Floodplain Analyses and Drilling Reports for Camps Barkeley, Bowie, Mabry, Maxey, and Swift and Fort Wolters

Interim Report

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CONTENTS

FIGURES

INTRODUCTION

The Bureau of Economic Geology (BEG) is conducting hydrologic and hydrogeologic studies of Texas National Guard training facilities at Camps Barkeley, Bowie, Mabry, Maxey, and Swift and Fort Wolters. These investigations, in conjunction with aquatic and biological surveys conducted by the Texas Parks and Wildlife Department, will provide information needed by the Texas National Guard to plan training and preparedness activities such that environmental resources will be protected and enhanced without compromising national security readiness.

This report presents interim results on floodplain analysis and drilling activities. Floodplain analysis results include 100-yr rainfalls, 100-yr flood hydrographs at camp and fort outlets, and maps of the 100-yr floodplain at each training facility. Our drilling results include well schematics, well schedules, and location maps.

Results are reported in 6 sections with each section discussing the drilling reports and floodplain mapping for an individual training facility. The methods section contains details about the procedures used to drill and complete the wells and map the floodplains.

METHODS

FLOODPLAIN ANALYSIS

Floodplain analysis involves determining the area adjacent to a river or stream that will flood for a specified return period (for example, a 100-year flood). The standard procedure is to determine the 100-yr flood at key points on the stream and use backwater computation to determine stages upstream (Linsley and others, 1982, p. 452). If available, the 100-yr flood is determined from stream-gage record. However, this data is typically lacking and regional frequency methods or loss rate and unit hydrograph applied to the 100-yr rainfall can be used (Linsley and others, 1982, p. 452). Because most of the camps lack stream-gage records, we used the loss rate and unit hydrograph method to estimate the 100-yr floodplain.

Our floodplain analysis consisted of (1) designing 100-yr 24 hr synthetic storms, (2) determining the 100-yr flood hydrographs at strategic points in the watersheds, (3) determining 100-yr flooding surfaces, and (4) mapping the 100-yr floodplains on 1:2400 USGS topographic maps.

To design the 100-yr 24 hr synthetic storms, we first used maps published by the U.S. Weather Bureau (Herschfield, 1961 as shown in Chow, 1964, p. 9-56) to determine the 100-yr 24 hr rainfall for each camp and fort. We then used these rainfall rates with the SCS Type II distribution (Bedient and Huber, 1988) to generate the storms.

To determine the 100-yr flood hydrographs, we used HEC-1 (Hydrologic Engineering Center, 1981) with SCS unit hydrographs (Soil Conservation Service, 1957) and Muskingum routing (McCarthy, 1938). Input to HEC-1 included: sub-basin drainage area, runoff curve numbers, basin lag, routing storage coefficient, and routing weight factor. Runoff curve numbers are used to define the unit hydrographs and are a function of soil type, vegetation, land use, antecedent moisture, and the hydrologic properties of the catchment surface. Basin lag, also called catchment lag, is the elapsed time, or response time, between rainfall and runoff occurrence and is partly a function of hydraulic length, catchment gradient, drainage density, and drainage patterns. The routing storage coefficient, or time constant, is a function of the channel reach length and the speed of the flood wave. The routing weight factor is a function of the flow and channel characteristics that affect the dispersion of the flood wave downstream.

We delineated detailed sub-watersheds and determined sub-watershed drainage area with ARC/INFO (ESRI, 1993). We calculated weighted curve numbers in ARC/INFO for each sub-watershed using STATSGO (Soil Conservation Service, 1991) digital hydrologic soil data and land use data assuming moderate antecedent moisture conditions (I_a = 0.25 in). Because the majority of the watersheds were not gauged, we estimated the basin lag, t_p, using (Linsley and others, 1982, p. 224):

$$t_p = C_t\left(\frac{LL_c}{\sqrt{s}}\right)^n \qquad (1)$$

where C_t is a constant that varies between 1.8 and 2.2 for units of miles (Snyder, 1938), L is the stream distance to the divide, L_c is the stream distance, n is 0.35 for valley drainage areas (Linsley and others, 1982, p. 225), and s is

the channel gradient. For this study, we chose a mean C_t value of 2.0. We assigned the routing storage coefficient as 0.20, a typical value for most natural streams (Linsley and others, 1982, p. 219). We measured L, L_t, and s from USGS 1:24000 topographic sheets. We estimated the routing travel time constant, K, using (Linsley and others, 1949, p. 465-541):

$$K = \frac{bL\sqrt{A}}{\sqrt{s}} \qquad (2)$$

where A is the drainage area and b is a constant between 0.04 and 0.08 for L in miles and A in square miles. For this study, we chose a mean b value of 0.06. With the above data input into HEC-1, we modeled 100-yr flood hydrographs for sub-watersheds on or just outside the camps and fort. We recorded peak flows for these 100-yr flood hydrographs for assessing flooding depths.

We used HEC-RAS (Hydrologic Engineering Center, 1995) to estimate 100-yr flooding surfaces at the locations where we determined the flood hydrographs. Input to HEC-RAS included: topographic cross-sections at hydrograph locations, stream lengths between cross-sections, Manning's n values, discharge rates, and stream flow boundary conditions. We measured topographic cross sections from USGS 1:24000 topographic sheets perpendicular to the stream path. Using a map roll gauge, we measured stream lengths between cross sections from the topographic sheets. We assumed Manning's n values to be 0.06 on the banks (Hydrologic Engineering Center, 1995) and 0.05 in and near the stream channel. HEC-1 supplied the peak 100-yr discharge rates for each hydrograph location. We assigned the stream-flow boundary condition at the output end of the model as a critical depth boundary. In all simulations, we assumed subcritical flow. After inputting the above information, HEC-RAS determined the flood surface at each of the chosen locations.

