities Group  
Rights, Records & Land Services  
rls/irr

cc: Bill Ward



**FAX TRANSMITTAL**

PAGE 1 OF 1

**WOOD/PATEL  
ASSOCIATES**

Civil Engineers  
Hydrologists  
Land Surveyors

DATE: November 25, 1997

TIME: 8:13 AM

TO: Fadi Jalaghi

COMPANY: Harding Lawson Associates

FAX NO.: 252-4162

FROM: James Tailon

PROJECT: Northern/Orangewood Subphase A      JOB NO.: 94153.02

SUBJECT: Pipe Thickness at Junction Structures

COMMENTS:

If you have any further questions or require additional  
information, please let me know.

Thank you.

James

CC: File

**FAX TRANSMITTAL**

PAGE 1 OF 1

**WOOD/PATEL  
ASSOCIATES**

Civil Engineers  
Hydrologists  
Land Surveyors

.....  
DATE: November 24,  
.....

.....  
TIME: 10:21 AM  
.....

**TO: Fadi Jalaghi**

.....  
**COMPANY: Harding Lawson Associates**

.....  
**FAX NO.: 252-4162**

.....  
**FROM: James Taillon**

.....  
**PROJECT: Northern/Orangewood Subphase A      JOB NO.: 94153.02**

.....  
**SUBJECT: Soils Report for Junction Structures**

.....  
**COMMENTS: Attached is a copy of the Soils Report for the areas with the  
Junction Structures. If you have any further questions or require additional  
information, please let me know.**

.....  
Thank you.

.....  
James

.....  
CC: File



November 17, 1997

RECEIVED

NOV 20 1997

WOOD, PATEL &  
ASSOCIATES

Mr. Quenton Lindstrom  
Wood, Patel & Associates, Inc.  
1550 East Missouri, Suite 203  
Phoenix, Arizona 85014

Re: **R/W 970441 - Encroachment: Maricopa  
County Flood Control District-Northern/  
Orangewood Storm Drain; Agua Fria  
Line (2215) M.P. 3, Maricopa County, AZ**

Dear Mr. Lindstrom:

We are in receipt of the plans for the captioned project where the Maricopa County Flood Control District is proposing to construct it Northern/Orangewood storm drain in the vicinity of our 16-inch high pressure natural gas pipeline. The plans have been forwarded to our engineering department for review. Upon completion of their review, specific areas concerning our facilities will be addressed.

In the mean time, if you have any questions, don't hesitate to phone Mr. Bill Ward, our Phoenix District Manager, at 438-4221 or the undersigned at 915/496-2099.

Very truly yours,

  
Robert L. Starks  
Contract ROW Analyst  
Securities Group  
Rights, Records & Land Services  
ris/irr

cc: Bill Ward

**WOOD, PATEL & ASSOC., INC.**

**LETTER OF TRANSMITTAL**

*Civil Engineers, Hydrologists, Land Surveyors*

1550 East Missouri, Suite 203

Phoenix, AZ 85014

(602) 234-1344 • FAX 234-1322

TO:  
CITY OF GLENDALE--WATER AND SEWER  
850 WEST GLENDALE AVE.  
GLENDALE, AZ 85301

DATE: November 13, 1997	JOB NO. 94153.02
ATTENTION: GLEN COMPTON	
RE: NORTHERN/ORANGEWOOD STORMDRAIN	
FCD CONTROL 94-12 PHASE II	
BUTLER & NORTHERN STORM DRAINS, SUB PHASE "A"	
60%--SUBMMITTAL	
UTILITY CONFLICT REVIEW NOTIFICATION	

WE ARE SENDING YOU  Attached  Under separate cover via U.S. MAIL the following items:

Shop drawings       Prints       Plans       Samples       Specifications  
 Copy of letter       Change Order       \_\_\_\_\_

COPIES	DATE	NO.	DESCRIPTION
1	11-13-97	1-31	STORM DRAIN PLANS

THESE ARE TRANSMITTED as checked below:

For approval       Approved as submitted       Approved as noted  
 For your use       As requested       For review and comment

REMARKS: PLEASE REVIEW THE ATTACHED PLANS FOR ANY UTILITY CONFLICTS THAT MAY EXIST. PLEASE NOTIFY US OF YOUR CONCLUSIONS. IF YOU SHOULD HAVE ANY QUESTIONS, PLEASE CALL.

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

COPY TO: \_\_\_\_\_

SIGNED:  
QUENTON LINDSTROM

**WOOD, PATEL & ASSOC., INC.**

**LETTER OF TRANSMITTAL**

*Civil Engineers, Hydrologists, Land Surveyors*

1550 East Missouri, Suite 203

Phoenix, AZ 85014

(602) 234-1344 • FAX 234-1322

DATE: November 13, 1997

JOB NO. 94153.02

ATTENTION: Mr. Bob Maurer

RE: **NORTHERN/ORANGEWOOD STORMDRAIN**

**FCD CONTROL 94-12 PHASE II**

**BUTLER & NORTHERN STORM DRAINS, SUB PHASE "A"**

**60%--SUBMMITTAL**

**UTILITY CONFLICT REVIEW NOTIFICATION**

O:  
SRVWUA

P.O. Box 52025

Phoenix, AZ 85072-2025

WE ARE SENDING YOU  Attached  Under separate cover via U.S. MAIL the following items:

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COPY TO: \_\_\_\_\_

SIGNED:  
QUENTON LINDSTROM

**WOOD, PATEL & ASSOC., INC.**

**LETTER OF TRANSMITTAL**

*Civil Engineers, Hydrologists, Land Surveyors*

1550 East Missouri, Suite 203

Phoenix, AZ 85014

(602) 234-1344 • FAX 234-1322

DATE: November 13, 1997

JOB NO. 94153.02

ATTENTION: Don Quinn

RE: **NORTHERN/ORANGEWOOD STORMDRAIN**

**FCD CONTROL 94-12 PHASE II**

**BUTLER & NORTHERN STORM DRAINS, SUB PHASE "A"**

**60%--SUBMMITTAL**

**UTILITY CONFLICT REVIEW NOTIFICATION**

TO: SANTA FE PACIFIC PIPELINE CO.

100 TOWN & COUNTRY ROAD

ORANGE, CA 92868

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COPY TO: \_\_\_\_\_

SIGNED:  
QUENTON LINDSTROM

**WOOD, PATEL & ASSOC., INC.**

**LETTER OF TRANSMITTAL**

*Civil Engineers, Hydrologists, Land Surveyors*

1550 East Missouri, Suite 203

Phoenix, AZ 85014

(602) 234-1344 • FAX 234-1322

TO: MCI TELECOMMUNICATIONS

826 193rd AVENUE

WITTMANN, AZ 85361

DATE: November 13, 1997

JOB NO. 94153.02

ATTENTION: KENT PILCHER

RE: NORTHERN/ORANGEWOOD STORMDRAIN

FCD CONTROL 94-12 PHASE II

BUTLER & NORTHERN STORM DRAINS, SUB PHASE "A"

60%—SUBMMITTAL

*UTILITY CONFLICT REVIEW NOTIFICATION*

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QUENTON LINDSTROM

**WOOD, PATEL & ASSOC., INC.**

**LETTER OF TRANSMITTAL**

*Civil Engineers, Hydrologists, Land Surveyors*

1550 East Missouri, Suite 203

Phoenix, AZ 85014

(602) 234-1344 • FAX 234-1322

To:  
Cox Communications-Engineering Department

15 North 51st Avenue

Phoenix, AZ 85043

DATE: November 13, 1997

JOB NO. 94153.02

ATTENTION: Ms. Angie Hardesty

RE: **NORTHERN/ORANGEWOOD STORMDRAIN**

**FCD CONTROL 94-12 PHASE II**

**BUTLER & NORTHERN STORM DRAINS, SUB PHASE "A"**

**60%--SUBMMITTAL**

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SIGNED:  
QUENTON LINDSTROM

**WOOD, PATEL & ASSOC., INC.**

**LETTER OF TRANSMITTAL**

*Civil Engineers, Hydrologists, Land Surveyors*

1550 East Missouri, Suite 203

Phoenix, AZ 85014

(602) 234-1344 • FAX 234-1322

O:  
AT & T

535 East 40th Avenue, Room C-18  
Denver, CO 80205

DATE: November 13, 1997

JOB NO. 94153.02

ATTENTION: CHC Engineering Inquiry

RE: NORTHERN/ORANGEWOOD STORMDRAIN

FCD CONTROL 94-12 PHASE II

BUTLER & NORTHERN STORM DRAINS, SUB PHASE "A"

60%--SUBMMITTAL

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COPY TO: \_\_\_\_\_

SIGNED:  
QUENTON LINDSTROM

**WOOD, PATEL & ASSOC., INC.**

**LETTER OF TRANSMITTAL**

*Civil Engineers, Hydrologists, Land Surveyors*

1550 East Missouri, Suite 203

Phoenix, AZ 85014

(602) 234-1344 • FAX 234-1322

TO:  
EL PASO NATURAL GAS

15 SOUTH 48TH STREET

PHOENIX, AZ 85044

DATE: November 13, 1997

JOB NO. 94153.02

ATTENTION: MR. BILL WARD

RE: NORTHERN/ORANGEWOOD STORMDRAIN

FCD CONTROL 94-12 PHASE II

BUTLER & NORTHERN STORM DRAINS, SUB PHASE "A"

60%--SUBMMITTAL

UTILITY CONFLICT REVIEW NOTIFICATION

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COPY TO: \_\_\_\_\_

SIGNED:  
QUENTON LINDSTROM

**WOOD, PATEL & ASSOC., INC.**

**LETTER OF TRANSMITTAL**

*Civil Engineers, Hydrologists, Land Surveyors*

1550 East Missouri, Suite 203

Phoenix, AZ 85014

(602) 234-1344 • FAX 234-1322

To:

SOUTHWEST GAS CORPORATION

SOUTH 43RD AVENUE, M/S 420-586

PHOENIX, AZ 85009

DATE: November 13, 1997

JOB NO. 94153.02

ATTENTION: LISA POWERS

RE: NORTHERN/ORANGEWOOD STORMDRAIN

FCD CONTROL 94-12 PHASE II

BUTLER & NORTHERN STORM DRAINS, SUB PHASE "A"

60%--SUBMMITTAL

UTILITY CONFLICT REVIEW NOTIFICATION

WE ARE SENDING YOU  Attached  Under separate cover via U.S. MAIL the following items:

- Shop drawings       Prints       Plans       Samples       Specifications  
 Copy of letter       Change Order       \_\_\_\_\_

COPIES	DATE	NO.	DESCRIPTION
1	11-13-97	1-31	STORM DRAIN PLANS

THESE ARE TRANSMITTED as checked below:

- For approval       Approved as submitted       Approved as noted  
 For your use       As requested       For review and comment

REMARKS: PLEASE REVIEW THE ATTACHED PLANS FOR ANY UTILITY CONFLICTS THAT MAY EXIST. PLEASE NOTIFY US OF YOUR CONCLUSIONS. IF YOU SHOULD HAVE ANY QUESTIONS, PLEASE CALL.

COPY TO:

SIGNED:  
QUENTON LINDSTROM

**WOOD, PATEL & ASSOC., INC.**

**LETTER OF TRANSMITTAL**

*Civil Engineers, Hydrologists, Land Surveyors*

1550 East Missouri, Suite 203

Phoenix, AZ 85014

(602) 234-1344 • FAX 234-1322

TO:

US WEST COMMUNICATIONS

2220 NORTH 25TH AVENUE, SUITE 100

PHOENIX, AZ 85021

DATE: November 13, 1997	JOB NO. 94153.02
ATTENTION: KEITH NICHOLSON	
RE: NORTHERN/ORANGEWOOD STORMDRAIN	
FCD CONTROL 94-12 PHASE II	
BUTLER & NORTHERN STORM DRAINS, SUB PHASE "A"	
60%--SUBMMITTAL	
UTILITY CONFLICT REVIEW NOTIFICATION	

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COPY TO: \_\_\_\_\_

SIGNED:  
QUENTON LINDSTROM

**WOOD, PATEL & ASSOC., INC.**

**LETTER OF TRANSMITTAL**

*Civil Engineers, Hydrologists, Land Surveyors*

1550 East Missouri, Suite 203

Phoenix, AZ 85014

(602) 234-1344 • FAX 234-1322

TO:  
CITY OF PEORIA - WATER AND SEWER  
401 WEST MONROE STREET  
PEORIA, AZ 85345

DATE: November 13, 1997

JOB NO. 94153.02

ATTENTION: DAN NISSEN

RE: NORTHERN/ORANGEWOOD STORMDRAIN

FCD CONTROL 94-12 PHASE II

BUTLER & NORTHERN STORM DRAINS, SUB PHASE "A"

60%--SUBMMITTAL

*UTILITY CONFLICT REVIEW NOTIFICATION*

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- Shop drawings       Prints       Plans       Samples       Specifications  
 Copy of letter       Change Order       \_\_\_\_\_

COPIES	DATE	NO.	DESCRIPTION
1	11-13-97	1-31	STORM DRAIN PLANS

THESE ARE TRANSMITTED as checked below:

- For approval       Approved as submitted       Approved as noted  
 For your use       As requested       For review and comment

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COPY TO:

SIGNED:  
QUENTON LINDSTROM

**WOOD, PATEL & ASSOC., INC.**

**LETTER OF TRANSMITTAL**

*Civil Engineers, Hydrologists, Land Surveyors*

1550 East Missouri, Suite 203

Phoenix, AZ 85014

(602) 234-1344 • FAX 234-1322

**TO:**  
SALT RIVER PROJECT

MAIL STATION WVS208, P.O. BOX 52025

PHOENIX, AZ 85072-2025

DATE: November 13, 1997

JOB NO. 94153.02

ATTENTION: EXPEDITOR, DESIGN

RE: NORTHERN/ORANGEWOOD STORMDRAIN

FCD CONTROL 94-12 PHASE II

BUTLER & NORTHERN STORM DRAINS, SUB PHASE "A"

60%--SUBMMITTAL

*UTILITY CONFLICT REVIEW NOTIFICATION*

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- Shop drawings       Prints       Plans       Samples       Specifications  
 Copy of letter       Change Order       \_\_\_\_\_

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1	11-13-97	1-31	STORM DRAIN PLANS

THESE ARE TRANSMITTED as checked below:

- For approval       Approved as submitted       Approved as noted  
 For your use       As requested       For review and comment

REMARKS: PLEASE REVIEW THE ATTACHED PLANS FOR ANY UTILITY CONFLICTS THAT MAY EXIST. PLEASE NOTIFY US OF YOUR CONCLUSIONS. IF YOU SHOULD HAVE ANY QUESTIONS, PLEASE CALL.

COPY TO:

SIGNED:  
QUENTON LINDSTROM

**MINUTES OF MEETING**October 23, 1997  
WP #94154.02

Darrel E. Wood, P.E., R.L.S.  
Ashok C. Patel, P.E., R.L.S.  
James S. Campbell, P.E.  
Gordon W. R. Wark, P.E.  
Thomas R. Gettings, R.L.S.  
Bruce Friedhoff, P.E.  
Duane M. Hunn, P.E.  
Scott A. Nelson, R.L.S.  
Richard L. Hiner, P.E.  
Fredrick K. Schneider, P.E.  
Timothy A. Huval, P.E.  
Michael J. Sexton, R.L.S.  
Jack K. Moody, P.E.  
Leslie J. Kland, P.E.  
Carl Sitterley, R.L.S.  
Curtis L. Brown, P.E.

**PROJECT:** Northern and Butler Storm Drains Sub-Phase A  
Contract FCD 94-12 Phase II

**SUBJECT:** Salt River Project Irrigation Ties  
Into Northern Avenue Storm Drain

**ATTENDEES:** Dan Nissen, City of Peoria  
Burton Charron, City of Peoria  
Bob Maurer, Salt River Project  
Dave Schreeve, Salt River Project  
Harold Biever, Salt River Project  
R.W. Shobe, Flood Control District of Maricopa County  
Ash Patel, Wood, Patel & Associates, Inc.  
James Taillon, Wood, Patel & Associates, Inc.

Two issues were discussed regarding the connection of SRP laterals into the proposed Northern Avenue Storm Drain. The first issue was maintenance. The City of Peoria indicated that they would like to enter into an agreement with SRP for maintenance of the system. The concern is for any debris and/or sedimentation which the SRP laterals may contribute to the Northern Avenue storm drain. Salt River Project stated that these issues can be addressed by constructing trash racks at the headwall inlets and constructing manholes with silting basins as part of their inlet structure. SRP would then be responsible for maintenance of these items which occur prior to the connection into the storm drain and outside of the city right-of-way. The City of Peoria felt that this would be satisfactory and a maintenance agreement would not be necessary.

The second issue discussed was the cost of upsizing the storm drain for the Salt River Project irrigation flows. Wood/Patel has run the hydraulics for the storm drain based on an additional 16 cfs which would be contributed by Salt River Project laterals. Salt River Project indicated that by providing inlets for SRP flows at 89th Avenue, 87th Avenue, 85th Avenue, and 83rd Avenue would allow for MCDOT to eliminate the tiling of the RID ditch along Northern Avenue from 83rd Avenue to 85th Avenue. SRP felt that the cost savings realized by eliminating 1/4 mile of tiling the Northern Avenue storm drain to accept SRP flows would offset the cost of upsizing the Northern Avenue storm drain to accept SRP flows. Bob Maurer of SRP will contact Kent McLain of Maricopa County Department of Transportation (MCDOT) and discuss this issue. Mr. Maurer will ask MCDOT to incorporate the necessary SRP inlets into their plans, eliminate the tiling of the RID ditch and to upsize the storm drain pipe west of the Peoria basin. At this time, Wood/Patel will not incorporate any of the SRP improvements or flows into their design. The hydraulics will remain as they were prior to SRP's upgrade requirements and no laterals, manholes, or stubouts will be included at this time. If MCDOT and SRP reach an agreement on this issue prior to the final plan submittal for Northern and Butler storm drains, Wood/Patel may be directed to perform additional work to incorporate these revisions.

cc: All Attendees, Kent McLain, MCDOT, Mike Chase, Stanley Consultants

Memos\94154\min.024

Darrel E. Wood, P.E., R.L.S.  
Ashok C. Patel, P.E., R.L.S.  
James S. Campbell, P.E.  
Gordon W. R. Wark, P.E.  
Thomas R. Gettings, R.L.S.  
Bruce Friedhoff, P.E.  
Duane M. Hunn, P.E.  
Scott A. Nelson, R.L.S.  
Richard L. Hiner, P.E.  
Fredrick K. Schneider, P.E.  
Timothy A. Huval, P.E.  
Michael J. Sexton, R.L.S.  
Jack K. Moody, P.E.  
Leslie J. Kland, P.E.

**MINUTES OF MEETING**

October 9, 1997  
WP #94154

**PROJECT:** Northern and Butler Storm Drains Sub-Phase A  
Contract FCD 94-12 Phase II

**SUBJECT:** Storm Drain Alignment on Northern Avenue

**ATTENDEES:** R.W. Shobe, Flood Control District of Maricopa County  
Ash Patel, Wood, Patel & Associates, Inc.  
James Taillon, Wood, Patel & Associates, Inc.

**83rd Avenue to 85th Avenue**

In a previous meeting with MCDOT, it was determined that our storm drain alignment would be moved to the proposed alignment of a 21-inch sanitary sewer for the City of Peoria which is no longer going to be constructed. By utilizing the sanitary sewer alignment, two crossings of the 16-inch gas line are required. However, since receiving utility pothole information, a conflict has arisen with one of the crossings. Wood/Patel suggested that between 85th Avenue to 83rd Avenue the storm drain should be relocated to the previous alignment as shown on the 30% plan submittal. This alignment will eliminate the gas line crossing conflict and also minimize the number of utility conflicts which occur at 83rd Avenue. R.W. Shobe concurred with this suggestion.

A second issue which was discussed was the access into the Peoria basin from the north at 85th Avenue and Griswold. The City of Peoria requested that Wood/Patel extend the storm drain line south approximately 80 to 100 feet with RGRCP to allow for a roadway access into the site north of the basin for future parking. This would eliminate the need for construction of a future bridge over the proposed channel. R.W. also agreed with this suggestion.

Wood/Patel will fax R.W. a copy of the 30% review comments and responses. Wood/Patel estimated that the approximate submittal date for the 60% plans would be in three weeks or approximately the last day of October, 1997.

MEMOS\94154min.o10

**ALLWASTE/NAL, INC.**  
NORTH AMERICAN LOCATING  
1801 West Watkins  
Phoenix, Arizona 85007

(602) 254-7344  
(800) 631-5216  
FAX: (602) 254-7412

Fax Transmittal

Date: 10-7-97

Time: 12:35 P.M.