We mapped the 100-yr floodplains by transcribing the 100-yr flood surfaces estimated by HEC-RAS onto USGS 1:24000 topographic sheets and interpolated between hydrograph locations. Once mapped, we digitized the floodplains in ARC/INFO GIS and printed maps.

MONITOR WELL INSTALLATION

The installation of monitor wells at the camps and fort included (1) selecting and staking appropriate sites for well locations, (2) arranging access

to the well sites and, if needed, a source of water for the drill rig, (3) drilling the well, (4) developing the well, (5) installing casing, and (6) developing the cased well. Drilling sites were chosen to best investigate the hydrogeology of the sites and still be accessible to a drill rig. Hydrogeologic justifications for these locations are included in a former interim report (Fisher and Mace, 1995). Before staking the well sites, we contacted camp commanders to ensure the locations would not interfere with camp activities and were not located near any known buried utilities. We coordinated our drilling with the camps to ensure our activities would not interfere with training schedules.

We drilled the monitor wells with our Central Mine Equipment 75 drilling rig. Depending on the geology, we used hollow stem augering, solid stem boring, rotary/wet coring or a combination thereof to install the wells. Most wells were installed using hollow stem augering. A few wells required solid stem boring or rotary/wet coring due to the presence of hard rock. The drilling mud we used for solid stem boring and rotary/wet coring was biodegradable Super Mud. Where possible, we collected core and cuttings for inspection at our facilities.

Once the well was drilled, we augered or flushed the cuttings from the hole and developed the well with a bailer, usually removing 1 to 2 well-bore volumes of water. Well completion consisted of installing 2-inch diameter well screen and pipe, placing a sandpack around the screen, placing a bentonite seal above the sandpack, grouting to a few feet below land surface, installing a well guard, and cementing the guard in place with a well pad. We installed either 10 or 20 feet of 0.010-inch slotted screen in the wells. The sandpack consisted of 20/40 sand and straddled the screen. We installed locking above-ground well guards on each of the wells. Once the well was completed and the cement had dried, we developed the well again with a bailer or an electrical submersible pump.

CAMP BARKELEY

DRILLING REPORTS

We drilled and completed two wells in the Vale Formation at Camp Barkeley. BARKELEY-1 is 53.5 ft deep, and BARKELEY-2 is 93.2 ft deep. These

wells are located near the northern entrance to the camp (fig. 1). We used hollow stem augering to install both of these wells. Detailed well schematics and drilling reports are included in the appendix.

FLOODPLAIN ANALYSIS

Camp Barkeley does not contain substantial 100-yr floodplains. The only mapable floodplain, which barely extends from the stream bed, is on the small stream in the southern part of the camp (fig. 2). Owing to the steep slopes near the mesa, rainfalls may cause substantial sheet flows and runoffs that can fill nearby arroyos and erode the landscape. There is evidence of erosion due to runoff down the camp road up to the mesa. The 100-yr 24-hr rainfall is 8.5-in with a maximum SCS Type II distributed rainfall intensity of 3.61 in hr^{-1} (fig. 3a). This 100-yr rainfall results in a maximum flow of 918 cfs in the northern stream (fig. 3b for point A in fig. 2) and 2538 cfs in the southern stream (fig. 3c for point B in fig 2).

CAMP BOWIE

DRILLING REPORTS

We drilled and completed two wells on Camp Bowie: one in the Travis Peak Formation near the escarpment (BOWIE-2) and another in alluvium/Strawn Group near the camp boundary (BOWIE-1). These wells are located in the central and eastern parts of the camp (fig. 4). The well drilled into the Travis Peak Formation is 101.2 ft deep and screened from 81.2 to 101.2 ft. The well drilled into the alluvium/Strawn Group is 53.8 ft deep. We used hollow stem augering to install BOWIE-1. On BOWIE-2, we used hollow stem augering to drill through the shallow unconsolidated deposits and solid stem boring for the remainder of the hole. Drilling progress was delayed several times due to training on the camp and freezing conditions. Detailed well schematics and drilling reports are included in the appendix.

FLOODPLAIN ANALYSIS

Camp Bowie has several streams that drain into Pecan Bayou to the north-east. The floodplains exist as halos around the stream beds, generally becoming wider as they approach Pecan Bayou (fig. 5). Floodplains are wider

about higher order streams such as South Willis Creek, Lewis Creek, and Devils River. The 100-yr 24-hr rainfall is 9.5-in with a maximum SCS Type II distributed rainfall intensity of 4.04 in hr^{-1} (fig. 6a). This 100-yr rainfall results in a maximum flow of 3693 cfs in the tributary to MacKinally Creek in the south (fig. 6b for point A in fig. 5), 7484 cfs for Devils River near the camp boundary (fig. 6c for point B in fig 5), and 3762 cfs for Lewis Creek near the camp boundary (fig. 6d for point C in fig 5).

CAMP MABRY

DRILLING REPORTS

We drilled one well on Camp Mabry in the Edwards Group in the southern portion of the camp (fig. 7). This well (MABRY-1) is 151.5 ft deep and is open from 41.4 ft to 151.5 ft. Once hydraulic testing and water sampling is complete, we will complete the well with screen and casing so it can be used as a permanent monitoring well. We used solid stem boring and rotary/wet coring to drill the well. We had circulation losses and difficulty drilling through the 20 to 30 ft of surface fill which included boulders and tree stumps. We tested this fill zone before sealing it off with cemented casing. Once we set this surface casing, we entered the hole with a smaller rock bit. Owing to the hardness of the limestone, this bit was worn at a depth of 122 ft. We then entered the hole with a smaller bit to arrive at the total depth. Detailed well schematics and drilling reports are included in the appendix.

FLOODPLAIN ANALYSIS

Camp Mabry does not contain substantial 100-yr floodplains. The only mapable floodplains, which barely extend from the stream bed, are on the small streams that flow south into Lake Austin (fig. 8). Runoffs are slightly greater due to impervious cover and will increase as development continues on the camp. The 100-yr 24-hr rainfall is 10.0-in with a maximum SCS Type II distributed rainfall intensity of 4.25 in hr^{-1} (fig. 9a). This 100-yr rainfall results in a maximum flow of 918 cfs in the western stream (fig. 9b for point A in fig. 8) and 2538 cfs in the eastern stream (fig. 9c for point B in fig 8).

CAMP MAXEY

DRILLING REPORTS

We drilled and completed two wells at Camp Maxey (fig. 10) along a transect that incorporates a preexisting hand-dug well on the camp. One well (MAXEY-1) was drilled 53 ft into the Bonham Formation and the other (MAXEY-2A) is drilled 61.2 ft into the Eagle Ford Formation. We initially tried rotary/wet coring to install MAXEY-2 but had difficulty with the sides of the hole washing out and collapsing. We filled and sealed this uncompleted well and used hollow stem augering to install another well, MAXEY-2A, nearby. We used solid stem boring to install MAXEY-1. Detailed well schematics and drilling reports are included in the appendix.

FLOODPLAIN ANALYSIS

Camp Maxey has several streams that either drain north into Pat Mayse Lake or south into Hick's Creek. Floodplains for these streams are not large and exist as halos around the stream beds, generally becoming wider downstream as they feed into Pat Mayse Lake (fig. 11). USGS topographic maps show a controlled flooding surface for Pat Mayse Lake. This surface extends minimally (less than 250 ft) into Camp Maxey. The 100-yr 24-hr rainfall is 9.75-in with a maximum SCS Type II distributed rainfall intensity of 4.14 in hr^{-1} (fig. 12a). This 100-yr rainfall results in a maximum flow of 4452 cfs in the eastern tributary to Pat Mayse Lake (fig. 12b for point A in fig. 11), 688 cfs for the creek that drains into Lamar Lake (fig. 12c for point B in fig 11), and 1236 cfs for the northern tributary to Pat Mayse Lake near the camp boundary (fig. 12d for point C in fig 11).

CAMP SWIFT

DRILLING REPORTS

We drilled and completed two wells in the Calvert Bluff Formation on Camp Swift. SWIFT-1 is located in the northern part of the camp (fig. 13) and is 57.1 ft deep in the sandy portion of the Calvert Bluff Formation. SWIFT-2 is located in the south-central part of the camp (fig. 13) near the USGS well field

and is 51 ft deep in the clayey portion of the Calvert Bluff Formation. We used solid stem boring to install SWIFT-1 and hollow stem augering to install SWIFT-2. Detailed well schematics and drilling reports are included in the appendix.

FLOODPLAIN ANALYSIS

Big Sandy Creek, McLaughlin Creek, and Dogwood Creek cross Camp Swift. U.S. Department of Housing and Urban Development (1977) published flood hazard boundaries for these creeks and their tributaries. We transferred the floodplains to USGS 1:24000 topographic sheets and better constrained the floodplains on the tributaries (fig. 14). Gaylord and others (1985, p. 44-49) summarized the stream flow characteristics for the Big Sandy Creek watershed. The U.S. Bureau of Land Management (1980, table 2-7, p. A4-5-A4-8) estimated the 100-yr flow at Big Sandy Creek on the west side of the camp to be 20,850 cfs, at mouth of McLaughlin Creek to be 6,780 cfs, and where Dogwood Branch crosses Highway 95 to be 4,470 cfs.

FORT WOLTERS

DRILLING REPORTS

We drilled and completed two wells on Fort Wolters in the Mineral Wells Formation. WOLTERS-2A is 52.2 ft deep and is located in the southern part of the western arm of the fort (fig. 15). WOLTERS-1 is 73.9 ft deep and is located on a nearby mesa overlooking WOLTERS-2A (fig. 15). We initially tried rotary/wet coring to install WOLTERS-2 but had difficulty with losing circulation and having water flow from desiccation cracks at land surface near the hole and the drilling rig. We filled and sealed this uncompleted well and used hollow stem augering to install another well, WOLTERS-2A, nearby. On WOLTERS-1, we used hollow stem augering to install 9 ft of surface casing and hollow stem augering to reach total depth. Detailed well schematics and drilling reports are included in the appendix.

FLOODPLAIN ANALYSIS

Two major streams, Rocky Creek and Rippy Branch, cross Fort Wolters. Fort Wolters is also cut by several minor creeks. These streams and creeks do not have major 100-yr floodplains. The floodplains exist as halos around the

stream beds, generally becoming wider downstream (fig. 16). Floodplains are wider about higher order streams such as Rocky Creek and Rippy Branch except where the floodplain has steep slopes. The 100-yr 24-hr rainfall is 9.0-in with a maximum SCS Type II distributed rainfall intensity of 3.83 in hr^{-1} (fig. 17a). This 100-yr rainfall results in a maximum flow of 12,085 cfs in Rocky Creek near the fort boundary (fig. 17b for point A in fig. 16), 6516 cfs for Rippy Branch near the fort boundary (fig. 17c for point B in fig 16), and 3448 cfs for a north-west tributary to Rocky Creek (fig. 17d for point C in fig 16).