Attention: JAMES

Fax#: 274-1322

Company: WOOD PATTEL

From: JOHN WENRY

Number of pages (Including Cover): 10

Please notify us if you do not receive all pages.

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
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\_\_\_\_\_



ALLWASTE/NORTH AMERICAN LOCATING, INC.
Testhole Data Form - FULL

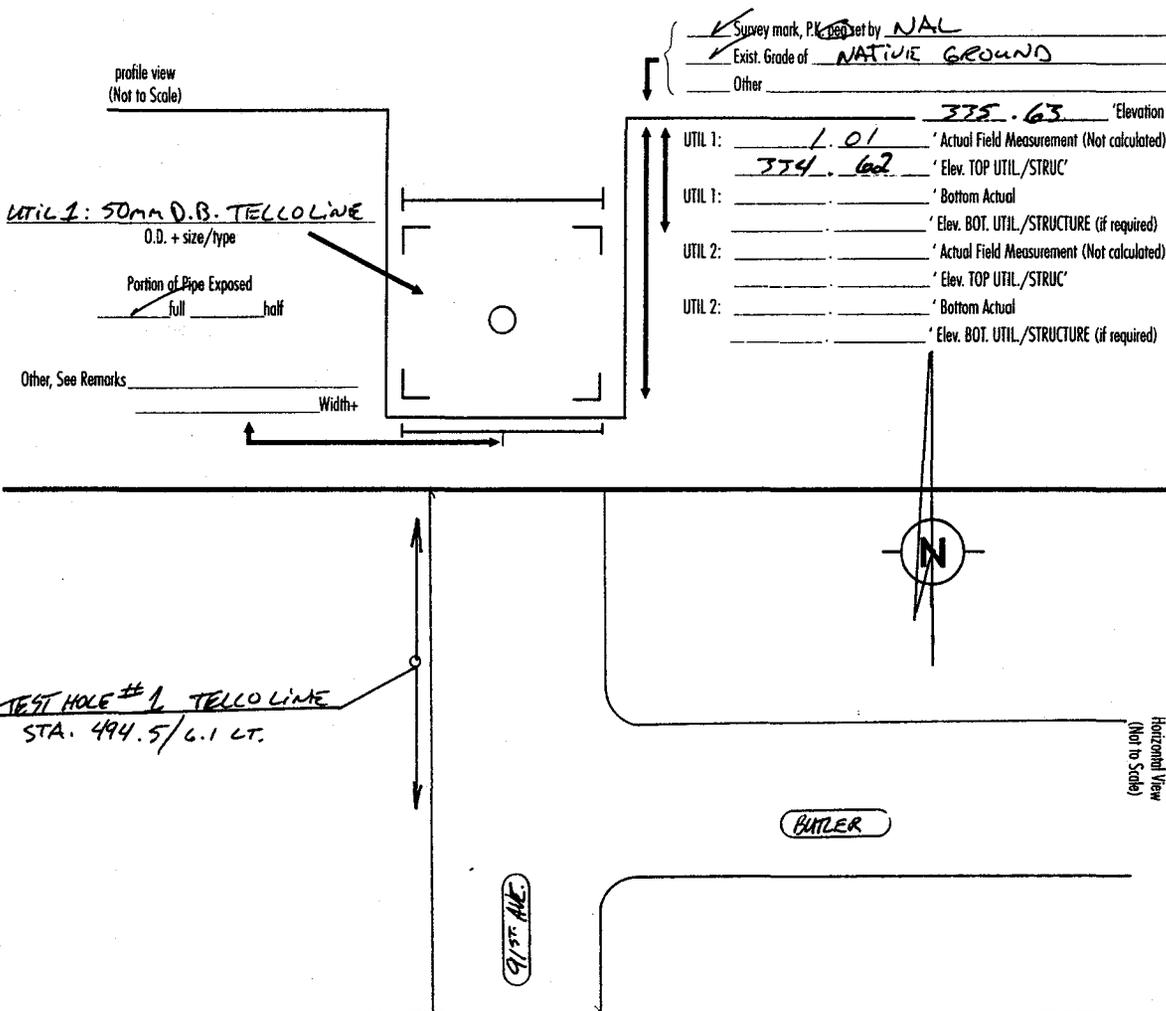
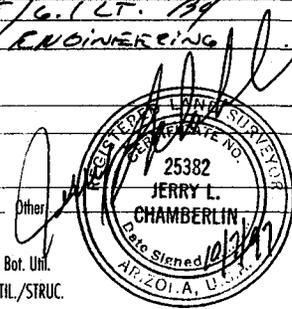
Arizona Contractor's License L-05 #105748

1801 West Watkins
Phoenix, Arizona 85007
(800) 631-5216 (602) 254-7344
Fax (602) 254-7412

Form Prepared by JOHN HENRY OLKHO
Foreman
Jurisdiction CITY OF PEORIA
Location 91ST AVE & BUTLER
Customer Project # FD94-12
Test Hole # 1
Plan Scale
Sheet # of
Date Dug
N. A. L. Project# 02-171797

Specific Location STA. 494.5 / 6.1 LT.
Type/Condition Pavement N/A
Anticipated Size, Type, Material 50mm DIRECT BURIAL TELCO LINE

Elev. B.M. 1 335.59 B.M. 1 Description 4" NAL SET @ STA. 494.5 / 6.1 LT. 189
Rod Read. + 1.49 KAMINSKI, HUSBARD ENGINEERING
H.I. = 337.08 B.M. 1 Given, Assumed, Calculated
Elev. B.M. 2
Rod Read. +
H.I. = B.M. 2 Given, Assumed, Calculated
Do B.M.'s (H.I.'s) check by 05' Yes No Diff.
H.I. 337.08 (-) 1.45 = 335.63 PK./PEG/HUB Ex Gr. Other
(Rod Read.) (Elevation)
2.46 Rod Reading Top Util.
= 334.62 Elev. TOP UTIL./STRUC.



REMARKS:



ALLWASTE/NORTH AMERICAN LOCATING, INC.

Testhole Data Form - FULL

Arizona Contractor's License L-05 #105748

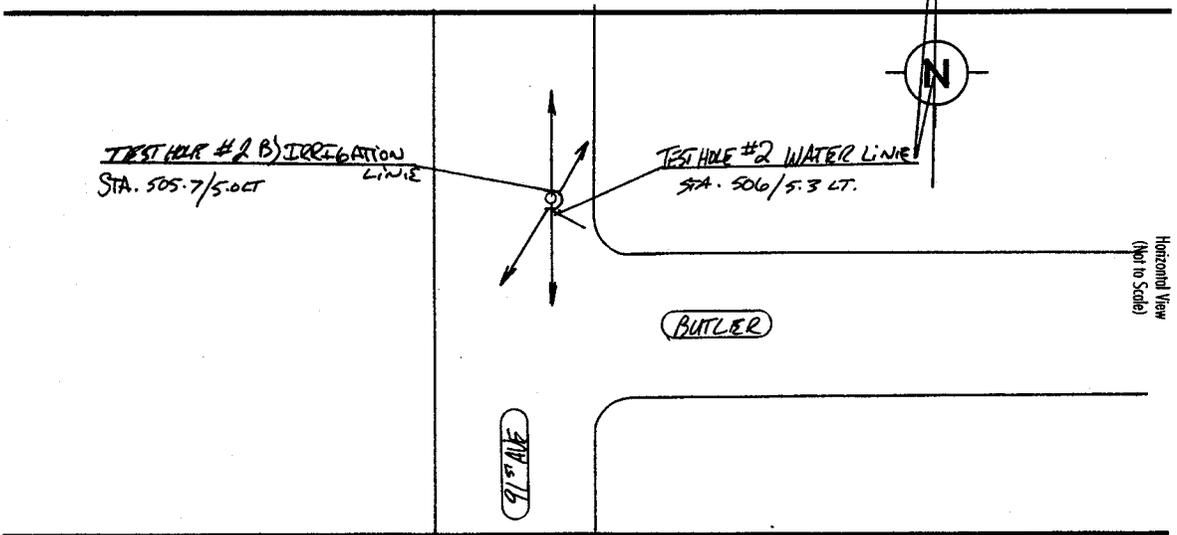
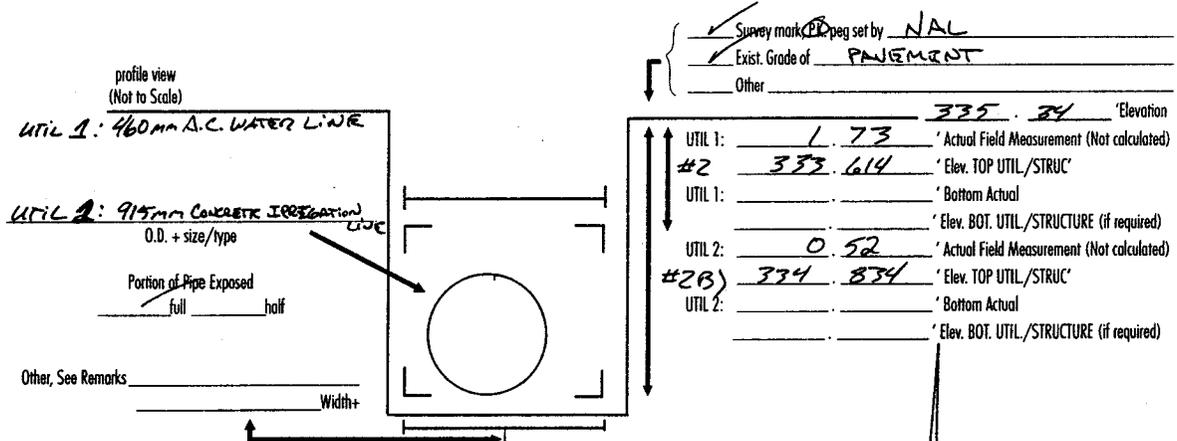
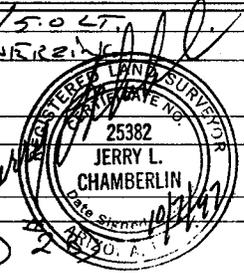
1801 West Watkins  
Phoenix, Arizona 85007  
(800) 631-5216 (602) 254-7344  
Fax (602) 254-7412

Form Prepared by JOHN HENRY, CE 404 Customer Project # F0281-12  
Foreman \_\_\_\_\_ Test Hole # 2 & 2 B  
Jurisdiction CITY OF PHOENIX Plan Scale "=  
Location 915 AVENUE & BUTLER Sheet # \_\_\_\_\_ of \_\_\_\_\_  
Date Dug \_\_\_\_\_  
N. A. L. Project# 02-171797

Specific Location UTIL 1: STA: 506/5.3 LT. WATER LINE UTIL 2: 505.7/5.0 LT IRRIGATION LINE  
Type/Condition Pavement 6" ASPHALT  
Anticipated Size, Type, Material UTIL 1: 460mm A.C. WATER LINE & UTIL 2: 915mm CONCRETE IRRIGATION LINE

Elev. B.M. 1	-	<u>335.754</u>	B.M. 1 Description	<u>1/2" P.K. NAIL SET @ STA. 506/5.0 LT.</u>
Rod Read.	+	<u>1.740</u>	<u>BY KAMINSKI HUBBARD ENGINEERS</u>	
H.I.	=	<u>337.094</u>	B.M. 1 Given, Assumed, Calculated	
Elev. B.M. 2	-	_____	B.M. 2 Description	
Rod Read.	+	_____		
H.I.	=	_____	B.M. 2 Given, Assumed, Calculated	

Do B.M.'s (H.I.'s) check by .05' Yes No Diff.  
H.I. 337.094 (-) 1.75 = 335.744 P.K./PEG/HUB Ex Gr. \_\_\_\_\_ Other \_\_\_\_\_  
(Rod Read.) (Elevation)  
H.I. 337.094 Rod Reading Top Util. 2.26 Top  
= 333.614 Elev. TOP UTIL./STRUC. = 334.834 Elev. BOT. UTIL./STRUC.



REMARKS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



ALLWASTE/NORTH AMERICAN LOCATING, INC.

Testhole Data Form - FULL

Arizona Contractor's License L-05 #105748

1801 West Watkins

Phoenix, Arizona 85007

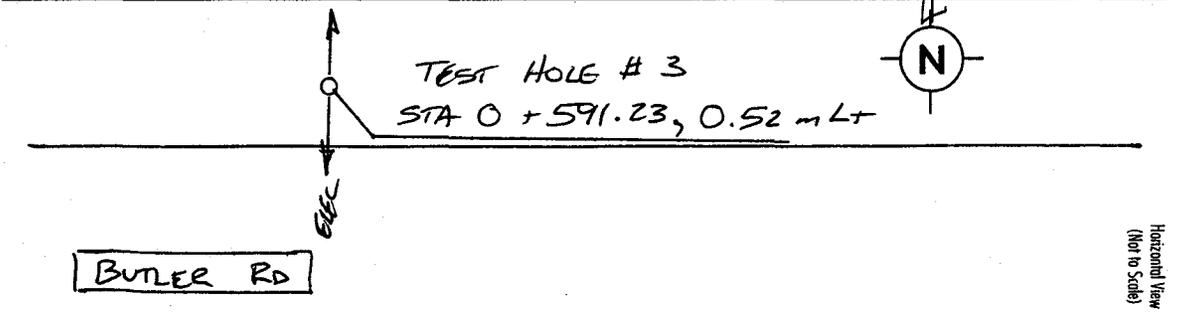
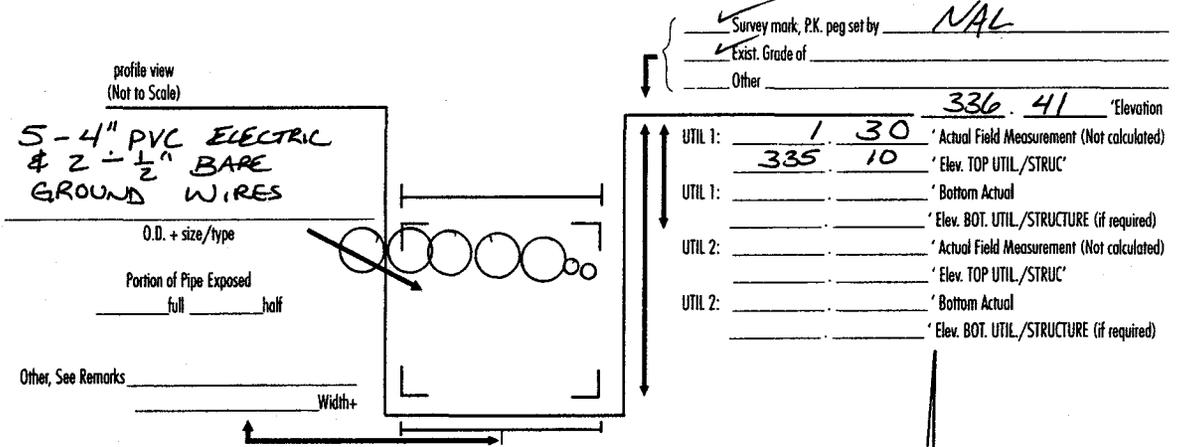
(800) 631-5216 (602) 254-7344

Fax (602) 254-7412

Form Prepared by DA PADILLA Customer Project # FCD 94-12  
 Foreman DAN PADILLA Test Hole # 3  
 Jurisdiction CITY OF PEORIA Plan Scale "=  
 Location BUTLER, WEST OF EARNE AVE Sheet # of  
 Date Dug \_\_\_\_\_  
 N. A. L. Project# 02-171797

Specific Location STA 0 + 591.23, 0.52 m LT  
 Type/Condition Pavement N/A-DIRT  
 Anticipated Size, Type, Material POUGH

Elev. B.M. 1 336.410 ' B.M. 1 Description Q STA 0 + 591.23, 0.52m LT  
 Rod Read. + 1.44 ' SET BY NAL & SURVEYED BY KAMINSKI  
 H.I. = 337.85 ' B.M. 1 Given, Assumed, Calculated  
 Elev. B.M. 2 \_\_\_\_\_ ' B.M. 2 Description \_\_\_\_\_  
 Rod Read. + \_\_\_\_\_ ' B.M. 2 Given, Assumed, Calculated  
 H.I. = \_\_\_\_\_ ' B.M. 2 Given, Assumed, Calculated  
 Do B.M.'s (H.I.'s) check by .05' Yes \_\_\_\_\_ No \_\_\_\_\_ Diff. \_\_\_\_\_  
 H.I. 337.85 ' (-) 1.44 = 336.41 ' P.K./PEG/HUB Ex Gr. \_\_\_\_\_ Other \_\_\_\_\_  
 (Rod Read.) (Elevation)  
 \_\_\_\_\_ ' Rod Reading Top Util.  
 = 335.10 ' Elev. TOP UTIL./STRUC.  
 \_\_\_\_\_ ' Rod Reading Bot. Util.  
 = \_\_\_\_\_ ' Elev. BOT. UTIL./STRUC.



REMARKS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



ALLWASTE/NORTH AMERICAN LOCATING, INC.

Testhole Data Form - FULL

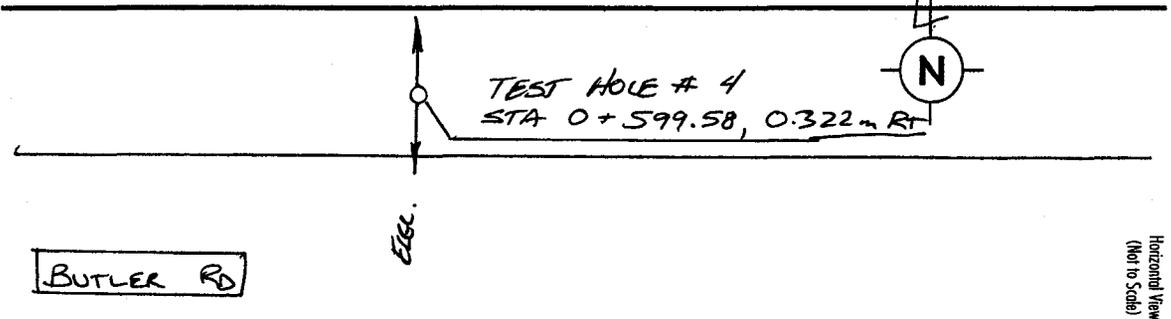
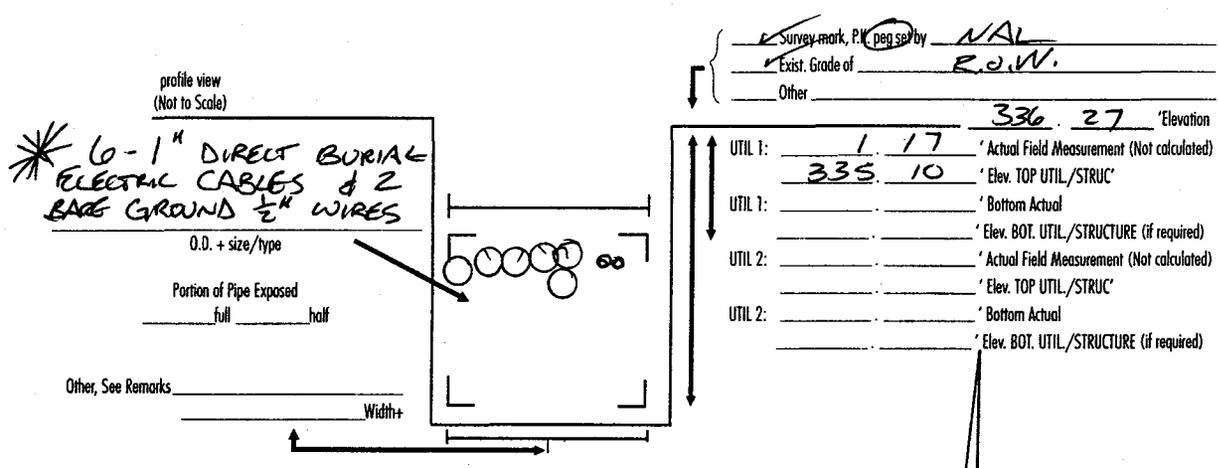
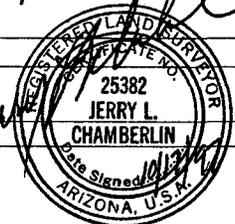
Arizona Contractor's License L-05 #105748

1801 West Watkins
Phoenix, Arizona 85007
(800) 631-5216 (602) 254-7344
Fax (602) 254-7412

Form Prepared by [Signature] Customer Project # FCD 94-12
Foreman JOAN HENRY OCHOA Test Hole # 4
Jurisdiction CITY OF PEORIA Plan Scale =
Location BUTLER RD WEST OF 89th AVE Sheet # of
Date Dug
N. A. L. Project# 02-171297

Specific Location STA 0 + 599.58 , 0.322 m RT
Type/Condition Pavement
Anticipated Size, Type, Material TELCO

Table with columns: Elev. B.M., Rod Read., H.I., B.M. Description, etc. Includes handwritten values like 336.27, 1.58, 337.85 and a note '1/2\"/>



REMARKS: \* TELEPHONE WAS REQUESTED FACILITY AT THIS LOCATION. TELEPHONE MAY BE IN WITH ABOVE SHOWN ELECTRIC BUT WAS NOT READILY VISIBLE



ALLWASTE/NORTH AMERICAN LOCATING, INC.

Testhole Data Form - FULL

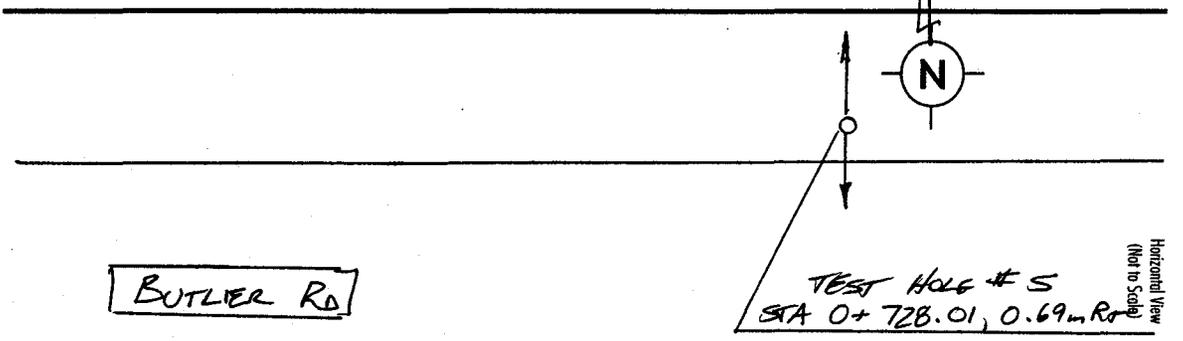
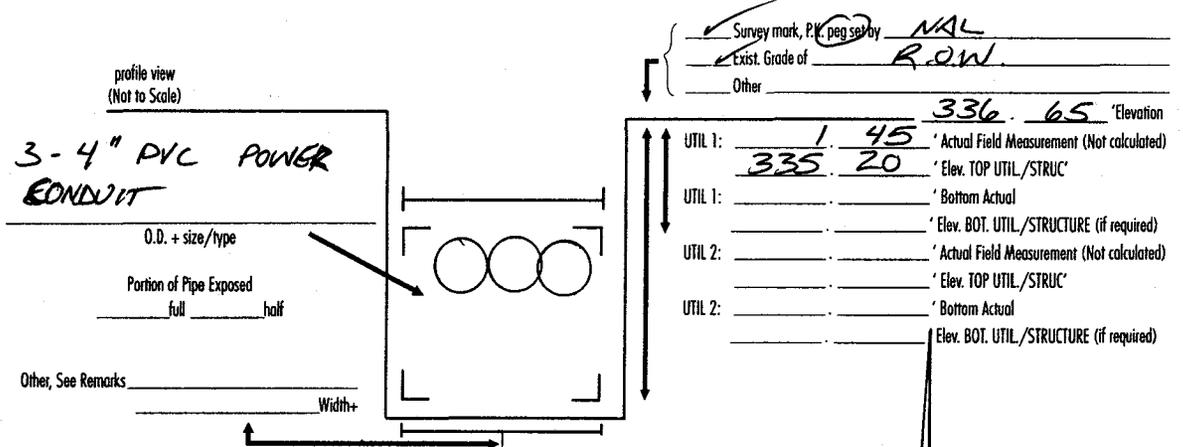
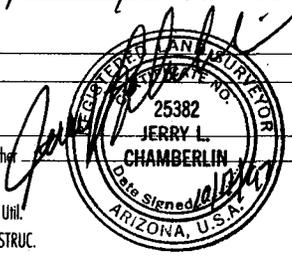
Arizona Contractor's License L-05 #105748

1801 West Watkins  
Phoenix, Arizona 85007  
(800) 631-5216 (602) 254-7344  
Fax (602) 254-7412

Form Prepared by John Henry Customer Project # FD-94-12  
Foreman JOHN HENRY Test Hole # 5  
Jurisdiction CITY OF PEORIA Plan Scale "=  
Location BUTLER WEST OF 89th AVE Sheet # of  
Date Dug \_\_\_\_\_  
N. A. L. Project# 02-177197

Specific Location STA 0+728.01, 0.69m Rt  
Type/Condition Pavement N/A - DIRT  
Anticipated Size, Type, Material POWER

Elev. B.M. 1 - 336.65 ' B.M. 1 Description 1/2" REBAR @ STA 0+728.01, 0.69m Rt  
Rod Read. + 1.61 ' SET BY NAL & SURVEYED BY KHE  
H.I. = 338.26 ' B.M. 1 Given, Assumed, Calculated  
Elev. B.M. 2 - \_\_\_\_\_ ' B.M. 2 Description \_\_\_\_\_  
Rod Read. + \_\_\_\_\_ ' B.M. 2 Given, Assumed, Calculated  
H.I. = \_\_\_\_\_ ' B.M. 2 Given, Assumed, Calculated  
Do B.M.'s (H.I.'s) check by .05' Yes No Diff.  
H.I. 338.26 (-) 1.61 = 336.65 ' P.K./PEG/HUB Ex Gr. \_\_\_\_\_ Other \_\_\_\_\_  
(Rod Read.) (Elevation) H.I. \_\_\_\_\_  
3.06 ' Rod Reading Top Util. 'Rod Reading Bot. Util.  
335.20 'Elev. TOP UTIL./STRUC. 'Elev. BOT. UTIL./STRUC.



REMARKS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



ALLWASTE/NORTH AMERICAN LOCATING, INC.

Testhole Data Form - FULL

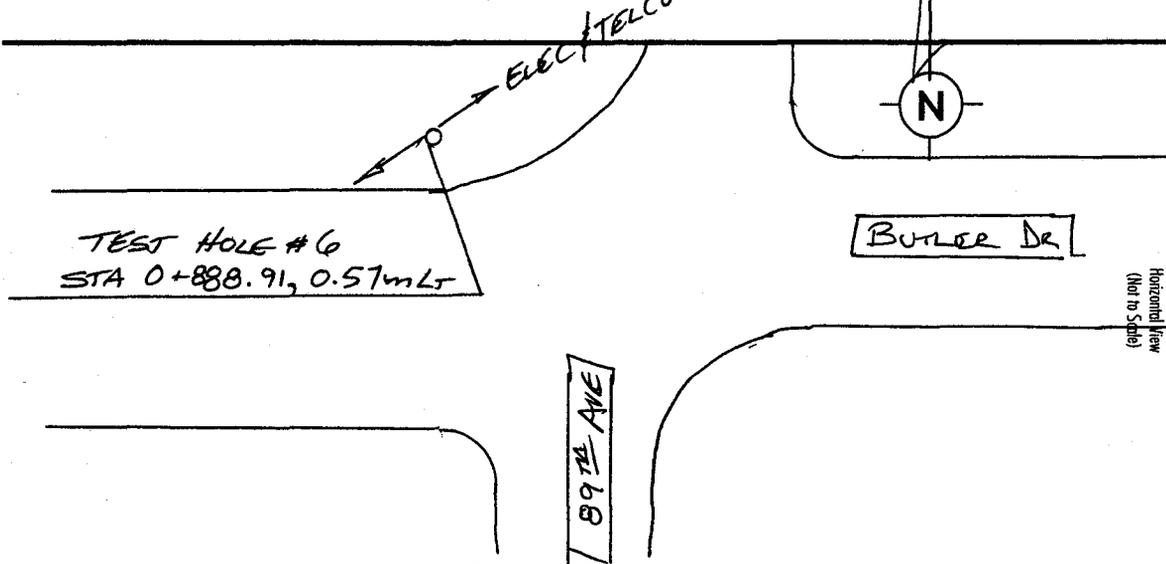
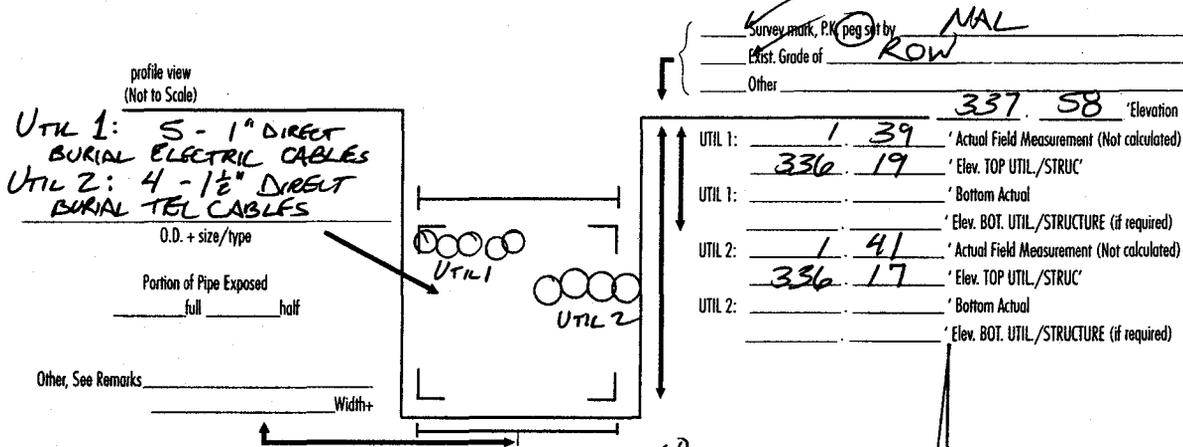
Arizona Contractor's License L-05 #105748

1801 West Watkins  
Phoenix, Arizona 85007  
(800) 631-5216 (602) 254-7344  
Fax (602) 254-7412

Form Prepared by John Henry Ochoa Customer Project # PCA 94-12  
Foreman JOHN HENRY OCHOA Test Hole # 4  
Jurisdiction PEORIA Plan Scale "=  
Location 89TH AVE & BUTLER Sheet # of  
Date Dug \_\_\_\_\_  
N. A. L. Project# 02-171797

Specific Location STA 0+888.910, 0.556m LT  
Type/Condition Pavement N/A-DIRT  
Anticipated Size, Type, Material TELCO

Elev. B.M. 1 - 337.58 ' B.M. 1 Description 1/2" REBAR @ STA 0+888.91, 0.57m L  
Rod Read. + 1.56 ' SET BY NAL & SURVEYED BY KHE  
H.I. = 339.14 ' B.M. 1 Given, Assumed, Calculated  
Elev. B.M. 2 - \_\_\_\_\_ ' B.M. 2 Description \_\_\_\_\_  
Rod Read. + \_\_\_\_\_ ' B.M. 2 Given, Assumed, Calculated  
H.I. = \_\_\_\_\_ ' B.M. 2 Given, Assumed, Calculated  
Do B.M.'s (H.I.'s) check by .05' Yes \_\_\_\_\_ No \_\_\_\_\_ Diff. \_\_\_\_\_  
H.I. 339.14 ' (-) 1.56 = 337.58 ' P.K./PEG/HUB Ex Gr. \_\_\_\_\_ Other \_\_\_\_\_  
2.95 ' Rod Reading Top Util. } UTIL 1  
= 336.19 ' Elev. TOP UTIL./STRUC. } ELECTRIC  
2.97 ' Rod Reading Bot. Util. } UTIL 2  
= 336.17 ' Elev. BOT. UTIL./STRUC. } TELCO



REMARKS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



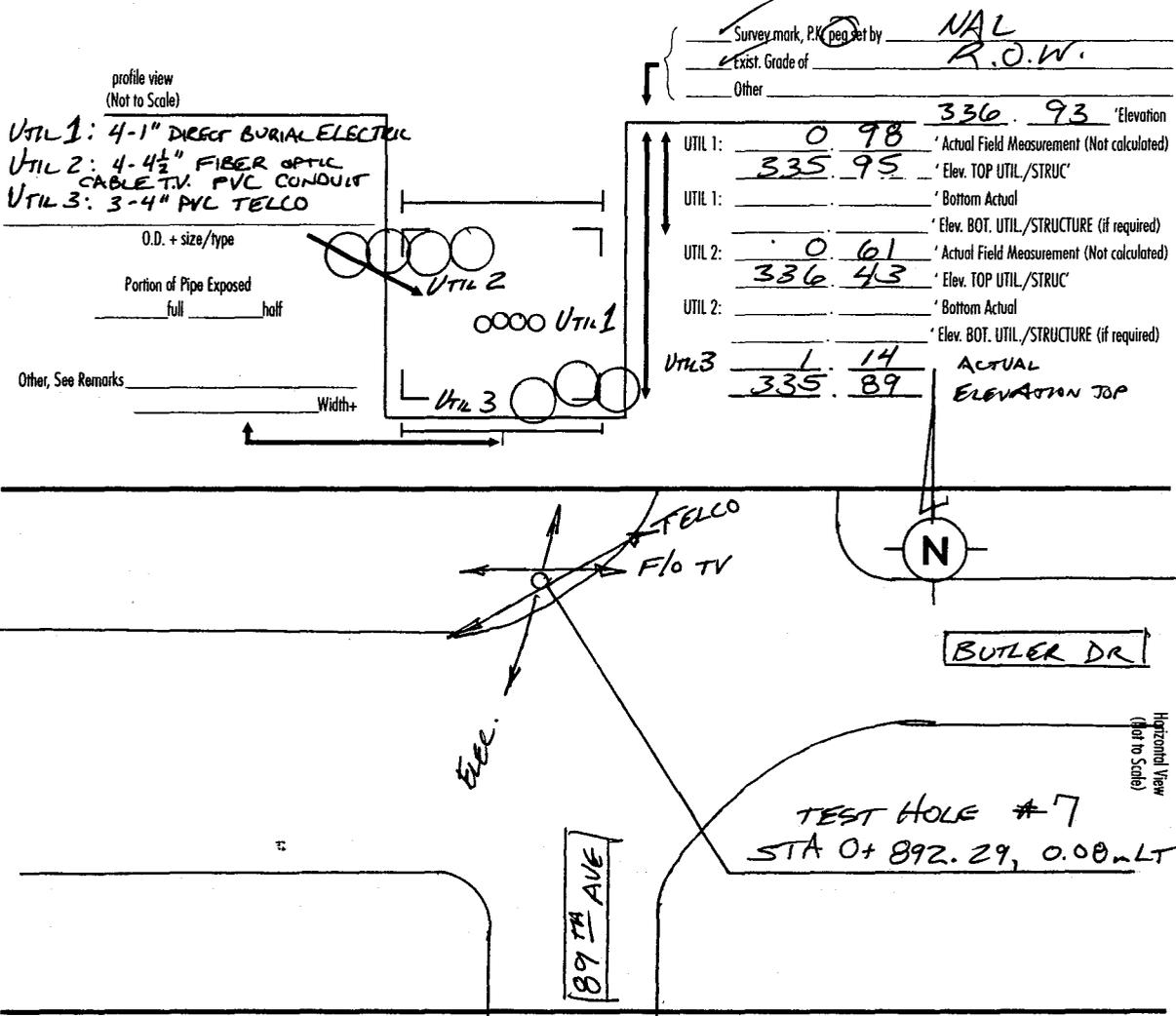
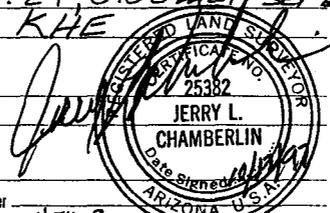
**ALLWASTE/NORTH AMERICAN LOCATING, INC.**  
**Testhole Data Form - FULL**

Arizona Contractor's License L-05 #105748

1801 West Watkins  
 Phoenix, Arizona 85007  
 (800) 631-5216 (602) 254-7344  
 Fax (602) 254-7412

Form Prepared by John Henry Ochoa Customer Project # FCD 94-12  
 Foreman JOHN HENRY OCHOA Test Hole # 7  
 Jurisdiction CITY OF PEORIA Plan Scale "=  
 Location BUTLER & 89<sup>th</sup> AVE Sheet #      of       
 Date Dug      N. A. L. Project# 02-171797  
 Specific Location \* STA 0+892.287, 0.08 m LT  
 Type/Condition Pavement N/A - DIRT  
 Anticipated Size, Type, Material ELECTRIC

Elev. B.M. 1	-	336.93	' B.M. 1 Description	1/2" REBAR @ STA 0+892.29 0.08 m LT SET BY
Rod Read.	+	1.91		NAL & SURVEYED BY KHE
H.I.	=	338.84	' B.M. 1 Given, Assumed, Calculated	
Elev. B.M. 2	-		' B.M. 2 Description	
Rod Read.	+			
H.I.	=		' B.M. 2 Given, Assumed, Calculated	
Do B.M.'s (H.I.'s) check by .05' Yes <u>    </u> No <u>    </u> Diff. <u>    </u>				
H.I.		338.84	(Rod Read.)	1.91 = 336.93 (Elevation)
		2.89	' Rod Reading Top Util.	
		335.95	' Elev. TOP UTIL./STRUC.	
				UTIL 1 ELECTRIC
				UTIL 2 CATV
				UTIL 3 TELCO





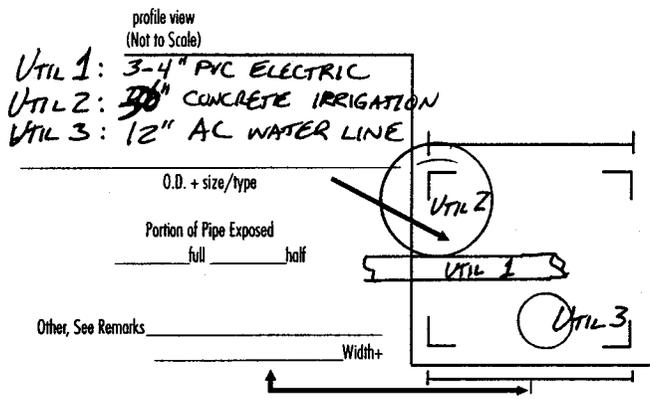
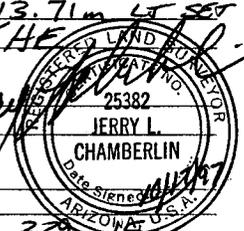
ALLWASTE/NORTH AMERICAN LOCATING, INC. Testhole Data Form - FULL

1801 West Watkins Phoenix, Arizona 85007 (800) 631-5216 (602) 254-7344 Fax (602) 254-7412

Arizona Contractor's License L-05 #105748

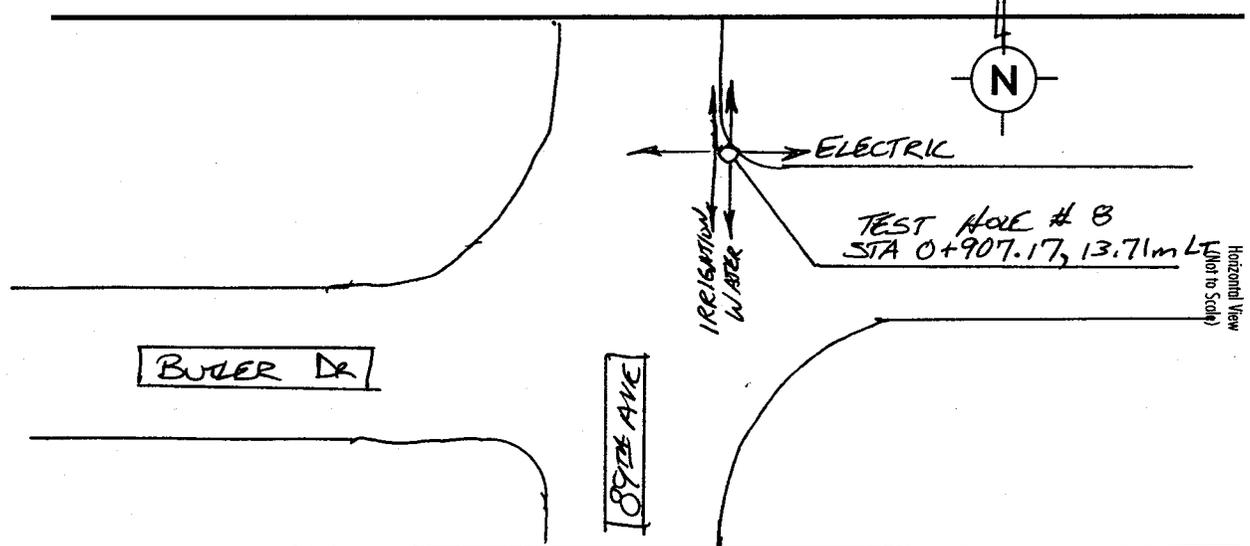
Form Prepared by: Nan Padilla Customer Project #: FCD 94-12  
Foreman: JOAN HENRY OCHOA Test Hole #: 8  
Jurisdiction: CITY OF PEORIA Plan Scale: " = "  
Location: 89th AVE & BUTLER Sheet #: of  
Date Dug: \_\_\_\_\_ N. A. L. Project#: 02-171797  
Specific Location: \* STA 0 + 907.17, 13.71 m LT  
Type/Condition Pavement: ASPHALT - FAIR  
Anticipated Size, Type, Material: ELECTRIC