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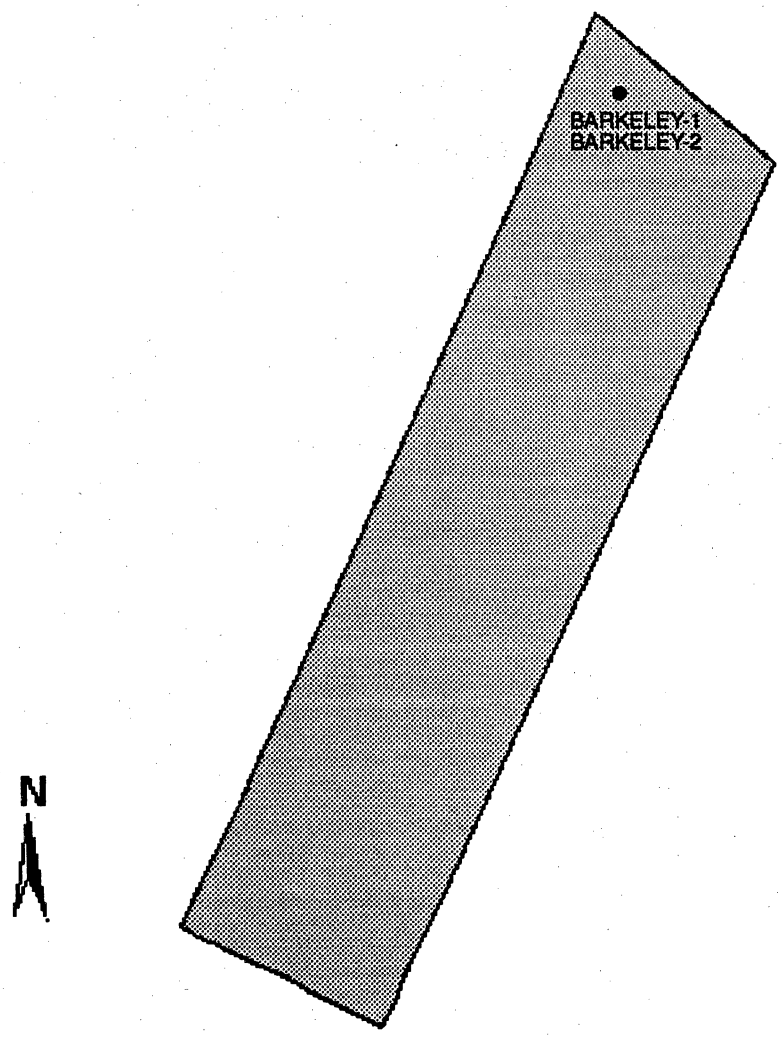


Figure 1. Monitor wells drilled on Camp Barkeley

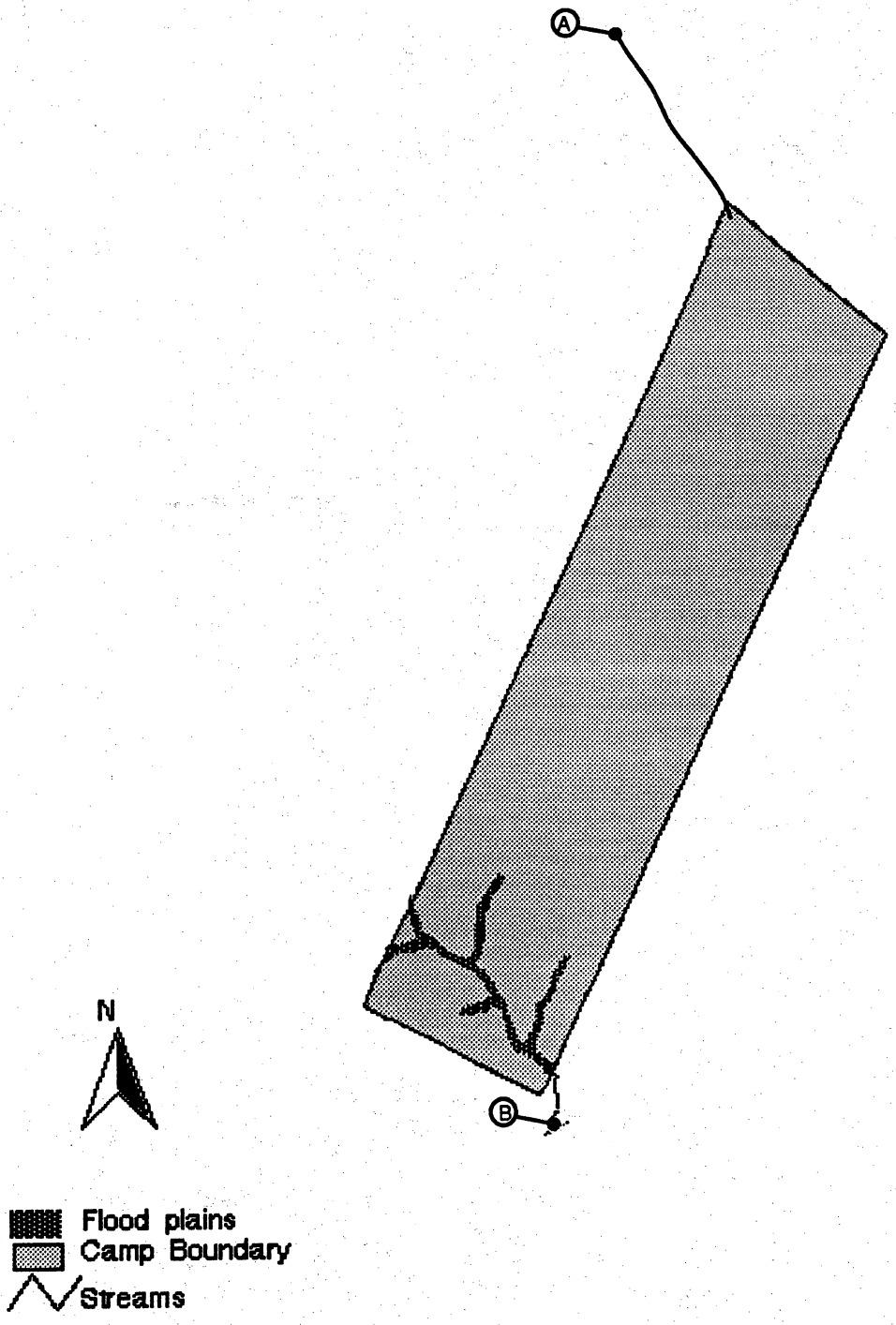


Figure 2. One-hundred year floodplains on Camp Barkeley. Points A and B refer to 100-yr flood hydrographs in figure 3.

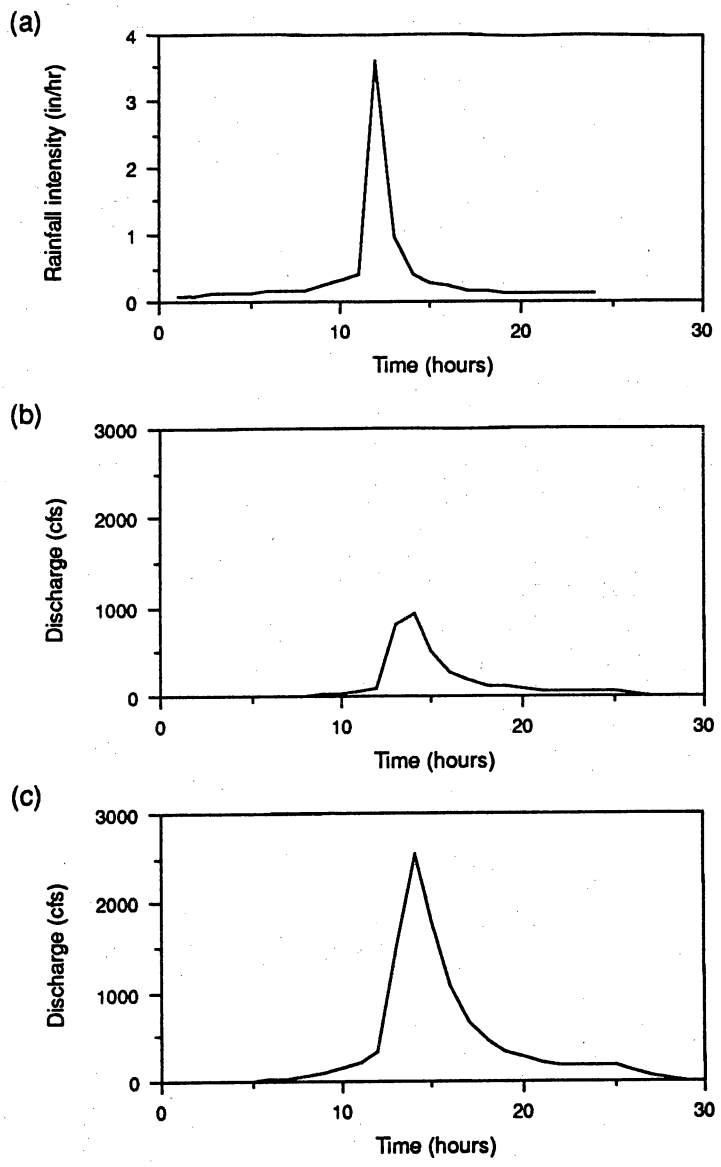


Figure 3. Flood hydrograph analysis for Camp Barkeley including (a) 100-yr 24-hr SCS Type II distributed rainfall intensity, (b) 100-yr flood hydrograph for northern stream (point A, fig. 2), and (c) 100-yr flood hydrograph for southern stream (point B, fig. 2).