Elev. B.M. 1: 336.72 ' B.M. 1 Description: PK NAL @ STA 0+907.17, 13.71m LT SET  
Rod Read.: + 2.43 ' BY NAL & SURVEYED BY KHE  
H.I.: = 339.15 ' B.M. 1 Given, Assumed, Calculated  
Elev. B.M. 2: \_\_\_\_\_ ' B.M. 2 Description: \_\_\_\_\_  
Rod Read.: \_\_\_\_\_ ' B.M. 2 Given, Assumed, Calculated  
H.I.: \_\_\_\_\_ ' B.M. 2 Given, Assumed, Calculated  
Do B.M.'s (H.I.'s) check by .05' Yes \_\_\_\_\_ No \_\_\_\_\_ Diff. \_\_\_\_\_  
H.I. 339.15 ' (-) 2.43 ' = 336.72 ' P.K./PEG/HUB Ex Gr. \_\_\_\_\_ Other \_\_\_\_\_  
4.02 ' Rod Reading Top Util. } UTIL 1  
335.13 ' Elev. TOP UTIL./STRUC. } ELECTRIC  
H.I. 339.15 ' } UTIL 2 339.15 ' }  
3.06 ' Rod Reading Bot. Util. } IRR 334.75 ' } UTIL 3  
336.09 ' Elev. BOT. UTIL./STRUC. } WATER



Survey mark P.K. peg set by NAL  
Exist. Grade of PAVEMENT  
Other \_\_\_\_\_

UTIL 1:	<u>1.59</u>	' Actual Field Measurement (Not calculated)
	<u>335.13</u>	' Elev. TOP UTIL./STRUC'
UTIL 1:		' Bottom Actual
UTIL 2:	<u>0.63</u>	' Actual Field Measurement (Not calculated)
	<u>336.09</u>	' Elev. TOP UTIL./STRUC'
UTIL 2:		' Bottom Actual
UTIL 3:	<u>1.97</u>	' ACTUAL ELEVATION TOP



REMARKS: \* IRRIGATION - STA = 0 + 907.01, 14.07 m LT  
WATER - STA = 0 + 907.31, 13.05 m LT

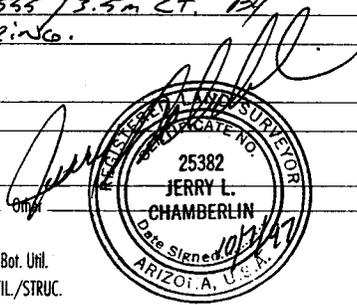




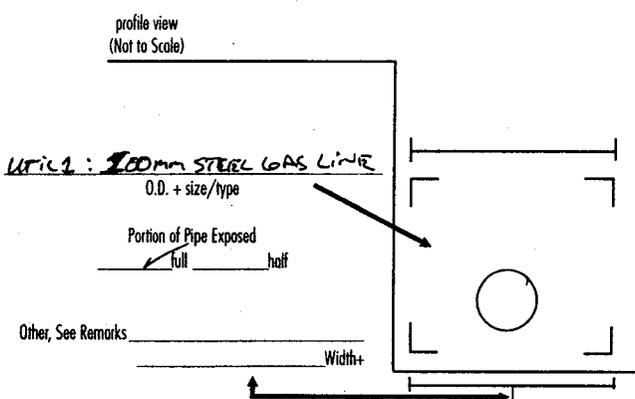
Form Prepared by JOHN HENRY COLTON Customer Project # FC094-12  
 Foreman \_\_\_\_\_ Test Hole # 16  
 Jurisdiction CITY OF PEORIA Plan Scale \_\_\_\_\_  
 Location 83RD AVENUE Sheet # \_\_\_\_\_ of \_\_\_\_\_  
 Date Dug \_\_\_\_\_  
 N. A. L. Project# 02-171797

Specific Location STA. 0+555/4.0 LT.  
 Type/Condition Pavement 6" ASPHALT  
 Anticipated Size, Type, Material 100mm STEEL

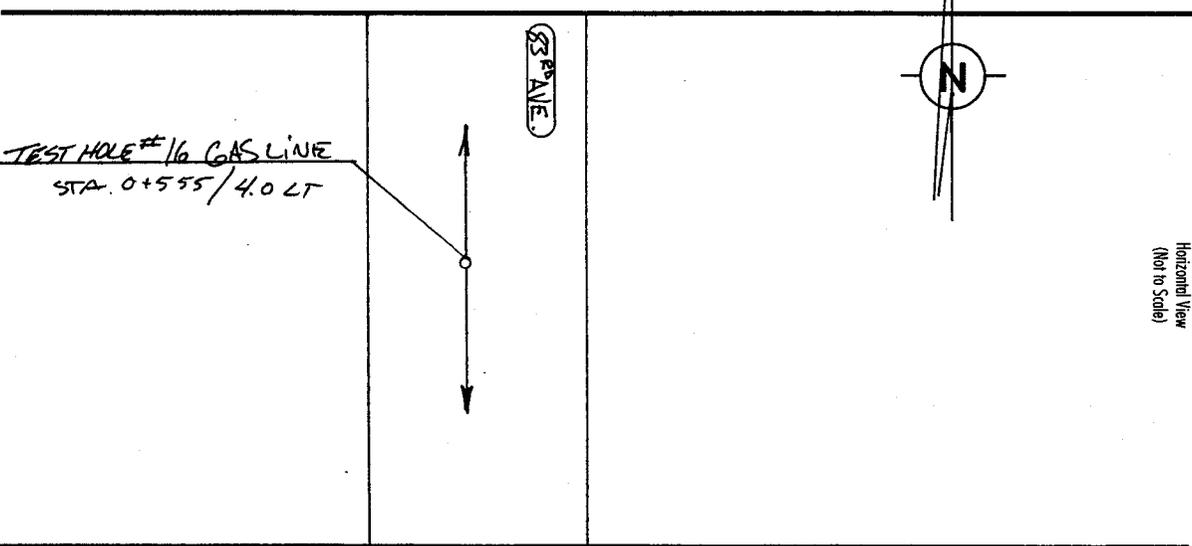
Elev. B.M. 1 - 338.06 ' B.M. 1 Description 1/2" P.K. NAIL SET @ STA. 0+555/3.5m CT. BY  
 Rod Read. + 1.665 ' KAMINSKI: HUMANEN ENGINEERING.  
 H.I. = 339.72 ' B.M. 1 Given, Assumed, Calculated  
 Elev. B.M. 2 - \_\_\_\_\_ ' B.M. 2 Description \_\_\_\_\_  
 Rod Read. + \_\_\_\_\_ ' B.M. 2 Given, Assumed, Calculated  
 H.I. = \_\_\_\_\_ ' B.M. 2 Given, Assumed, Calculated  
 Do B.M.'s (H.I.'s) check by .05' Yes \_\_\_\_\_ No \_\_\_\_\_ Diff. \_\_\_\_\_  
 H.I. 339.72 ' (-) 1.650 ' = 338.07 ' P.K./PEG/HUB Ex Gr. \_\_\_\_\_  
 (Rod Read.) (Elevation) H.I. \_\_\_\_\_  
 = 2.630 ' Rod Reading Top Util. 'Rod Reading Bot. Util.  
 = 337.095 ' Elev. TOP UTIL./STRUC. 'Elev. BOT. UTIL./STRUC.



Survey mark PK set by NAL  
 Exist. Grade of PAVEMENT  
 Other \_\_\_\_\_  
 Elevation 338.07



UTIL 1: 0.97 ' Actual Field Measurement (Not calculated)  
337.095 ' Elev. TOP UTIL./STRUC'  
 Bottom Actual  
 UTIL 1: \_\_\_\_\_ ' Elev. BOT. UTIL./STRUCTURE (if required)  
 UTIL 2: \_\_\_\_\_ ' Actual Field Measurement (Not calculated)  
 \_\_\_\_\_ ' Elev. TOP UTIL./STRUC'  
 UTIL 2: \_\_\_\_\_ ' Bottom Actual  
 \_\_\_\_\_ ' Elev. BOT. UTIL./STRUCTURE (if required)



REMARKS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

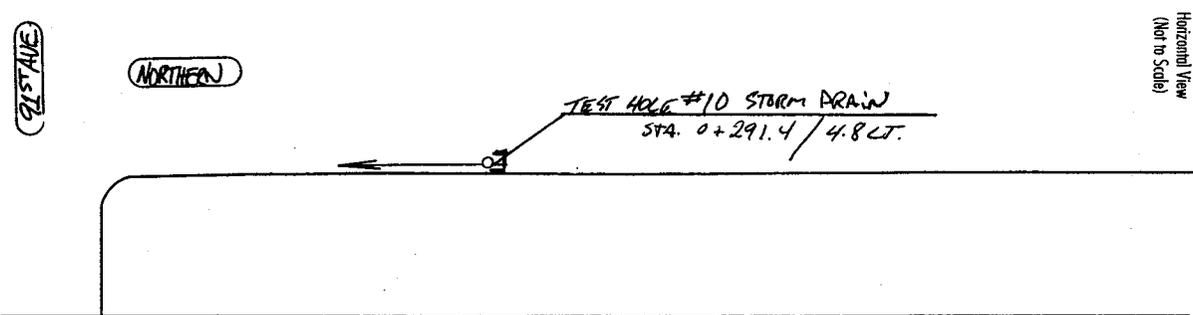
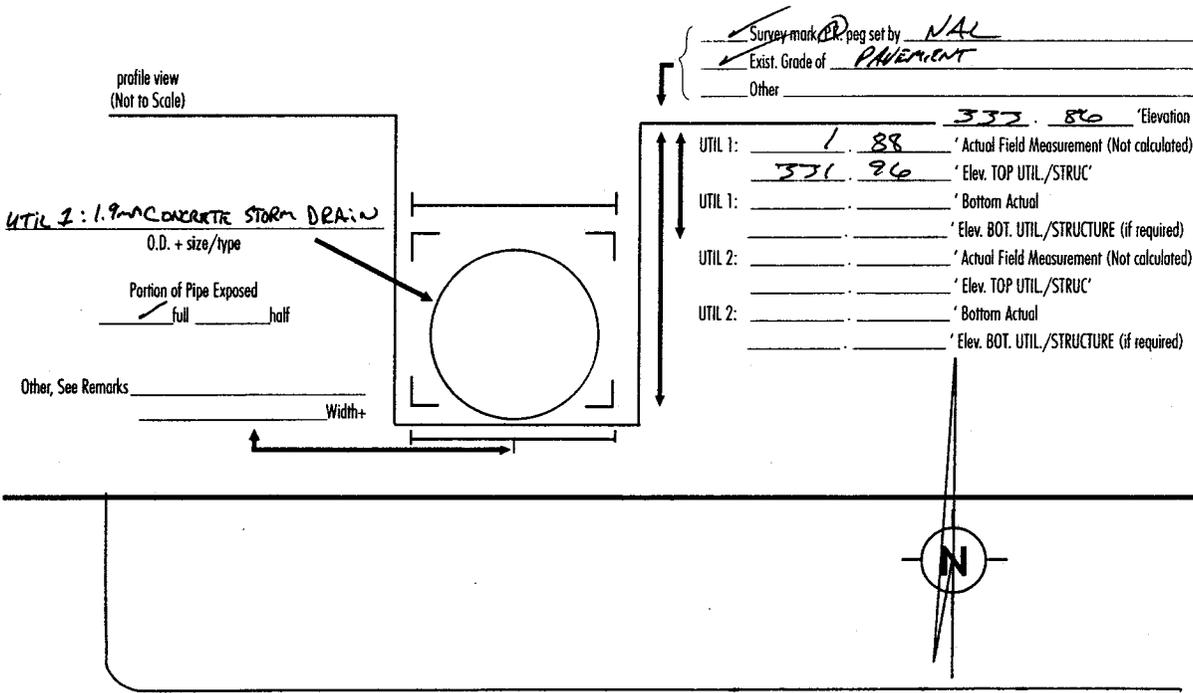
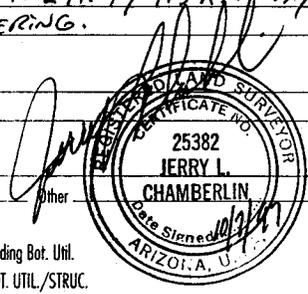


Form Prepared by JOHN HENRY OCHOA Customer Project # FC094-12  
 Foreman \_\_\_\_\_ Test Hole # 10  
 Jurisdiction CITY OF PEORIA Plan Scale "=  
 Location 91ST AVE. E NORTHERN Sheet # of  
 Date Dug \_\_\_\_\_  
 N. A. L. Project# 02-171797

Specific Location STA. 0+291.4/4.8  
 Type/Condition Pavement 6" ASPHALT  
 Anticipated Size, Type, Material 1.9m CONCRETE STORM DRAIN

Elev. B.M. 1 - 333.85 ' B.M. 1 Description 1/2" P.I.K. NAIL SET @ STA. 291.4/4.5 RT. 191  
 Rod Read. + 1.61 ' KAMINSKI HUBBARD ENGINEERING.  
 H.I. = 335.46 ' B.M. 1 Given, Assumed, Calculated  
 Elev. B.M. 2 - \_\_\_\_\_ ' B.M. 2 Description \_\_\_\_\_  
 Rod Read. + \_\_\_\_\_ ' B.M. 2 Given, Assumed, Calculated  
 H.I. = \_\_\_\_\_ ' B.M. 2 Given, Assumed, Calculated

Do B.M.'s (H.I.'s) check by .05' Yes \_\_\_\_\_ No \_\_\_\_\_ Diff. \_\_\_\_\_  
 H.I. 335.46 ' (-) 1.60 ' = 333.86 ' P.K./PEG/HUB Ex Gr. \_\_\_\_\_ Other \_\_\_\_\_  
 (Rod Read.) (Elevation) H.I. \_\_\_\_\_  
 ' Rod Reading Top Util. \_\_\_\_\_ ' Rod Reading Bot. Util. \_\_\_\_\_  
 = 331.96 ' Elev. TOP UTIL./STRUC. \_\_\_\_\_ ' Elev. BOT. UTIL./STRUC. \_\_\_\_\_



REMARKS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_





ALLWASTE/NORTH AMERICAN LOCATING, INC.

Testhole Data Form - FULL

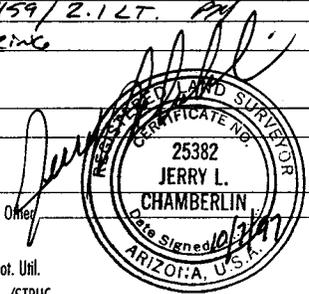
Arizona Contractor's License L-05 #105748

1801 West Watkins  
Phoenix, Arizona 85007  
(800) 631-5216 (602) 254-7344  
Fax (602) 254-7412

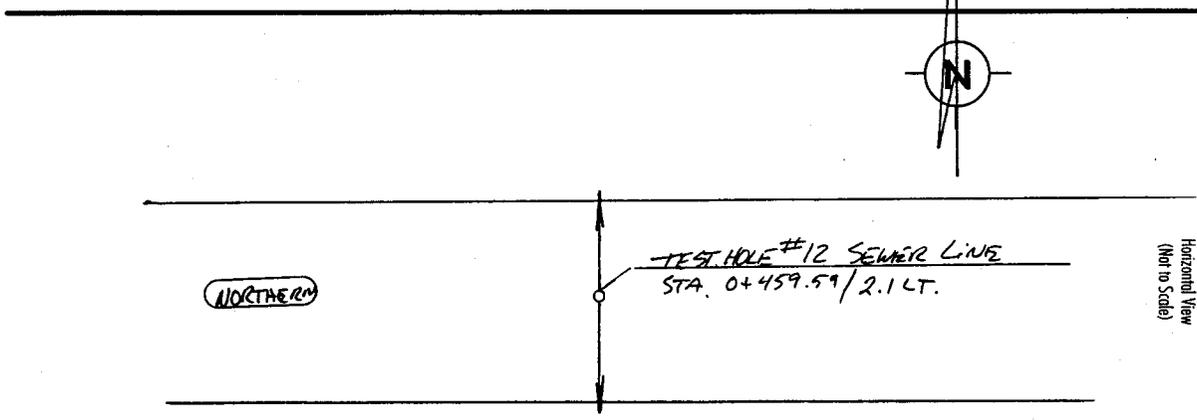
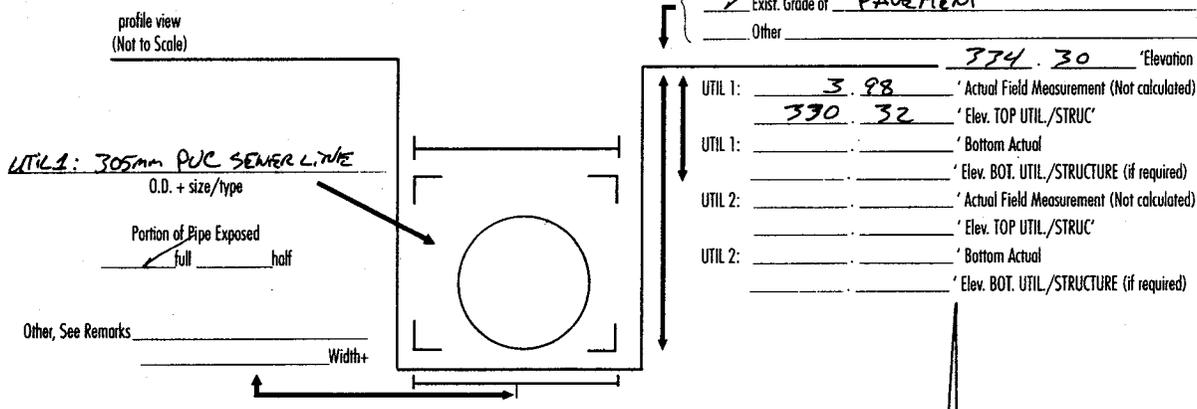
Form Prepared by JOHN HENRY CHOYA Customer Project # RD-94-12  
Foreman \_\_\_\_\_ Test Hole # 12  
Jurisdiction CITY OF PEORIA Plan Scale \_\_\_\_\_  
Location NORTHERN AVE. Sheet # \_\_\_\_\_ of \_\_\_\_\_  
Date Dug \_\_\_\_\_  
N. A. L. Project# 02-27797

Specific Location STA. 0+459.59 / 2.1 LT.  
Type/Condition Pavement 6" ASPHALT  
Anticipated Size, Type, Material 305mm PVC SEWER LINE

Elev. B.M. 1 - 374.30 ' B.M. 1 Description 1/2" P.K. NAIL SET @ STA. 0+459 / 2.1 LT. PM  
Rod Read. + 1.44 ' KARUSKI HUBBARD ENGINEERING  
H.I. = 335.74 ' B.M. 1 Given, Assumed, Calculated  
Elev. B.M. 2 - \_\_\_\_\_ ' B.M. 2 Description \_\_\_\_\_  
Rod Read. + \_\_\_\_\_ ' B.M. 2 Given, Assumed, Calculated  
H.I. = \_\_\_\_\_ ' B.M. 2 Given, Assumed, Calculated  
Do B.M.'s (H.I.'s) check by .05' Yes \_\_\_\_\_ No \_\_\_\_\_ Diff. \_\_\_\_\_  
H.I. 335.74 ' (-) 1.44 = 374.30 ' P.K./PEG/HUB Ex Gr. \_\_\_\_\_ Other \_\_\_\_\_  
(Rod Read.) (Elevation) H.I. \_\_\_\_\_  
5.42 ' Rod Reading Top Util. \_\_\_\_\_ ' Rod Reading Bot. Util. \_\_\_\_\_  
370.32 ' Elev. TOP UTIL./STRUC. \_\_\_\_\_ ' Elev. BOT. UTIL./STRUC. \_\_\_\_\_



Survey mark  Peg set by NAL  
Exist. Grade of PAVEMENT  
Other \_\_\_\_\_  
Elevation 374.30



REMARKS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



# ALLWASTE/NORTH AMERICAN LOCATING, INC.

## Testhole Data Form - FULL

Arizona Contractor's License L-05 #105748

1801 West Watkins  
Phoenix, Arizona 85007  
(800) 631-5216 (602) 254-7344  
Fax (602) 254-7412

Form Prepared by JOHN HENRY OCTOIA Customer Project # FCD94-12  
 Foreman \_\_\_\_\_ Test Hole # 13  
 Jurisdiction CITY OF PEORIA Plan Scale "=  
 Location NORTHERN AVE. Sheet # \_\_\_\_\_ of \_\_\_\_\_  
 Date Dug \_\_\_\_\_  
 N. A. L. Project# 02-171797

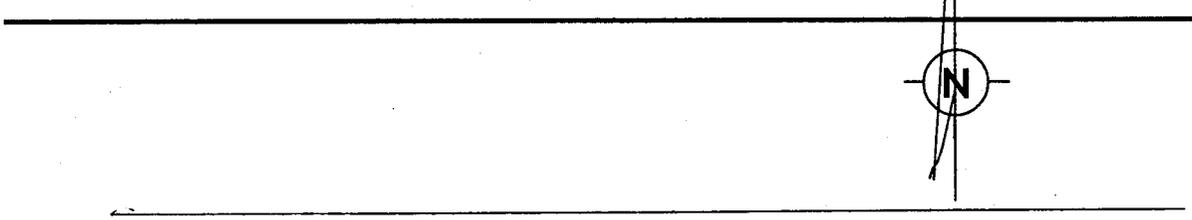
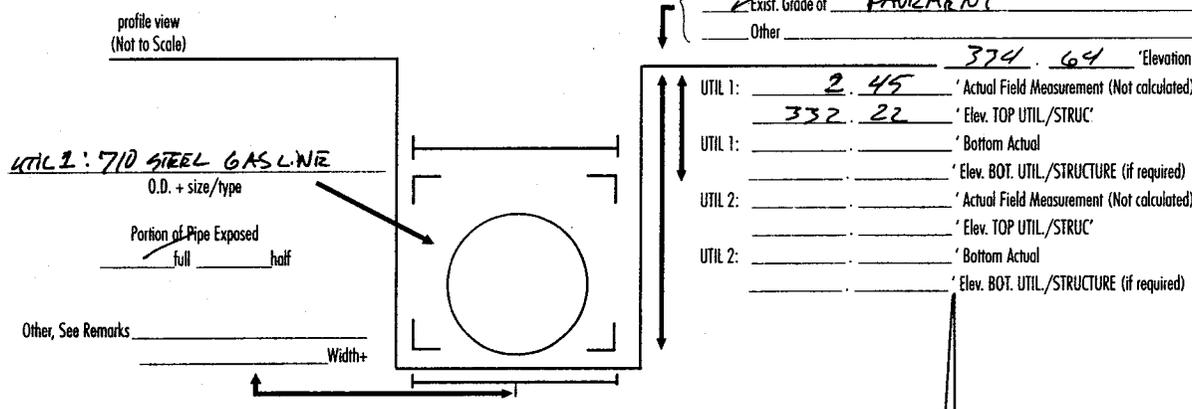
Specific Location STA. 0+590.5 / 5.2 LT.  
 Type/Condition Pavement 6" ASPHALT  
 Anticipated Size, Type, Material 710mm STEEL GAS LINE

Elev. B.M. 1	-	<u>334.65</u>	B.M. 1 Description	<u>1/2" P.I.C. NAIL SET @ STA. 0+590.5 / 4.945 BY</u>
Rod Read.	+	<u>1.73</u>		<u>KAMINSKI HUBBARD ENGINEERING</u>
H.I.	=	<u>336.38</u>	B.M. 1 Given, Assumed, Calculated	
Elev. B.M. 2	-	_____	B.M. 2 Description	
Rod Read.	+	_____		
H.I.	=	_____	B.M. 2 Given, Assumed, Calculated	

Do B.M.'s (H.I.'s) check by .05' Yes \_\_\_\_\_ No \_\_\_\_\_ Diff. \_\_\_\_\_  
 H.I. 336.38 (-) 1.74 = 334.64 'P.K./PEG/HUB Ex Gr. \_\_\_\_\_ Other \_\_\_\_\_  
 (Rod Read.) (Elevation) H.I. \_\_\_\_\_  
 = 4.16 'Rod Reading Top Util. \_\_\_\_\_ 'Rod Reading Bot. Util. \_\_\_\_\_  
 = 332.22 'Elev. TOP UTIL./STRUC. \_\_\_\_\_ 'Elev. BOT. UTIL./STRUC. \_\_\_\_\_



Survey mark P.K. peg set by NAL  
 Exist. Grade of PAVEMENT  
 Other \_\_\_\_\_



REMARKS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



ALLWASTE/NORTH AMERICAN LOCATING, INC.

Testhole Data Form - FULL

Arizona Contractor's License L-05 #105748

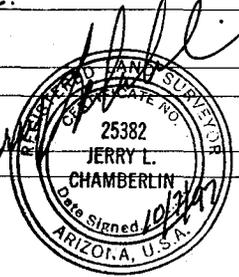
1801 West Watkins  
Phoenix, Arizona 85007  
(800) 631-5216 (602) 254-7344  
Fax (602) 254-7412

Form Prepared by JOHN HENRY SELTOA Customer Project # FD94-12  
 Foreman \_\_\_\_\_ Test Hole # 14  
 Jurisdiction CITY OF PEORIA Plan Scale "=  
 Location NORTHERN AVE. Sheet # \_\_\_\_\_ of \_\_\_\_\_  
 Date Dug \_\_\_\_\_  
 N. A. L. Project# 02-171797

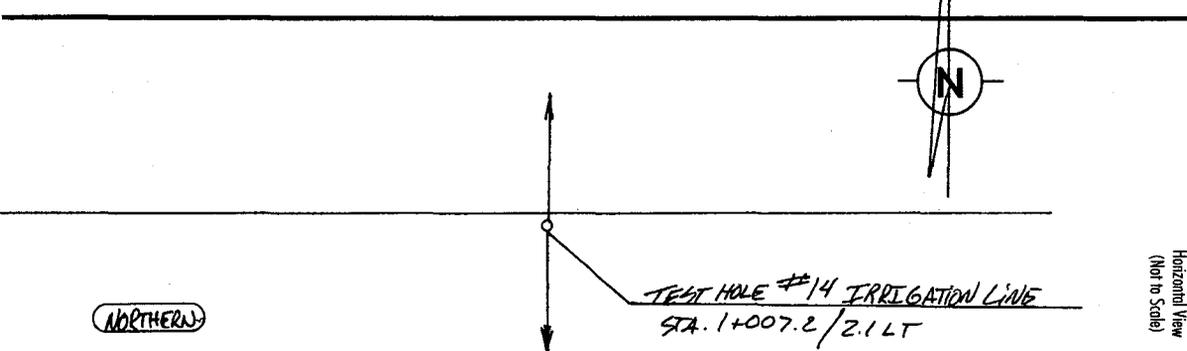
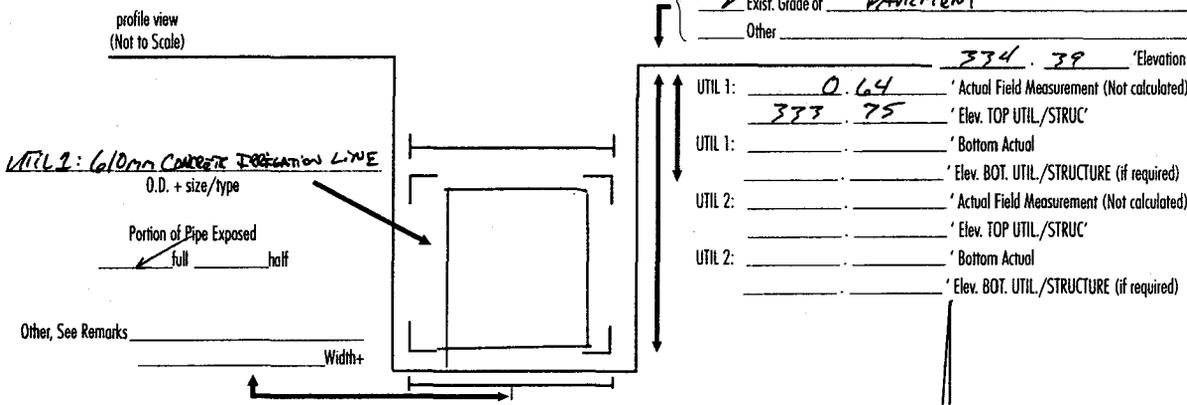
Specific Location STA. 1+007.2 / 2.1 LT.  
 Type/Condition Pavement 6" ASPHALT  
 Anticipated Size, Type, Material 610MM CONCRETE IRRIGATION LINE

Elev. B.M. 1	-	<u>334.38</u>	B.M. 1 Description	<u>1/2" P.K. NAIL SET @ STA. 1+007.5 / 2.1 LT B4</u>
Rod Read.	+	<u>1.71</u>		<u>KAMINSKI HUBBARD ENGINEERING.</u>
H.I.	=	<u>336.09</u>	B.M. 1 Given, Assumed, Calculated	
Elev. B.M. 2	-	_____	B.M. 2 Description	
Rod Read.	+	_____		
H.I.	=	_____	B.M. 2 Given, Assumed, Calculated	

Do B.M.'s (H.I.'s) check by .05' Yes \_\_\_\_\_ No \_\_\_\_\_ Diff. \_\_\_\_\_  
 H.I. 336.09 (-) 1.70 = 334.39 'P.K./PEG/HUB Ex Gr. \_\_\_\_\_ Other \_\_\_\_\_  
 (Rod Read.) (Elevation) H.I. \_\_\_\_\_  
 'Rod Reading Top Util. \_\_\_\_\_ 'Rod Reading Bot. Util. \_\_\_\_\_  
 = 333.75 'Elev. TOP UTIL./STRUC. = \_\_\_\_\_ 'Elev. BOT. UTIL./STRUC.



Survey mark  peg set by NAL  
 Exist. Grade of PAVEMENT  
 Other \_\_\_\_\_



REMARKS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



WOOD/PATEL

fax transmittal

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PAGE 1 OF

DATE:

TIME:

TO: *Bret Olson*

FAX NO: *912-6599*

COMPANY:

*Stanley*

FROM: *James Taillon*

JOB NO: *94153.02*

PROJECT: *Northern / Oranewood*

COMMENTS:

*Bret,*

*Pothole information per your request.*

*James*

copy to:

hard copy to follow in mail

POTHOLE NO.	STATION ±	OFFSET ±	UTILITY	POTHOLE RESPONSIBILITY
<b>BUTLER ALIGNMENT</b>				
1	494.5	6.1 LT	Telephone	NAL
2	506	5.0 LT	12" Water	NAL
3	591.5	3.0 LT	Power	NAL
4	599.0	3.0 LT	Telephone	NAL
5	728.5	3.0 LT	Power	NAL
6	888	3.0 LT	Telephone	NAL
7	891.7	2.0 LT	Power	NAL
8	909	13.0 LT	Power	NAL
9	1+295.0	13.0 LT	Power/Telephone	NAL
<b>NORTHERN ALIGNMENT</b> <i>(91st Ave &amp; Northern Ave) (Sta. 0+200.0)</i>				
10	291.4	4.5 RT	60" Storm Drain	NAL
11	308.2	4.9 LT	16" Gas	NAL
12	459.0	2.1 LT	8" Sanitary Sewer	NAL
13	590.5	4.9 LT	16" Gas	NAL
14	1+007.5	2.1 LT	24" Irrigation	NAL
15	1+1377	4.9 LT	16" Gas	NAL
17	1+1672	2.1 LT	Electric	FCDMC
18	1+783.8	2.1 LT	Telephone	FCDMC
19	1+789.0	2.1 LT	4" Gas	FCDMC
<b>83RD AVENUE</b>				
20	409.3	8.0 LT	Telephone	FCDMC
21	411.7	3.5 LT	4" Gas	FCDMC
16	555.0	3.5 LT	4" Gas	NAL







UTILITY LOCATION REPORT

CREW CHIEF T. Bix A. Williams

CREW MEMBERS J. POPPOE  
O. LAKREKA

CHECKED BY: DR

GENERAL LOCATION N. SIDE OF NORTHERN AVE STA 1+67.2

SIZE/TYPE/MATERIAL ANTICIPATED ELECTRIC

PAVING CONDITION BEFORE WORK ASPHALT/DIRT SHOULDER

JURISDICTION MARICOPA COUNTY

ELEVATION B.M. 336.015 DESCRIPTION B.M. #4 BLHM NORTHERN AVE 3360 AVE

ROD READING (+) 1.295

H.I. (=) 337.310

(-) 2.115

(=) 335.195

(-) 2.475

(=) 334.835

(-) 1.170

B.M. ELEV CHECK (=) 336.020

**Geotrack, Inc.**  
SURVEYORS UTILITY LOCATORS  
11219 N. 23rd Avenue (602) 331-3225  
Phoenix, Arizona 85029 FAX (602) 331-8837

GEOTRACK PROJECT NO. 17043  
CUSTOMER PROJECT NO. FCD 9412  
TEST HOLE NO. 17  
DATE DUG 9-27-97

B.M. GIVEN/ASSUMED/SURVEYED BY GEOTRACK

ROD READING AT SURFACE

ELEVATION AT SURFACE

ROD READING TOP UTILITY

ELEVATION TOP UTILITY

ROD READING BOTTOM UTILITY

ELEVATION BOTTOM UTILITY

PK/HUB/ST PIN/CHSLD "X"/OTHER

ACCURACY CHECK

DEPTH (MEASURED) 0.360 M

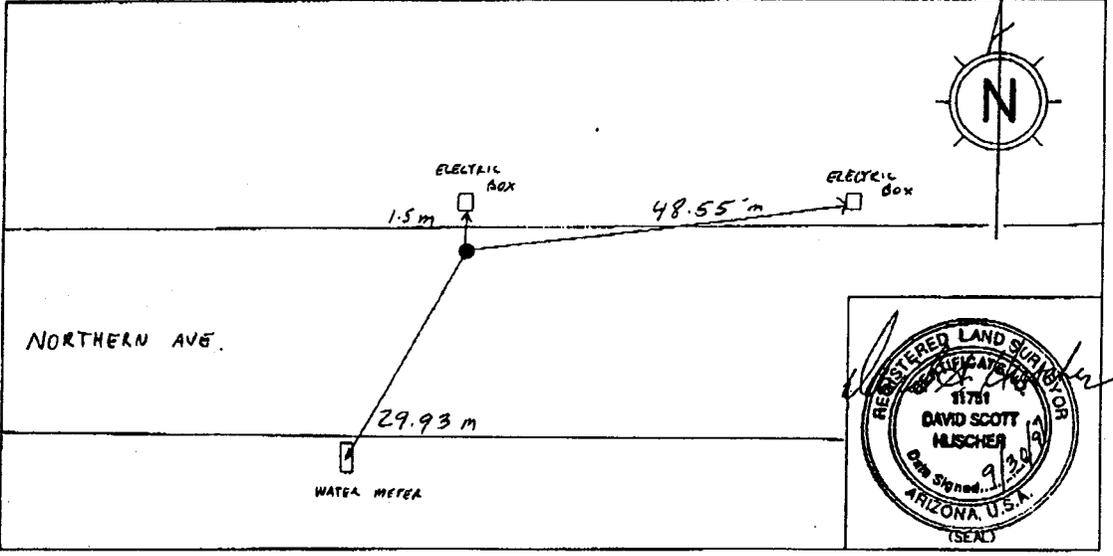
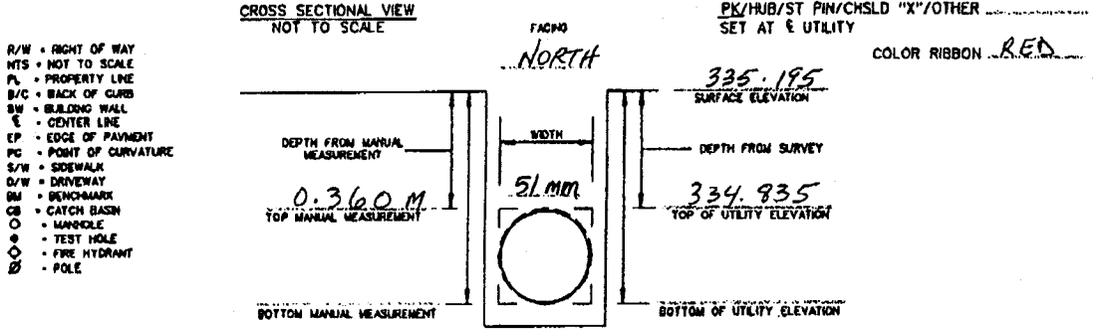
DEPTH (SURVEYED) 0.360 M

DIFFERENCE 0

BOTTOM (MEASURED)

BOTTOM (SURVEYED)

DIFFERENCE



T.H. DUG 2.1 M RT (L) OF CONST. @ 1+671.92 NORTHERN AVENUE  
DESC & STATION STREET NAME

WAS REQUESTED UTILITY FOUND?  YES NO O.D./TYPE 51MM PLASTIC ELEC. CONDUIT

PAVING THICKNESS & TYPE 75.0 mm ASPHALT SOIL TYPE CLAY

REMARKS: EXPOSED CONDUIT FEED TO LOOP DETECTION WIRES CROSSING NORTHERN AVE. IN A.C. P.V.M.T.

UTILITY LOCATION REPORT

CREW CHIEF T. BIX A. WILLIAMS

CREW MEMBERS J. POPPOF

O. LARREA

CHECKED BY: DH



Geotrack, Inc.

11219 N. 23rd Avenue (602) 331-3225  
Phoenix, Arizona 85029 FAX (602) 331-8837

GEOTRACK PROJECT NO. 17043  
CUSTOMER PROJECT NO. EGD 94-12  
TEST HOLE NO. 18  
DATE DUG 9-27-97

GENERAL LOCATION N.W. COR. 83rd AVE AND NORTHERN

SIZE/TYPE/MATERIAL ANTICIPATED TELEPHONE

PAVING CONDITION BEFORE WORK ASPHALT RD.

JURISDICTION MARICOPA COUNTY

ELEVATION B.M. 336.015 DESCRIPTION BM # 1 BY H.H. NORTHERN AND 83RD AVE.