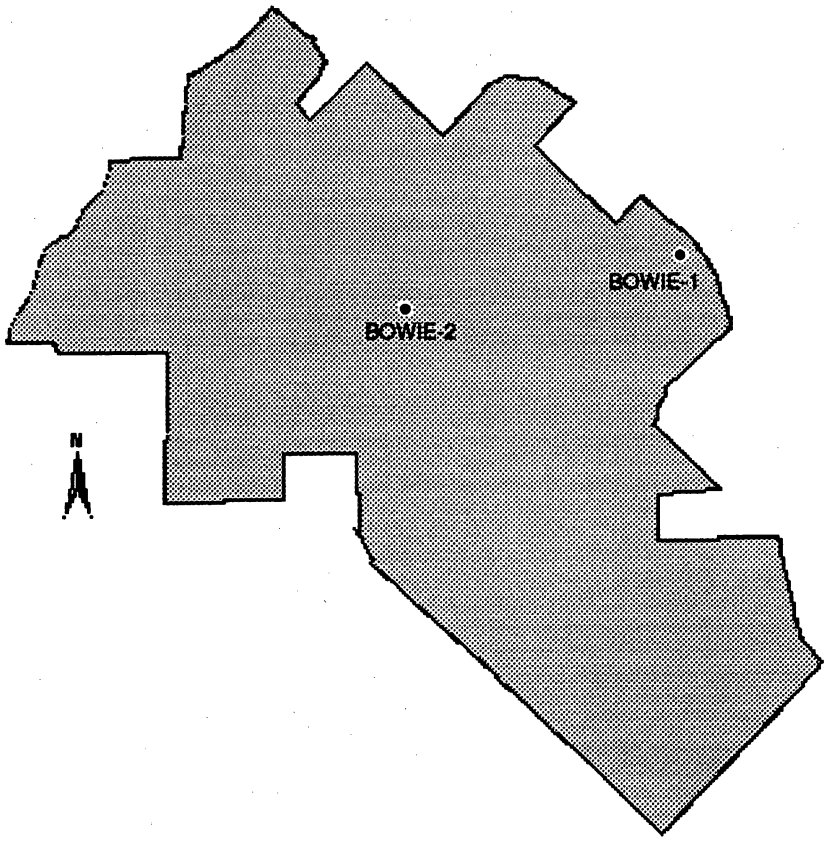


Figure 4. Locations of monitor wells drilled on Camp Bowie.

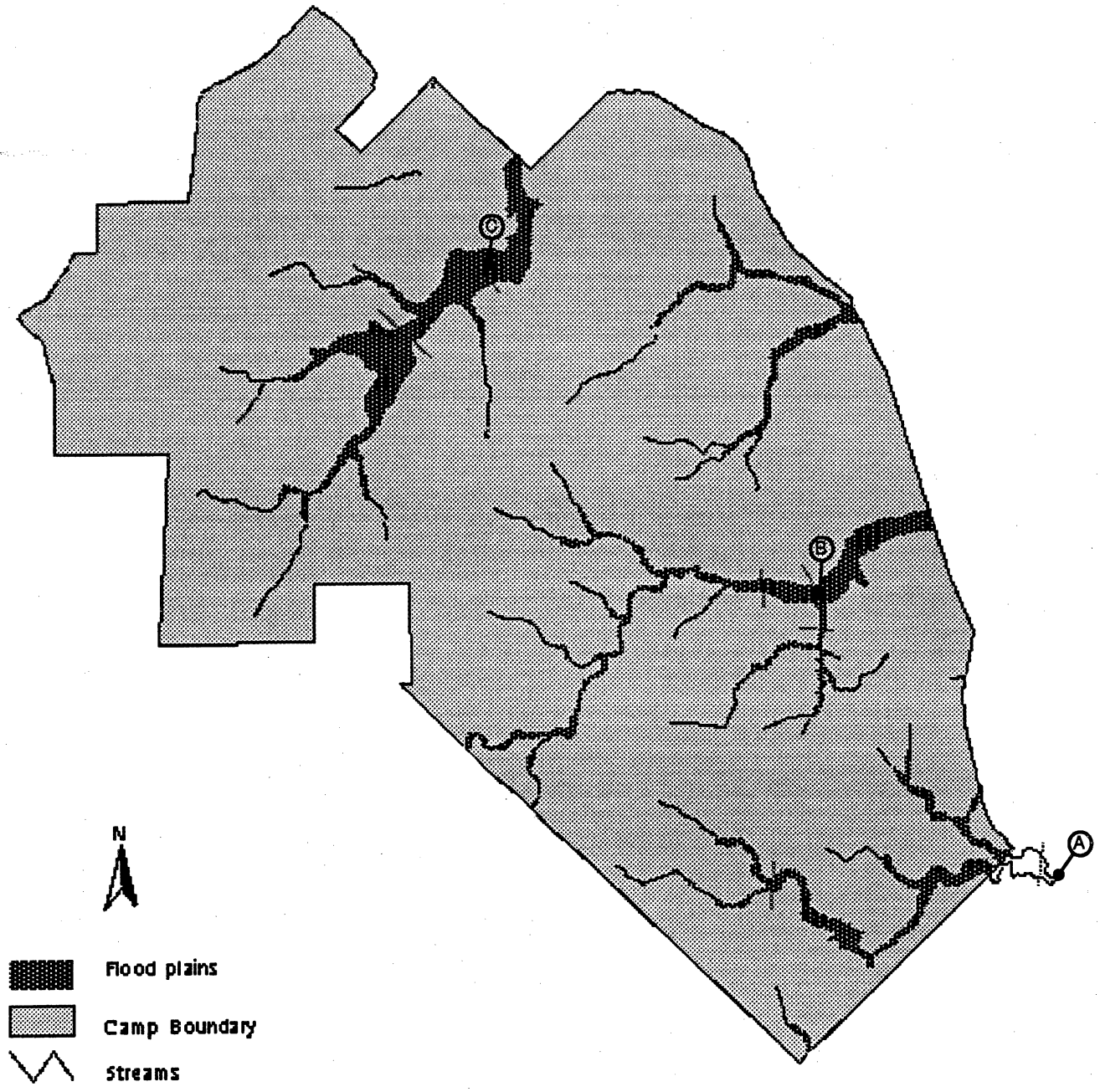


Figure 5. One-hundred year floodplains on Camp Bowie. Points A, B, and C refer to 100-yr flood hydrographs in figure 6.