ROD READING (+) 1.355

H.I. (-) 337.370

(-) 1.315

(=) 336.055

(-) 2.910

(=) 334.460

(-)

(=)

B.M. GIVEN/ASSUMED/SURVEYED BY GEOTRACK

ROD READING AT SURFACE

ELEVATION AT SURFACE PK/HUB/ST PIN/CHSLD "X"/OTHER

ROD READING TOP UTILITY

ELEVATION TOP UTILITY

ROD READING BOTTOM UTILITY

ELEVATION BOTTOM UTILITY

ACCURACY CHECK

DEPTH (MEASURED) 1.590 M

DEPTH (SURVEYED) 1.525 M

DIFFERENCE 0.005 M

BOTTOM (MEASURED)

BOTTOM (SURVEYED)

DIFFERENCE

CHECK BACK TO B.M. (BREAK SET-UP)

SURFACE ELEV. 336.055

ROD READING (+) 1.235

H.I. (-) 337.290

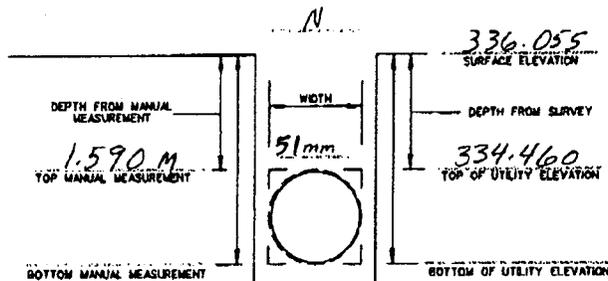
ROD READING B.M. (-) 1.270

B.M. ELEV CHECK (=) 336.020

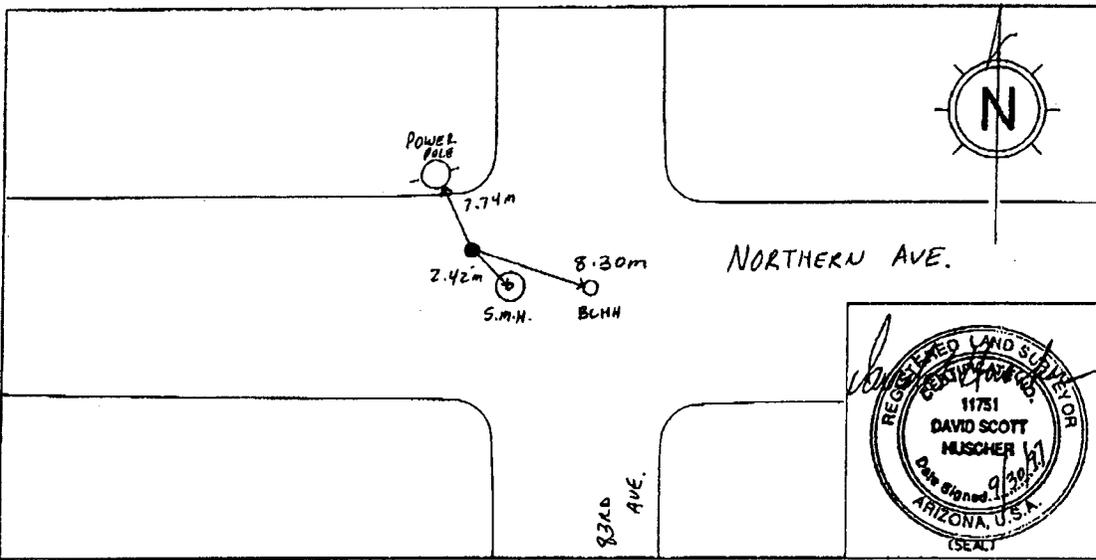
CROSS SECTIONAL VIEW NOT TO SCALE

PK/HUB/ST PIN/CHSLD "X"/OTHER SET AT & UTILITY

- R/W - RIGHT OF WAY
- M/S - NOT TO SCALE
- PL - PROPERTY LINE
- B/O - BACK OF CURB
- B/W - BUILDING WALL
- CL - CENTER LINE
- EP - EDGE OF PAYMENT
- PC - POINT OF CURVATURE
- S/W - SIDEWALK
- D/W - DRIVEWAY
- BM - BENCHMARK
- CB - CATCH BASIN
- O - MANHOLE
- - TEST HOLE
- - FIRE HYDRANT
- - POLE



COLOR RIBBON ORANGE



T.H. DUG 2.1m RT (LT) OF CONST. & 1+785.4 STATION NORTHERN AVE STREET NAME

WAS REQUESTED UTILITY FOUND? (YES) NO O.D./TYPE 51mm DIRECT BURIED TELEPHONE CABLE  
PAVING THICKNESS & TYPE ± 151.2mm ASPHALT SOIL TYPE SOFT CLAY

REMARKS:

**UTILITY LOCATION REPORT**

CREW CHIEF T. BIX A. WILLIAMS  
 CREW MEMBERS J. PORROE  
O. CARRERA  
 CHECKED BY: DA

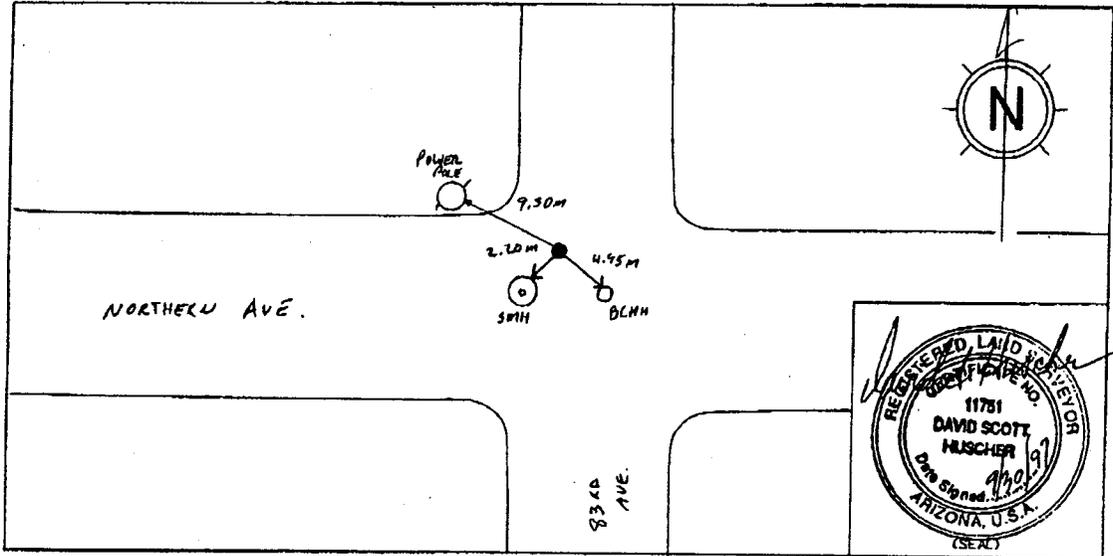
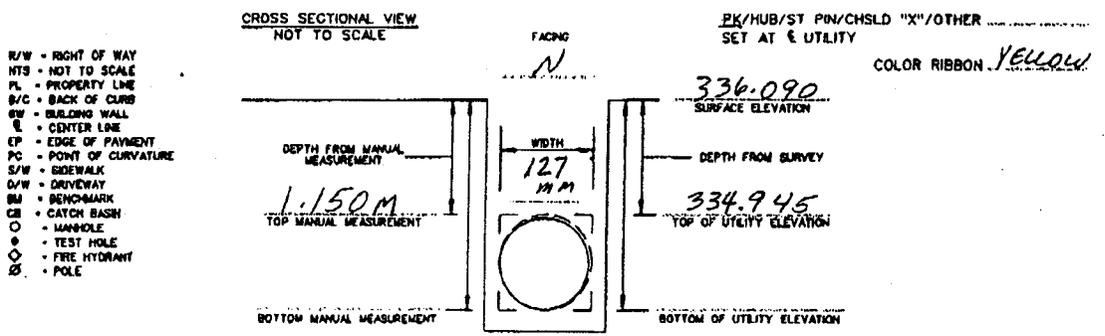
**Geotrack, Inc.**  
 SURVEYORS UTILITY LOCATORS  
 11219 N. 23rd Avenue (602) 331-3225  
 Phoenix, Arizona 85029 FAX (602) 331-8837

GEOTRACK PROJECT NO. 17043  
 CUSTOMER PROJECT NO. FCD 94-12  
 TEST HOLE NO. 19  
 DATE DUG 9-27-97

GENERAL LOCATION N.W. COR. 83RD AVE AND NORTHERN  
 SIZE/TYPE/MATERIAL ANTICIPATED GAS (4")  
 PAVING CONDITION BEFORE WORK ASPHALT RD  
 JURISDICTION MARICOPA COUNTY  
 ELEVATION B.M. 336.015 DESCRIPTION B/M # 4 BCHH NORTHERN AND 83RD AVE  
 ROD READING (+) 1.355  
 H.I. (=) 337.370 B.M. GIVEN/ASSUMED/SURVEYED BY GEOTRACK  
 (-) 1.280 ROD READING AT SURFACE  
 (=) 336.090 ELEVATION AT SURFACE BK/HUB/ST PIN/CHSLD "X"/OTHER  
 (-) 2.425 ROD READING TOP UTILITY  
 (=) 334.945 ELEVATION TOP UTILITY  
 (-) \_\_\_\_\_ ROD READING BOTTOM UTILITY  
 (=) \_\_\_\_\_ ELEVATION BOTTOM UTILITY

CHECK BACK TO B.M. (BREAK SET-UP)  
 SURFACE ELEV. 336.090  
 ROD READING (+) 1.200  
 H.I. (=) 337.290  
 ROD READING B.M.(-) 1.270  
 B.M. ELEV CHECK (=) 336.020

ACCURACY CHECK  
 DEPTH (MEASURED) 1.150 M  
 DEPTH (SURVEYED) 1.145 M  
 DIFFERENCE 0.005 M  
 BOTTOM (MEASURED) \_\_\_\_\_  
 BOTTOM (SURVEYED) \_\_\_\_\_  
 DIFFERENCE \_\_\_\_\_



T.H. DUG 2.1 MRT (L) OF CONST. & 17789.0 NORTHERN AVE  
 DESC & STATION STREET NAME

WAS REQUESTED UTILITY FOUND?  YES NO O.D./TYPE 127 MM WRAPPED STEEL GAS  
 PAVING THICKNESS & TYPE 1.512 MM ASPHALT SOIL TYPE CLAY / ROCKS

REMARKS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# UTILITY LOCATION REPORT

CREW CHIEF J. BIX A. WILLIAMS  
 CREW MEMBERS J. POPPA  
O. CARRERA  
 CHECKED BY: DH

**Geotrack, Inc.**  
 SURVEYORS UTILITY LOCATORS  
 11219 N. 23rd Avenue (602) 331-3225  
 Phoenix, Arizona 85029 FAX (602) 331-8837

GEOTRACK PROJECT NO. 17043  
 CUSTOMER PROJECT NO. FLD 94-12  
 TEST HOLE NO. 20  
 DATE DUG 9-27-97

GENERAL LOCATION W. SIDE OF 83RD AVE STA 0449.3

SIZE/TYPE/MATERIAL ANTICIPATED TELEPHONE

PAVING CONDITION BEFORE WORK OFF RD.

JURISDICTION MARICOPA COUNTY

ELEVATION B.M. 337.354 DESCRIPTION BM #1767 PK. 9 83RD AVE IN CROSS

ROD READING (+) 1.395

M.I. (=) 338.749 B.M. GIVEN/ASSUMED/SURVEYED BY GEOTRACK

(-) 1.705 ROD READING AT SURFACE

(=) 337.044 ELEVATION AT SURFACE PK/HUB/ST PIN/CHSLD "X"/OTHER

(-) 2.550 ROD READING TOP UTILITY

(=) 336.199 ELEVATION TOP UTILITY

(-) \_\_\_\_\_ ROD READING BOTTOM UTILITY

(=) \_\_\_\_\_ ELEVATION BOTTOM UTILITY

ACCURACY CHECK

DEPTH (MEASURED) 0.840 M

DEPTH (SURVEYED) 0.845 M

DIFFERENCE 0.005 M

BOTTOM (MEASURED) \_\_\_\_\_

BOTTOM (SURVEYED) \_\_\_\_\_

DIFFERENCE \_\_\_\_\_

CHECK BACK TO B.M. (BREAK SET-UP)

SURFACE ELEV. 337.044

ROD READING (+) 1.775

M.I. (=) 338.819

ROD READING B.M.(-) 1.465

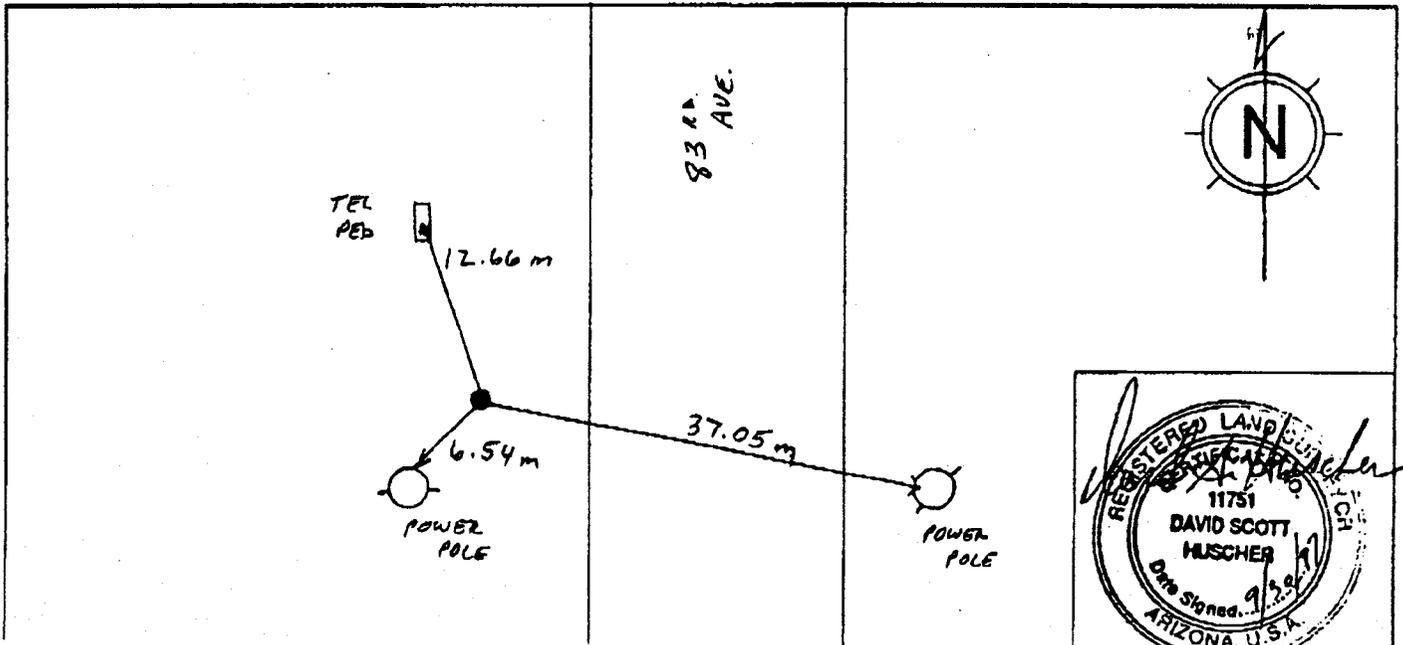
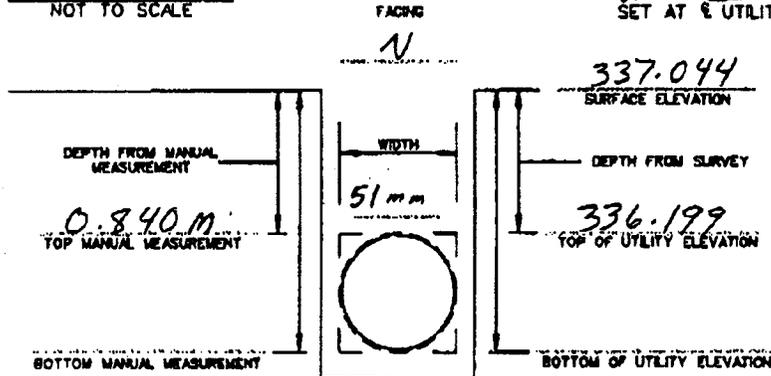
B.M. ELEV CHECK (=) 337.354

CROSS SECTIONAL VIEW  
NOT TO SCALE

PK/HUB/ST PIN/CHSLD "X"/OTHER  
SET AT & UTILITY

COLOR RIBBON ORANGE

- R/W - RIGHT OF WAY
- NTS - NOT TO SCALE
- PL - PROPERTY LINE
- B/O - BACK OF CURB
- BW - BUILDING WALL
- CL - CENTER LINE
- EP - EDGE OF PAVEMENT
- PC - POINT OF CURVATURE
- S/W - SIDEWALK
- D/W - DRIVEWAY
- BM - BENCHMARK
- CB - CATCH BASIN
- - MANHOLE
- - TEST HOLE
- ⊙ - FIRE HYDRANT
- ⊘ - POLE



# UTILITY LOCATION REPORT

CREW CHIEF T. BIX A. WILLIAMS  
 CREW MEMBERS J. POPPOFF  
D. CARRELA  
 CHECKED BY: DK

**Geotrack, Inc.**  
 SURVEYORS • UTILITY LOCATORS  
 11219 N. 23rd Avenue (602) 331-3225  
 Phoenix, Arizona 85029 FAX (602) 331-8837

GEOTRACK PROJECT NO. 17043  
 CUSTOMER PROJECT NO. FLD 94-12  
 TEST HOLE NO. 21  
 DATE DUG 9-27-97

GENERAL LOCATION W. SIDE 83RD AVE STA. 0+411.7

SIZE/TYPE/MATERIAL ANTICIPATED 4" GAS

PAVING CONDITION BEFORE WORK ASPHALT RD.

JURISDICTION MARICOPA COUNTY

ELEVATION B.M. 337.354 DESCRIPTION BM #1767 PK NAIL @ 83RD AVE IN CROSS

ROD READING (•) 1.395  
 H.I. (=) 338.749 B.M. GIVEN/ASSUMED/SURVEYED BY GEOTRACK

(-) 1.450 ROD READING AT SURFACE

(=) 337.299 ELEVATION AT SURFACE PK/HUB/ST PIN/CHSLD "X"/OTHER \_\_\_\_\_

(-) 2.805 ROD READING TOP UTILITY

(=) 335.944 ELEVATION TOP UTILITY

(-) \_\_\_\_\_ ROD READING BOTTOM UTILITY

(=) \_\_\_\_\_ ELEVATION BOTTOM UTILITY

ACCURACY CHECK

DEPTH (MEASURED) 1.360 M

DEPTH (SURVEYED) 1.355 M

DIFFERENCE 0.005 M

BOTTOM (MEASURED) \_\_\_\_\_

BOTTOM (SURVEYED) \_\_\_\_\_

DIFFERENCE \_\_\_\_\_

CHECK BACK TO B.M. (BREAK SET-UP)

SURFACE ELEV. 337.299

ROD READING (•) 1.520

H.I. (=) 338.819

ROD READING B.M.(-) 1.465

B.M. ELEV CHECK (=) 337.354

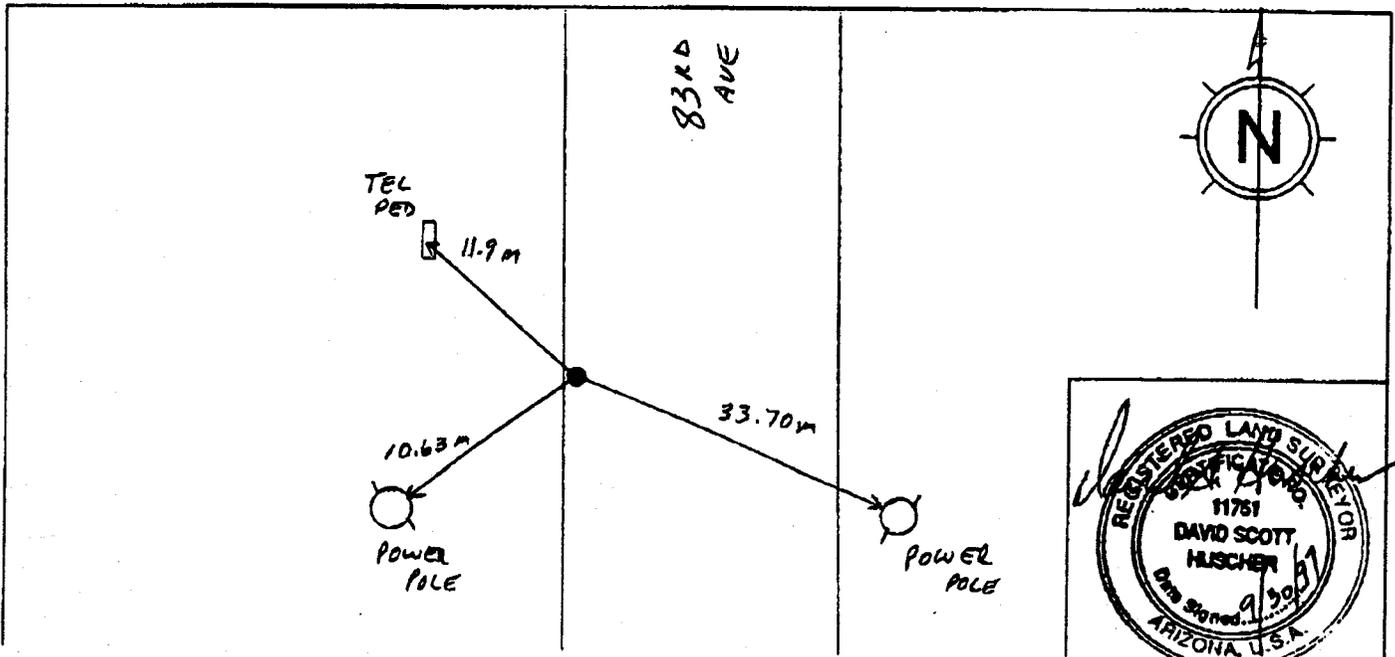
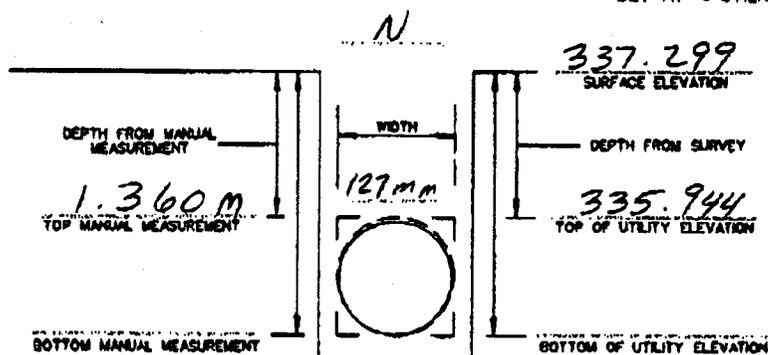
CROSS SECTIONAL VIEW  
 NOT TO SCALE

FACING N

PK/HUB/ST PIN/CHSLD "X"/OTHER \_\_\_\_\_  
 SET AT 6 UTILITY

COLOR RIBBON YELLOW

- R/W - RIGHT OF WAY
- NTS - NOT TO SCALE
- PL - PROPERTY LINE
- B/C - BACK OF CURB
- BW - BUILDING WALL
- CL - CENTER LINE
- EP - EDGE OF PAYMENT
- PC - POINT OF CURVATURE
- S/W - SIDEWALK
- D/W - DRIVEWAY
- BM - BENCHMARK
- CB - CATCH BASIN
- - MANHOLE
- - TEST HOLE
- ◇ - FIRE HYDRANT
- ⊗ - POLE



## MEETING MINUTES

**Date:** September 4, 1997

**Subject:** Storm Drain Alignments

**Attendees:** Scott Buchannan, Stanley Consultants  
Mike Chase, Stanley Consultants  
Bob Maurer, Salt River Project  
Greg, Salt River Project  
Kent McLain, Maricopa County Department of Transportation  
Mike Smith, Maricopa County Department of Transportation  
R.W. Shobe, Flood Control District of Maricopa County  
 Ash Patel, Wood/ Patel  
Fred Schneider, Wood/ Patel

**Re:** Northern & Butler Storm Drains  
FCD Contract 94-12  
WP #94153.02

Wood/Patel gave a brief overview of the project and selected alignment.