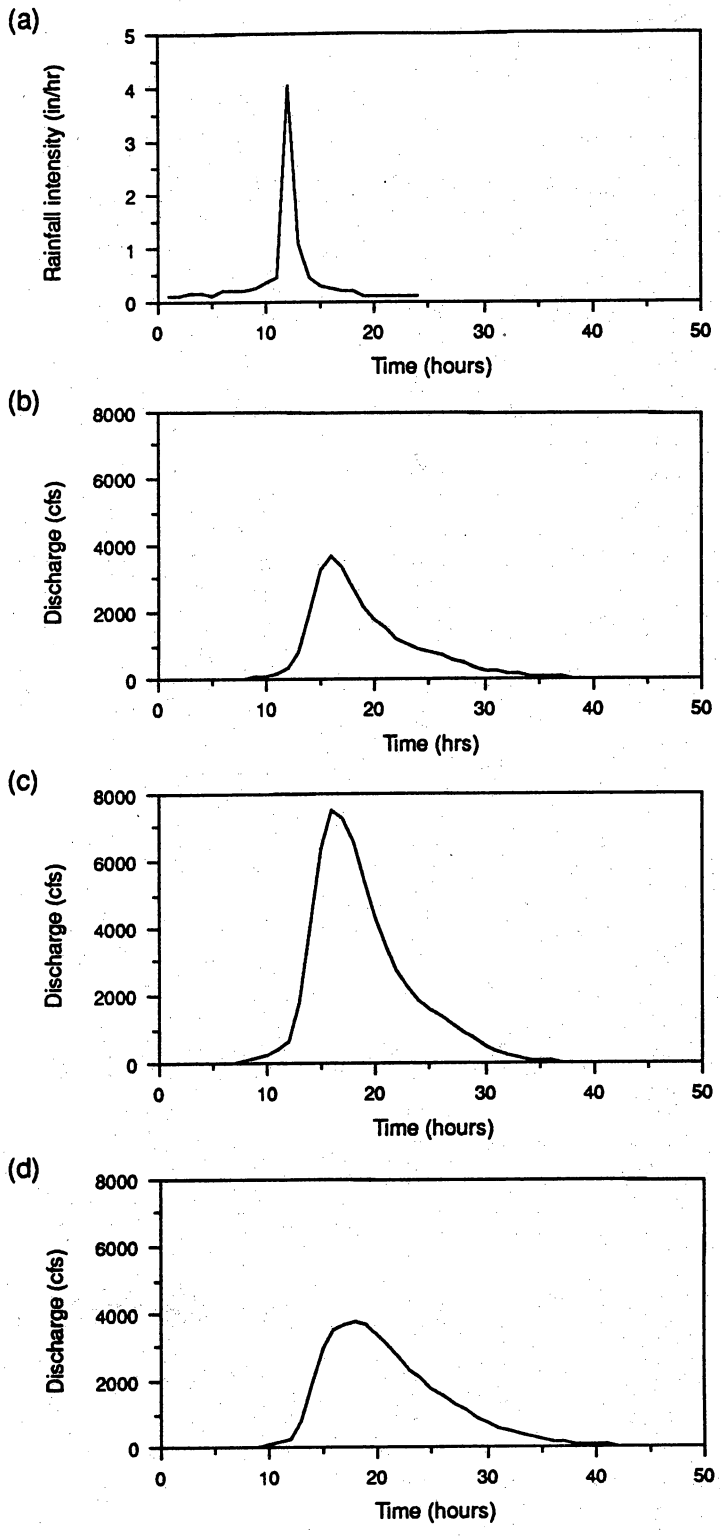


Figure 6. Flood hydrograph analysis for Camp Bowie including (a) 100-yr 24-hr SCS Type II distributed rainfall intensity and the 100-yr flood hydrographs near the camp boundary for (b) a tributary to MacKinally Creek (point A, fig. 5), (c) Devils River (point B, fig. 5), and (d) Lewis Creek (point C, fig. 5).