The Flood Control District of Maricopa County submitted their plan review comments to Wood/Patel regarding their requested storm drain re-alignment in Northern Avenue. The proposed sewer line shown on the plans will not be constructed as originally anticipated; Therefore, the storm drain will be re-aligned so that it follows the previously proposed sewer alignment by Peoria, which may reduce the potential utility conflicts. The Butler storm drain alignment will be moved south to follow a three (3) meter offset from the northern most utility, which will reduce the right-of-way requirements.

Wood/Patel discussed the utility and alignment conflicts at the intersection of Northern and 83<sup>rd</sup> Avenues. It appears that a clear corridor for the storm drain exists along the north side of Northern Avenue; However, this alignment may conflict with the existing SRP well site and the future traffic signals. Since Stanley Consultants is developing the Northern Avenue roadway plans for Maricopa County Department of Transportation, it was mutually agreed upon that Wood/Patel will end their design 100 meters west of the Northern and 83<sup>rd</sup> Avenues intersection. Stanley Consultants will design from this point to the intersection as part of the roadway project. Wood/Patel will provide Stanley Consultants with pothole information once it has been completed.

Salt River Project stated that they currently have two dead end irrigation drains along the project corridor at 87<sup>th</sup> and 89<sup>th</sup> Avenue alignments. Currently, these lines continue south through private property. SRP requested that these irrigation lines be connected to the Northern Avenue storm drain to eliminate this problem. SRP stated that the two pipes have a maximum combined discharge of 8 to 10 cfs. SRP also has an irrigation line at the 84<sup>th</sup> Avenue alignment which connects to an existing Roosevelt Irrigation District (RID) concrete

lined ditch. This ditch carries SRP tailwater to the west. Currently, SRP has been performing the required maintenance for RID. SRP requested that this facility be connected to the Northern Avenue storm drain also. SRP stated that pipe/irrigation ditch has a maximum discharge of 8 to 10 cfs.

Wood/Patel stated that a review of hydraulics will be required for the proposed storm drain in Northern Avenue. The review will result in an understanding as to whether the proposed pipe will have adequate capacity to handle the additional flow (16 to 20 cfs) from the SRP facilities. Wood/Patel will report their findings to R.W. Shobe and SRP.

As discussed with FCDMC, Wood/Patel's contract is for 16 potholes and 21 potholes were identified as being required. FCDMC stated that the additional 5 potholes will be coordinated by Wood/Patel but, that the actual locating will be performed by FCDMC's on call locating service.

cc: All attendees.

# WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

Wood, Patel & Associates, Inc.  
1550 East Missouri, Suite 203  
Phoenix, Arizona 85014  
(602) 234-1344  
FAX 234-1322

# LETTER OF TRANSMITTAL

DATE	9/3/97	JOB NO.	94153.02
ATTENTION	R. W. Shobe P.E.		
RE:	SRP Easement Northern/Orangewood Project		

to FDIAC

WE ARE SENDING YOU  Attached  Under separate cover via \_\_\_\_\_ the following items:

- Shop drawings
- Prints
- Plans
- Samples
- Specifications
- Copy of letter
- Change order
- \_\_\_\_\_

COPIES	DATE	NO.	DESCRIPTION
1	JUN 24		SRP'S Draft - Licence Agreement with Peoria

THESE ARE TRANSMITTED as checked below:

- For approval
- For your use
- As requested
- For review and comment
- FOR BIDS DUE \_\_\_\_\_ 19 \_\_\_\_\_
- Approved as submitted
- Approved as noted
- Returned for corrections
- \_\_\_\_\_
- Resubmit \_\_\_\_\_ copies for approval
- Submit \_\_\_\_\_ copies for distribution
- Return \_\_\_\_\_ corrected prints
- PRINTS RETURNED AFTER LOAN TO US

REMARKS \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

COPY TO \_\_\_\_\_

SIGNED: [Signature]



# FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

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

## COVER SHEET

TO: Ash Patel

Company or Department: Wood, Patel & Assos. Inc. Fax # 234-1322

FROM: RW Shobe

Number of pages being sent including Cover Sheet: 5

Comments: Please find herewith the remainder of the District's review comments for the Northern AVE. S.D. 30<sup>th</sup> submittal. If you have any questions please call.

August 27, 1997

To: R.W. Shobe

From: Olin S. Sutton, Jr.

Subject: Northern Avenue and Butler Drive Storm Drain Pothole Summary

1. Plans should be calling out all pipe material.
2. ~~Twenty~~ potholes have been identified, 16 will be paid through the consultant contract, the 4 remaining will be paid through the District's pothole contract.

Page 4 - Butler Drive

Telephone	491.0	No pothole	
• Telephone	493.8	(1) pothole	
33" Sanitary Sewer	496.2	No pothole	Rim and invert of 1st m/h north of storm drain.
• 12" water	505.8	(2) pothole	Identify material of pipe.
• 10" Sanitary Sewer	507.5	No pothole	Note rim and invert of north and south m/h.
Power	509.5	No pothole	

Page 5 - Butler Drive

• Power	591.5	(3) pothole
• Telephone	599.0	(4) pothole
• Power	728.5	(5) pothole

Page 6 - Butler Drive

(10) New storm drain manhole should be deleted - need justification.

• Telephone	886.6	(6) pothole	
• Power	891.7	(7) pothole	
10" Sanitary Sewer	903.6	No pothole	Rim and invert of manhole
8" Water	907.0	No pothole	Elevation of valve
8" Water	912.0	No pothole	
• Power	912.0	(8) pothole	

Page 7 - Butler Drive

10" Sanitary Sewer	1+295.0	No pothole	Rim and invert elevation
8" Water	1+295.0	No pothole	Elevation of valve
• power/Telephone	1+295.0	(9) Pothole	

Page 8 - Northern Avenue

- 60" Storm Drain 291.4 (10) Pothole
- 16" Gas 320.0 ~~(No)~~ pothole Storm drain will be moved south.

Page 9 - Northern Avenue

- 8" Sanitary Sewer 459.0 (12) Pothole
- 24" Irrigation 591.5 ~~(No)~~ Alignment moving south. }? No.
- 30" Irrigation 600.8 No pothole
- Telephone 613.2 No pothole
- 24" Irrigation 653.5 Elevation from open ends of ditch.
- Electric 589.5 No pothole
- 16" Gas 590.5 (13) Pothole ?
- 14" Pressure sewer 590.5 No pothole
- (Abandoned)
- Telephone 590.5 No pothole
- 12" Water 590.5 No pothole

Delete

- ⑧ Manhole should be moved >5 feet west.
- ⑥ New storm drain man hole should be moved >10 feet either way to miss 24"SS.

Page 10 - Northern Avenue

Clear

Page 11 - Northern Avenue

- 24" Irrigation 1+007.5 (14) Pothole
- 2" Water 1+102.2 No pothole
- 14" Pressure Sewer 1+160.5 No pothole
- (Abandoned)
- 36" Irrigation 1+180.5 No pothole - elevation of ditches.

Page 12 - Northern Avenue

- 16" Gas 1+384.0 (15) Pothole
- 2" Water 1+395.5 No pothole
- Telephone 1+396.9 No pothole
- 16" Gas 1+401.5 No pothole

Page 13 - Northern Avenue

	12" Water	1+764.5	No pothole
WD	• Electric	1+779.5	(16) Pothole
	2" Gas	1+782.5	No pothole
WD	• Telephone	1+783.8	(17) Pothole
	18" sanitary Sewer	1+787.5	No pothole
	12" Water	1+789.0	No pothole
WD	• 4" Gas	1+789.0	(18) Pothole at junction of 4" and 2" Gas
	2" Gas	1+792.0	No pothole
	24" Irrigation	1+805.0	No pothole
	24" Irrigation/ 18" Sanitary Sewer	1+787.3	No pothole - Run elevation from two open ends. Rim and invert elevations.

Page 18 - 83rd Avenue

	18" Sanitary Sewer	409.3	No pothole - rim and invert elevation.
WD	• Telephone	409.3	(19) Pothole
WD	• 4" Gas	411.7	(20) Pothole
	4" Water	415.6	No pothole
	16" Water	415.6	No pothole
	24" Irrigation	418.5	No pothole
	4" Gas	524.0	No pothole
	18" Sanitary Sewer	524.0	No pothole
	Telephone	524.0	No pothole
	6" Water	540.3	No pothole
	• 4" Gas	555.0	(21) Pothole
	18" Sanitary Sewer	555.0	No pothole
	Telephone	555.0	No pothole
	4" Water	555.0	No pothole
	16" Water	555.0	No pothole
	8" Water	555.0	No pothole

**FLOOD CONTROL DISTRICT  
OF  
MARICOPA COUNTY  
INTEROFFICE MEMORANDUM**

**TO:** R.W. Shobe, Project Management

**FROM:** Laurence Spanulescu, Civil Engineering Specialist

**DATE:** July 24, 1997

**SUBJECT:** Northern/Orangewood Storm Drain Project  
Contract FCD 94-12, Phase II  
Northern & Butler S.D., Sub-Phase "A" 30% submittal

- Include in bid quantities fence and landscaping replacement at outfall channel or any other location that might be the case.
- Include notes in reference to trees or structures to be protected in place if any.

Darrel E. Wood, P.E., R.L.S.  
Ashok C. Patel, P.E., R.L.S.  
James S. Campbell, P.E.  
Gordon W. R. Wark, P.E.  
Thomas R. Gettings, R.L.S.  
Duane M. Hunn, P.E.  
Scott A. Nelson, R.L.S.  
Willie J. Kates, Jr., R.L.S.  
Anthony J. Regis, P.E.  
Richard L. Hiner, P.E.  
Fredrick K. Schneider, P.E.  
William H. Thompson, P.E.  
Timothy A. Huval, P.E.  
Michael J. Sexton, R.L.S.  
Bruce Friedhoff, P.E.

July 8, 1997

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

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

Re: **Northern/Orangewood Storm Drain Project**  
Contract FCD 94-12 Phase II  
Northern & Butler Storm Drains, Sub-Phase "A"  
WP #94153.02

Dear Mr. Shobe:

We are pleased to submit this data package in conjunction with the 30% plan submittal for the referenced project. The package includes:

- Full size set of plans (blueprints) - 6 sets
- Half size set of plans (photocopy) - 2 sets
- Design Documentation Summary (Report) - 6 sets
- Geotechnical Report by Ricker, Atkinson, McBee - 5 sets
- Geotechnical Report by Huntingdon Engineers - 5 sets

Please note that the 30% review response meeting is scheduled with your office on August 13, 1997 at 9:00 a.m. You may want to inform the appropriate agencies (e.g., City of Peoria, MCDOT, etc.) about the review response dead lines as well as the August 13, 1997 meeting.

Please feel free to call if you have any questions.

Sincerely,

**WOOD, PATEL & ASSOCIATES, INC.**

Ashok C. Patel, P.E., R.L.S.  
Project Manager

ACP/djp

Enclosures

GENCOR\94153-02.J07



WOOD/PATEL

fax transmittal

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PAGE 1 OF 1

DATE: 9/13/97

TIME:

TO: John Felty

FAX NO: 236-8193

COMPANY:

SRP

FROM: James Tallon

JOB NO.: 94153

PROJECT: Northern/Orangewood Storm Drain

COMMENTS:

John,

We are interested in determining the status of the license Agreement between SRP & the City of Peoria for the proposed storm drain between 83<sup>rd</sup> & 85<sup>th</sup> Avenues north of Northern Ave.

Please call me so we can discuss this issue.

Thank You.

James Tallon

copy to:

hard copy to follow in mail



# City of Peoria

8401 West Monroe Street, Peoria, Arizona 85345

June 5, 1997

Mr. Ashok Patel  
Wood, Patel & Associates  
1550 E. Missouri #203  
Phoenix, Az. 85014

RECEIVED

JUN 06 1997

WOOD, PATEL &  
ASSOCIATES

Re: Northern/Orangewood Storm Drain, SS-8803, 9701

Dear Ash:

Enclosed for your use are reduced copies of the preliminary plats for the Butler Place and Summerset Village subdivisions. As these subdivisions are processed for final plat and construction drawing plan approval, I will ensure that copies are forwarded to you. Also, for your information I will be sending copies of the preliminary plats to the District.

Should you have any questions, feel free to contact me at 412-7210.

Sincerely,

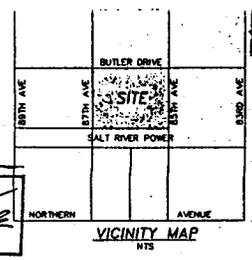
A handwritten signature in cursive script, appearing to read "Dan Nissen".

Dan Nissen, P.E.  
Assistant City Engineer

Enclosures

i:\letters\june97\northern

PRELIMINARY PLAT  
FOR  
**BUTLER PLACE**  
A PORTION OF THE SOUTHEAST  
1/4 OF SECTION 34, TOWNSHIP  
3 NORTH RANGE 1 EAST, GILA &  
SALT RIVER BASE & MERIDIAN,  
MARICOPA COUNTY, ARIZONA



PLANNING & SURVEYING COMMISSION  
By: *[Signature]*  
DATE: 10/1/96  
SCALE: AS SHOWN

**DEVELOPER**  
J.C. CONTINENTAL  
815 E. MIDWAY SCHOOL RD #107  
SCOTTSDALE, ARIZONA  
PHONE (602) 994-8533  
FAX (602) 944-4754

**ENGINEER**  
AMERICAN ENGINEERING CO.  
21442 N 20TH AVENUE  
PHOENIX, ARIZONA 85027  
PHONE (602) 582-0280  
FAX (602) 582-0253

**BENCHMARK**  
5C IN 1/4 AT THE INTERSECTION  
OF 31ST AVENUE AND  
NORTHERN AVENUE  
ELEVATION = 1094.807  
CITY OF PEORIA DATUM

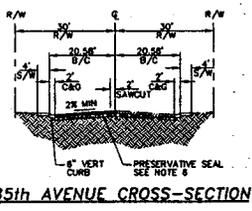
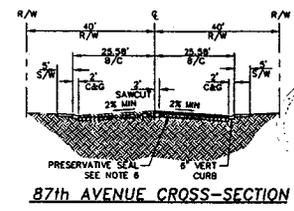
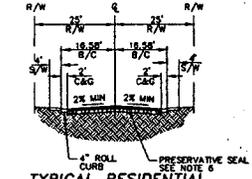
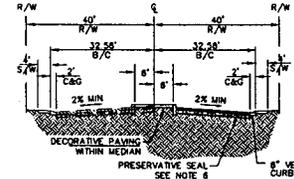
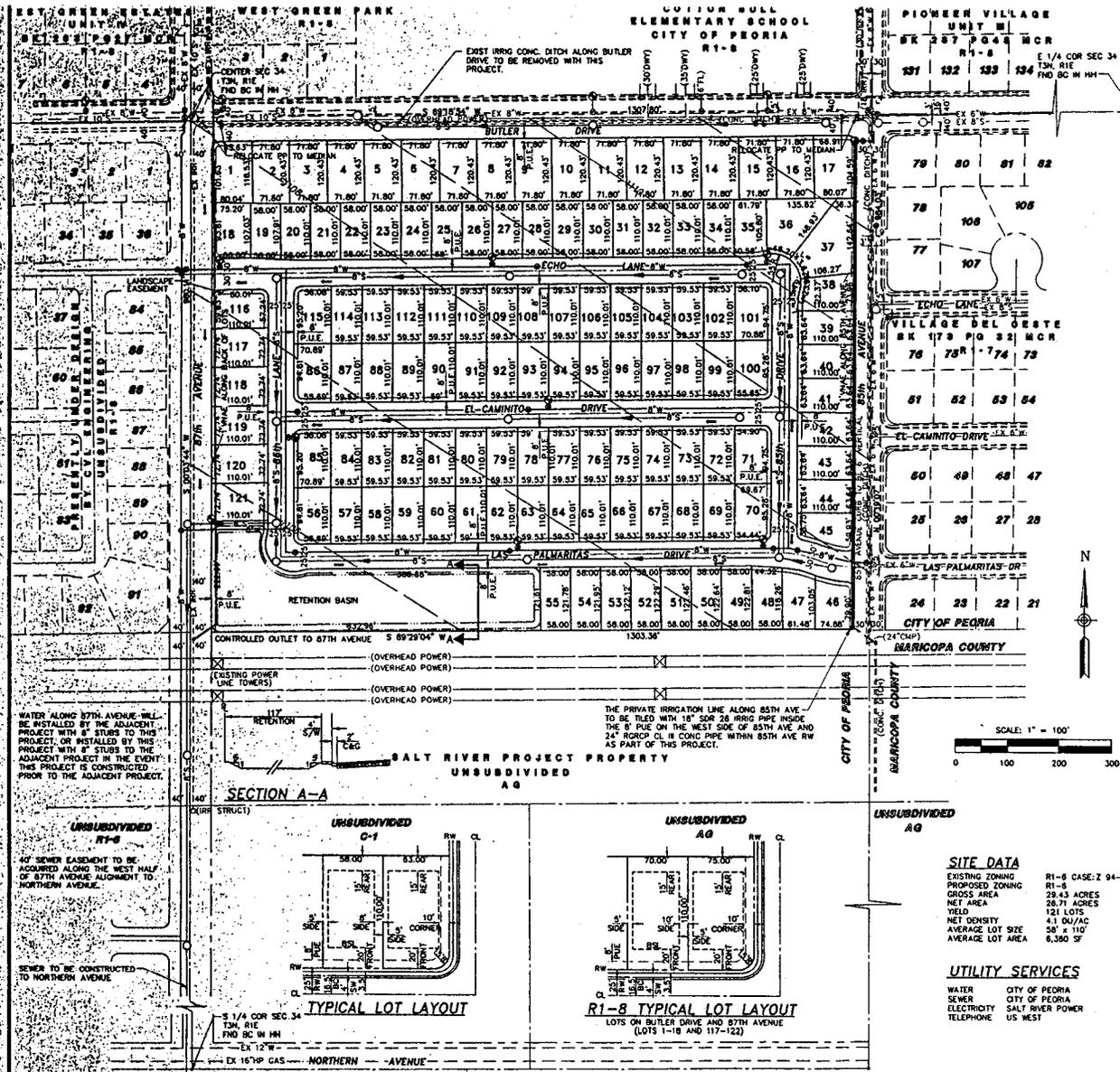
**LEGAL DESCRIPTION**  
THE NW 1/4 OF THE SE 1/4 OF SECTION 34, T34N, R1E OF THE GILBERT  
EXCEPT THE SOUTH 330 FEET THEREOF, AND THE EAST 33 FEET OF THE SW 1/4 OF THE SE 1/4 OF SAID SECTION 34 EXCEPT THE SOUTH 40 FEET THEREOF

**LEGEND**

- — — — — EXISTING WATERLINE
- — — — — EXISTING WATER VALVE
- — — — — EXISTING FIRE HYDRANT
- — — — — EXISTING SEWERLINE
- — — — — EXISTING SEWER MANHOLE
- 1520 — — — — — EXISTING TOPO (PER USGS)
- — — — — PROPOSED WATERLINE
- — — — — PROPOSED WATER VALVE
- — — — — PROPOSED FIRE HYDRANT
- — — — — PROPOSED SEWERLINE
- — — — — PROPOSED SEWER MANHOLE

**NOTES:**

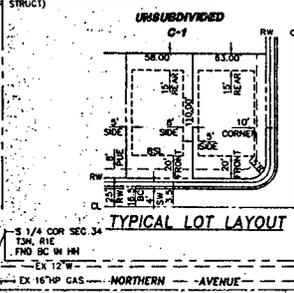
1. SEWER WILL NEED TO BE CONSTRUCTED TO EXISTING 24" SEWER LINE IN NORTHERN AVENUE OR THRU THE ADJACENT PROJECT TO NORTHERN AVENUE.
2. THE DEVELOPER WILL COORDINATE THE BUTLER DRIVE IMPROVEMENTS WITH THE PEORIA UNIFIED SCHOOL DISTRICT.
3. THE DEVELOPER WILL FORM A STREETLIGHT IMPROVEMENT DISTRICT FOR THIS SUBDIVISION.
4. THE PRESERVATIVE SEAL WILL BE APPLIED BY THE CITY OF PEORIA 1 YEAR AFTER COMPLETION OF STREETS. THE DEVELOPER WILL PROVIDE FUNDS TO THE CITY FOR THIS PURPOSE AT \$0.21/SY.
5. THE DEVELOPER WILL COORDINATE THE POWER POLE RELOCATIONS WITH SFP AND THE CITY OF PEORIA.
6. ALL ROOFS (WITH THE EXCEPTION OF PATIO COVERS) SHALL BE T&E.
7. NO ROOF MOUNTED MECHANICAL EQUIPMENT SHALL BE ALLOWED.
8. BUILDING EXTERIORS SHALL BE STUCCO AND/OR STUCCO AND BRICK.
9. EACH HOME SHALL HAVE A LANDSCAPE DESIGN PACKAGE FOR THE FRONT YARD INCLUDED IN THE PURCHASE PRICE OF THE HOME AND WILL BE INSTALLED BY THE HOME BUILDER.
10. ALL FENCING, WHICH INCLUDES REAR AND SIDE YARD FENCING, SHALL BE CONCRETE MASONRY BLOCK. NO CHAIN LINK OR WOOD FENCING WILL BE ALLOWED WHERE VISIBLE TO NEIGHBORING PROPERTIES.
11. TRACTS AND RETENTION BASINS WILL BE OWNED AND MAINTAINED BY A HOMEOWNERS ASSOCIATION FORMED BY THE DEVELOPER.
12. ADJACENT STREET RIGHT-OF-WAY WILL BE MAINTAINED BY A HOMEOWNERS ASSOCIATION.



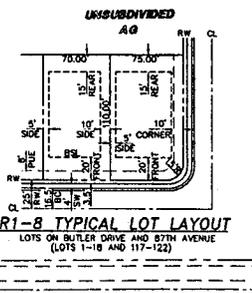
**SITE DATA**  
EXISTING ZONING R1-8 CASE:Z 94-10  
PROPOSED ZONING R1-8  
GROSS AREA 28.43 ACRES  
NET AREA 26.71 ACRES  
YIELD 121 LOTS  
NET DENSITY 4.1 DU/AC  
AVERAGE LOT SIZE 58' x 110'  
AVERAGE LOT AREA 6,300 SF

**UTILITY SERVICES**  
WATER CITY OF PEORIA  
SEWER CITY OF PEORIA  
ELECTRICITY SALT RIVER POWER  
TELEPHONE US WEST

**SECTION A-A**



**RI-8 TYPICAL LOT LAYOUT**



**AMERICAN ENGINEERING CO.**  
consulting engineers/surveyors



RESIDENTIAL BUTLER PLACE OCT. 1, 1996 AEC #96043

**SUMMERSET VILLAGE**

**LEGAL DESCRIPTION:**

THE E. 1/2 OF THE S.W. 1/4 SECTION 34,  
T. 3 N., R. 1 E., G. & S. R. B. M.,  
MARICOPA COUNTY, ARIZONA.

**BENCHMARK**

BRASS CAP IN HANDHOLD AT THE  
INTERSECTION OF 91ST AVENUE AND  
NORTHERN AVENUE. ELEVATION-  
1094.807 (CITY OF PEORIA DATUM)

**PREPARED FOR:**

DITZ-CRANE  
3612 N. DUNLAP AVENUE  
PHOENIX, ARIZONA 85051  
(602) 973-8632  
(602) 973-2258 (FAX)  
CONTACT:

**PREPARED BY:**

COE & VAN LOO  
4550 NORTH 12TH STREET  
PHOENIX, ARIZONA 85014  
(602) 264-6831  
(602) 264-0928 (FAX)

**LEGEND:**

- EXISTING CONTOUR ----- 1000-
- EXISTING WATER ----- W
- EXISTING SEWER ----- S
- PROPOSED WATER ----- W
- PROPOSED SEWER ----- S
- PROPOSED VALVE ----- ⊙
- PROPOSED MANHOLE ----- ○
- PROPOSED CLEANOUT ----- ⊙
- FIRE HYDRANT ----- ⊕
- SURFACE DRAINAGE ----- -
- SIGHT VISIBILITY LINE ----- -

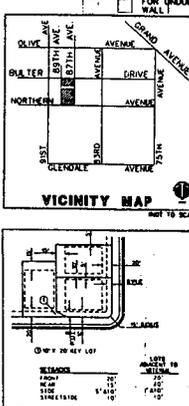
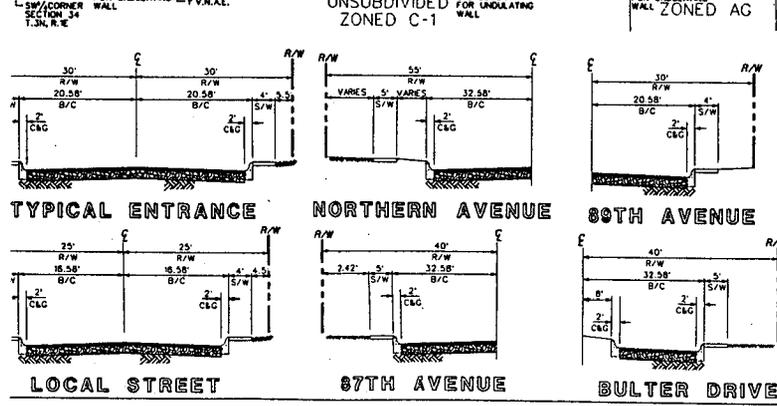
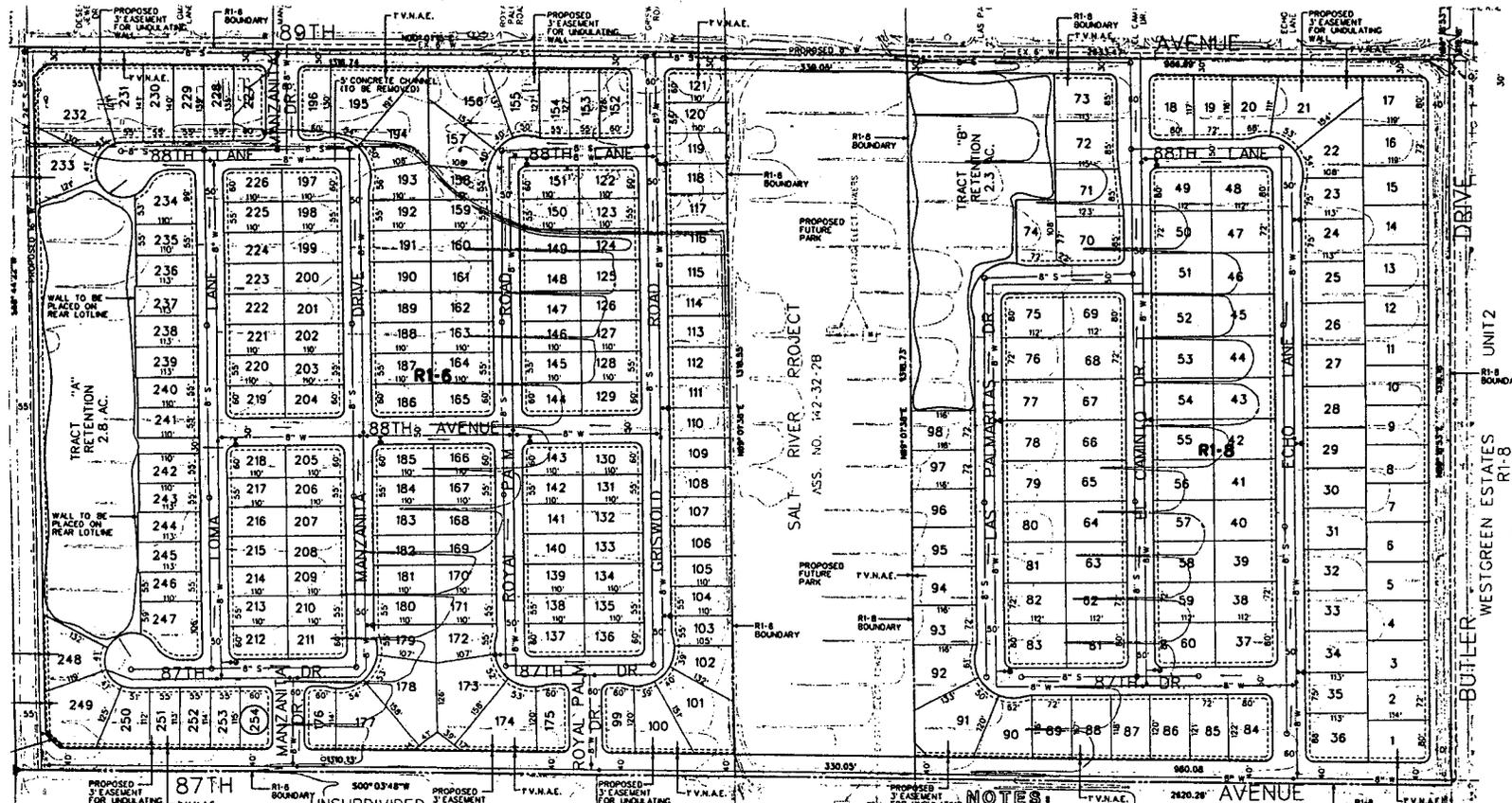
**SITE DATA:**

APPROVED  
DATE 07/18/03  
DRAWN BY [Signature]  
CHECKED BY [Signature]  
DATE 07/18/03

PLANNING & ZONING COMMISSION  
APPROVED  
DATE 07/18/03  
DRAWN BY [Signature]  
CHECKED BY [Signature]  
DATE 07/18/03

EXISTING ZONING  
PROPOSED ZONING  
GROSS AREA 69.51 AC.  
NET AREA EXCLUDING INTERNAL ROAD 63.07 AC.  
MIN LOT SIZE 55' X 110'  
YIELD 254 LOTS  
DENSITY 4.03 DU/AC  
WATER CITY OF PEORIA  
SEWER CITY OF PEORIA  
GAS SOUTHWEST PROJECT  
ELECTRIC SALT RIVER PROJECT  
TELEPHONE U.S. WEST

P96-03  
JUN 18 1996  
RECEIVED  
Planning & Zoning Dept.



**NOTES:**

NO STRUCTURE OF ANY KIND IS TO BE CONSTRUCTED WITHIN THE DRAINAGE EASEMENT WHICH WOULD AFFECT THE FLOW OF WATER OVER, UNDER OR THROUGH THE EASEMENT OR AREA. LANDSCAPING IS ALLOWED AS APPROVED BY THE CITY OF PEORIA D.S.D. LANDSCAPE ARCHITECT. THE CITY OF PEORIA MAY BE SO DESIRED CONSTRUCT AND/OR CONSTRUCTION OR RECONSTRUCTION OF CITY UTILITIES.

ALL EASEMENTS ARE SUBORDINATE TO DRAINAGE EASEMENTS.

ALL NEW OR RELOCATED UTILITIES WILL BE PLACED UNDERGROUND.

AN ASSOCIATION, INCLUDING ALL PROPERTY OWNERS IN THE DEVELOPMENT, WILL BE FORMED AND HAVE RESPONSIBILITY FOR MAINTAINING ALL COMMON AREAS TO BE NOTED AS "TRACTS" OR EASEMENTS, INCLUDING LANDSCAPED AREAS AND DRAINAGE FACILITIES IN ACCORDANCE WITH APPROVED PLANS.

STRUCTURES AND LANDSCAPING AT THE INTERSECTIONS OF STREET RIGHT-OF-WAY WILL BE MAINTAINED AT 3" IN HEIGHT WITH A TRIANGLE MEASURED 33' ALONG A MAJOR STREET AND 15' ALONG A LOCAL STREET.

ANY LIGHTING WILL BE PLACED SO AS TO DIRECT THE LIGHT AWAY FROM ADJACENT RESIDENTIAL DISTRICTS AND WILL NOT EXCEED ONE FOOT CANDLE AT THE PROPERTY LINE. NO MOISTURE, ODOOR OR VIBRATION WILL BE EMITTED SO THAT IT EXCEEDS THE GENERAL LEVEL OF MOISTURE, ODOOR OR VIBRATION EMITTED BY USES OUTSIDE OF THE SITE.

AN 8" SOLID BARRIER TO BE CONSTRUCTED ON NORTHERN AVENUE FRONTAGE TO MITIGATE TRAFFIC NOISE.

OWNERS OF PROPERTY ADJACENT TO PUBLIC RIGHT-OF-WAY WILL HAVE THE RESPONSIBILITY FOR MAINTAINING ALL LANDSCAPING WITHIN THE RIGHTS-OF-WAY IN ACCORDANCE WITH APPROVED PLANS.

TWO PARKING SPACES WILL BE PROVIDED PER DWELLING UNIT.

BUILDING HEIGHT - 2 STORES OR 30'.

DEVELOPMENT AND USE OF THIS SITE WILL CONFORM TO ALL APPLICABLE CODES AND ORDINANCES.

DECORATIVE PAVING TO BE INSTALLED IN THE MEDIAN FOR BUTLER DRIVE AS PART OF THE IMPROVEMENTS FOR THIS SUBDIVISION.

\*DESIGN OF THIS PROJECT IS BASED ON THE APPROVED PRELIMINARY



P96-03  
SHEET  
1 OF 1  
CVL #960006

CLIENT

JOB # 94153.02

CONTACT

PROJECT Northern/Orangewood Phasett A

SUBJECT

DATE 3/25/97

Stanley Eng.  
Scott Buchanan, Ash, Jones

Trunk line in Northern 91<sup>st</sup> to 83<sup>rd</sup> by Wood/Patel  
Catch Basins & laterals in this area by Stanley.  
Wood/Patel will stub out for laterals  
Wood/Patel & Stanley will need to coordinate datum &  
stationing with Stanley.  
Stanley will have equation for WP Sta & Stanley Sta.

W/P indicated that Catch basins need to be designed  
for full year flows based on W/P hydrology for  
Northern/Orangewood.

W/P will provide Scott with a copy of Dec-2 2 years &  
schematic. W/P will also send a letter to FCDMC Re:  
this meeting with recommended approach CC to Stanley.

WOOD/PATEL

fax transmittal

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PAGE 1 OF 2

DATE: 3/24/97

TIME:

TO: John Palmieri

FAX NO: 506-4601

COMPANY:

FCDMG

FROM: James Taillon

JOB NO.: 94153.02

PROJECT: Northern/Orangewood

COMMENTS:

John,

Attached is a copy of the Temporary Use License for SRP Transmission Corridor between 83<sup>rd</sup> & 85<sup>th</sup> Ave for your file.

Thank you,

James

copy to:

hard copy to follow in mail

FAX TRANSMITTAL

WOOD/PATEL  
ASSOCIATES

Civil Engineers  
Hydrologists  
Land Surveyors

PAGE 1 OF 2

DATE: 3/7/97

TIME:

TO: Bob Schaefer

COMPANY: SRP

FAX NO.: 236-8193

FROM: James Taillon

PROJECT: Northern Orangewood

JOB NO.: 9415302

SUBJECT: Permission to do Soil Borings

COMMENTS:

Bob,

Attached is a sketch showing 2 boring locations  
within SRP Transmission Line Corridor. As shown,  
the borings will be made @ approximately 10'  
north of the South TB.

Please let me know if you require any additional  
information for this permit.

Thank you,

James Taillon

HARD COPY TO FOLLOW IN MAIL

CC: File





FAX TRANSMITTAL

**WOOD/PATEL  
ASSOCIATES**

Civil Engineers  
Hydrologists  
Land Surveyors

PAGE 1 OF 5

DATE: 2/20/97

TIME:

TO: Hedy Hall

COMPANY: FCDMC

FAX NO.: 500-4001

FROM: James Taillon

PROJECT: Northern/Orangewood Ph. 2A      JOB NO.: 94153.02

SUBJECT: Right of Way / Property Access

COMMENTS: Hedy,

As discussed yesterday, certain Rights of Way and property access permission will be required for Phase II A.

The following sheets show these requirements based on current Assessors Map Information:

Please let me know if you have any questions.

Thank You,

James Taillon

HARD COPY TO FOLLOW IN MAIL

CC: R.W. Stobe

PROJECT Northern/OrangeWood ①  
PROJECT No. 94153.02 SHEET No. \_\_\_\_\_ OF \_\_\_\_\_  
CALCULATED BY JGT DATE 7/20/97 CHECKED BY \_\_\_\_\_ DAT \_\_\_\_\_

Street 2: It will be necessary to acquire right of way on the South side of Butler Drive between 87<sup>th</sup> and 89<sup>th</sup> Drive. There will also be a soil boring taken within this reach.

Street 3: It will be necessary to acquire right of way on the South side of Butler Drive Alignment between 91<sup>st</sup> Ave & the Agua Fria Freeway Outfall channel. There will also be a soil boring taken within this reach.

Street 4: There will be approximately seven borings taken within the SRP Transmission Line Corridor and the proposed Peoria Basin.

Please let us know when the agricultural areas where proposed Soil Borings are located will be fallow. In this way, we may be able to minimize disturbance.

Within the SRP Transmission Line Corridor, it will be necessary to acquire permission for surveying & soil boring. It will also be necessary to acquire an agreement from SRP for Construction & Maintenance of facilities within this Corridor.







Darrel E. Wood, P.E., R.L.S.  
Ashok C. Patel, P.E., R.L.S.  
James S. Campbell, P.E.  
Gordon W. R. Wark, P.E.  
Jeffrey J. Holzmeister, P.E.  
Thomas R. Gettings, R.L.S.  
Duane M. Hunn, P.E.  
Scott A. Nelson, R.L.S.  
Jonathon W. Stansel, P.E.  
Willie J. Kates, Jr., R.L.S.  
Anthony J. Regis, P.E.  
Richard L. Hiner, P.E.  
Fredrick K. Schneider, P.E.  
William H. Thompson, P.E.  
David E. Lucas, R.L.S.  
Timothy A. Huval, P.E.

**MEETING MINUTES****Date:** February 19, 1997**Subject:** Project Kick Off Meeting**Attendees:** R.W. Shobe, Flood Control District of Maricopa County  
Pedro Calza, Flood Control District of Maricopa County  
Fred Fuller, Flood Control District of Maricopa County  
Maximo Devera, Flood Control District of Maricopa County  
Hedy Hall, Flood Control District of Maricopa County  
Ash Patel, Wood/Patel  
James Taillon, Wood/Patel

JGT

**Re:** Northern Orangewood Design Subphase "A"  
FCD Contract 94-12, Phase II  
WP #94153.02**City of Peoria Storm Drain**

Wood/Patel gave a brief overview of the project and indicated that for this phase they will need access permission for surveying and soil borings within the SRP corridor, on Butler Avenue west of 91st Avenue and within the AFF channel. Wood/Patel also suggested that the FCDMC should begin the right-of-way acquisition for all three phases of this project as soon as possible using the recommended alignments from the concept/routing study. FCDMC stated that MCDOT, in conjunction with the City of Peoria, is going to improve 83rd Avenue between Northern and Olive Avenues. These improvements will include storm drains.

The City of Peoria basin will remain on the north end of the site as shown on the recommended concept routing report. With this configuration, any excess land will have frontage along Northern Avenue and may be made available for resale.

**Hydraulics**

Wood/Patel requested input from FCDMC regarding the design of catch basins in this phase. Future laterals which will contribute to this system are the responsibility of the City of Peoria. The concern is whether or not the catch basins constructed with this project should be designed taking future laterals into account. If so, the catch basins installed with this project will be undersized until the laterals are built. If not, when the future laterals are constructed, the oversized catch basins installed with this project may adversely impact the capacity of the new laterals in large runoff events. Pedro will review this issue and let Wood/Patel know.

Utilities/Geotech

Wood/Patel provided a set of plans indicating the soil boring locations for this phase. Utility pot holing requests will be made to the FCDMC after Wood/Patel reviews potential conflicts with the storm drain mainline and the number and locations of catch basin laterals have been determined. Also, where pot holing is required in agricultural fields, the FCDMC property management department will find out when the fields are fallow in order to minimize disturbance to the lessee.

Scheduling

The schedule as presented will be revised for a 365 day project length per R.W. Shobe. This will allow for an additional submittal and review at 60% project completion and will match the scope of work previously outlined. The Cities of Peoria and Glendale will also review all submittals.

Partnering

There is a concern that with three reviewing agencies and input from several others the review time may tend to exceed the time allotted. It was suggested for the FCDMC to consider partnering. This will allow for an understanding of the scope of work by all the agencies involved and will allow the FCDMC to obtain firm commitments regarding review times. R.W. Shobe will check into the potential for funding of the partnering.

cc: Attendees

MEMOS\94153-02.F19