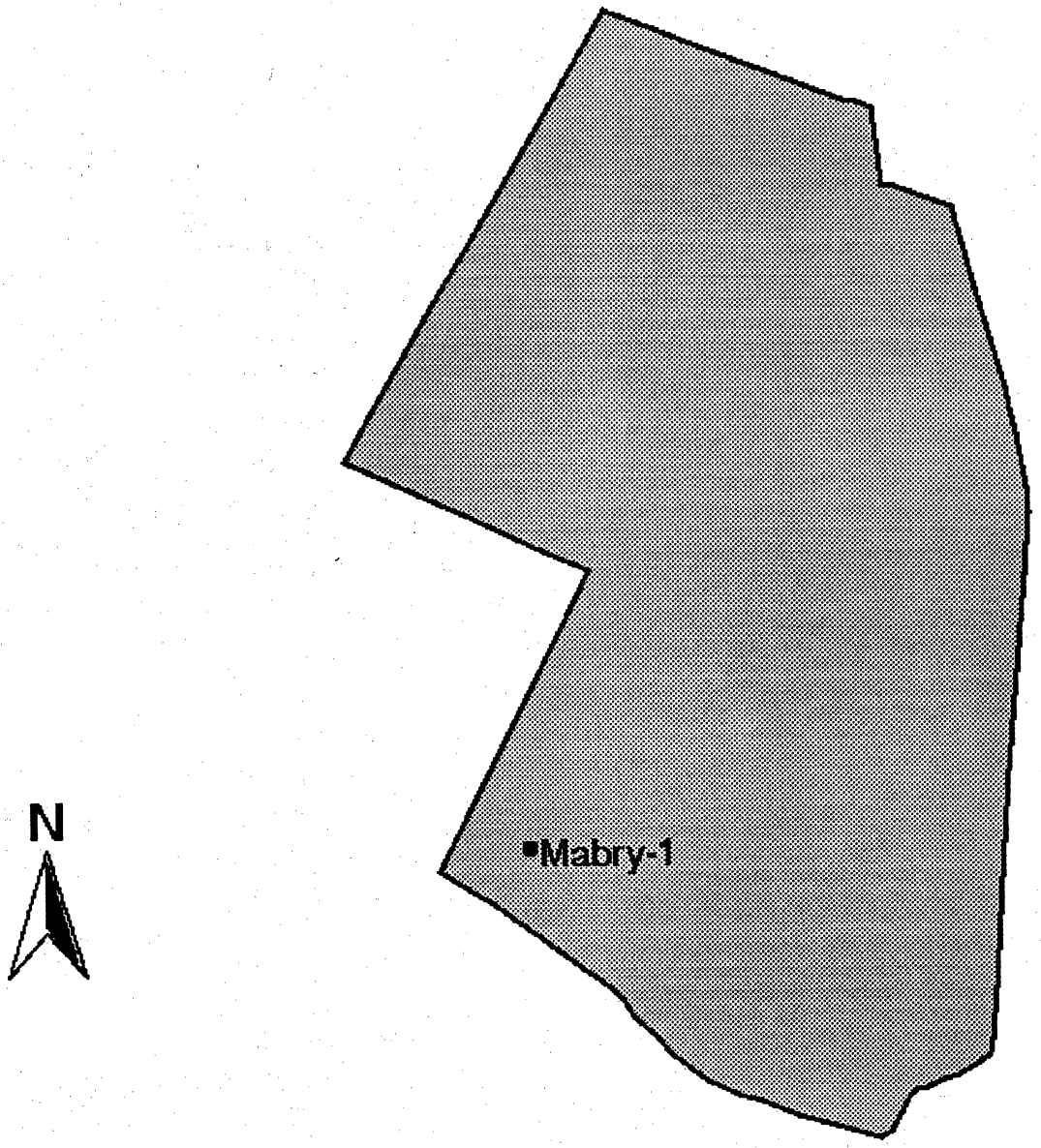


Figure 7. Moniter wells drilled on Camp Mabry.

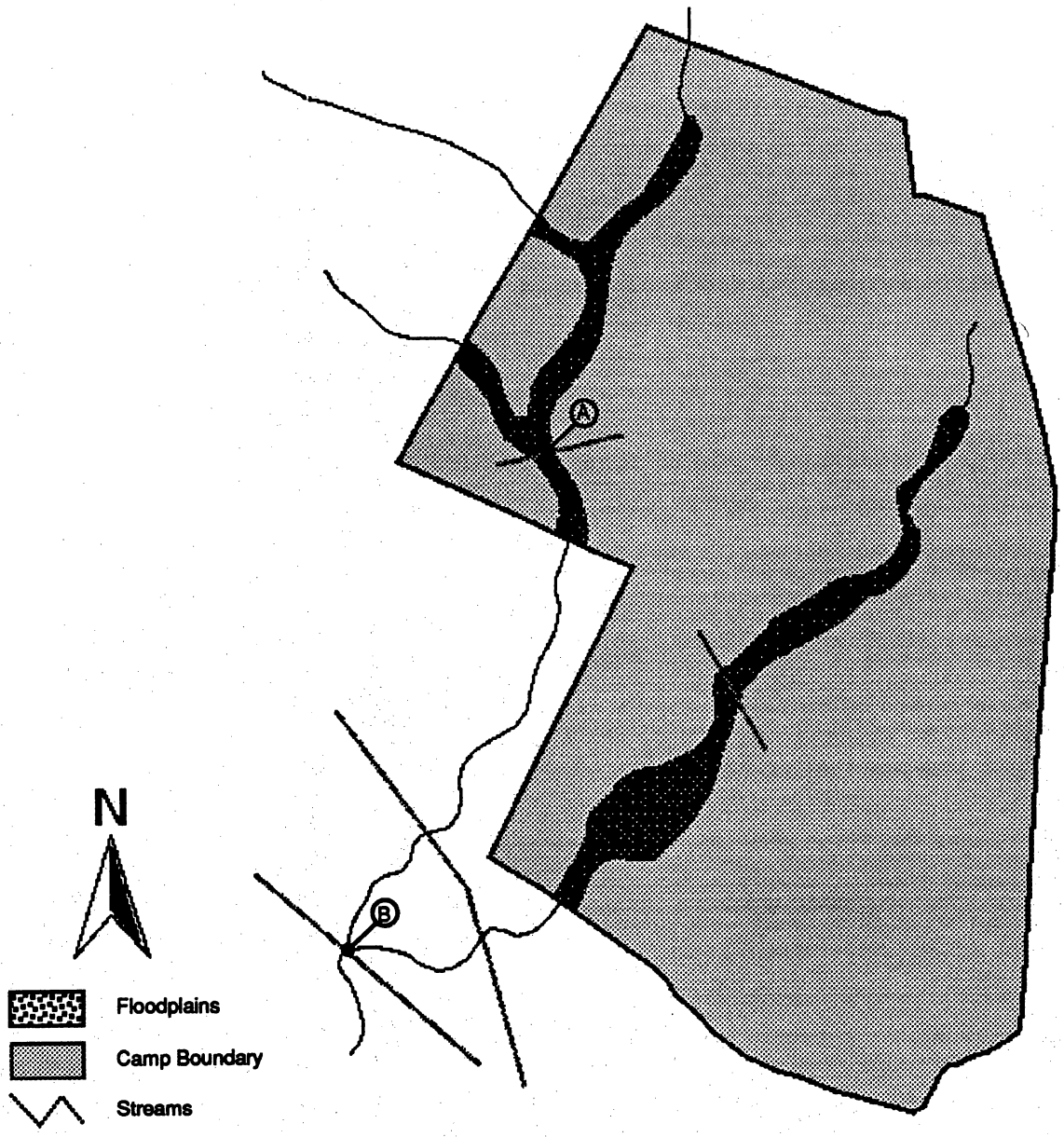


Figure 8. One-hundred year floodplains on Camp Mabry. Points A and B refer to 100-yr flood hydrographs in figure 9.

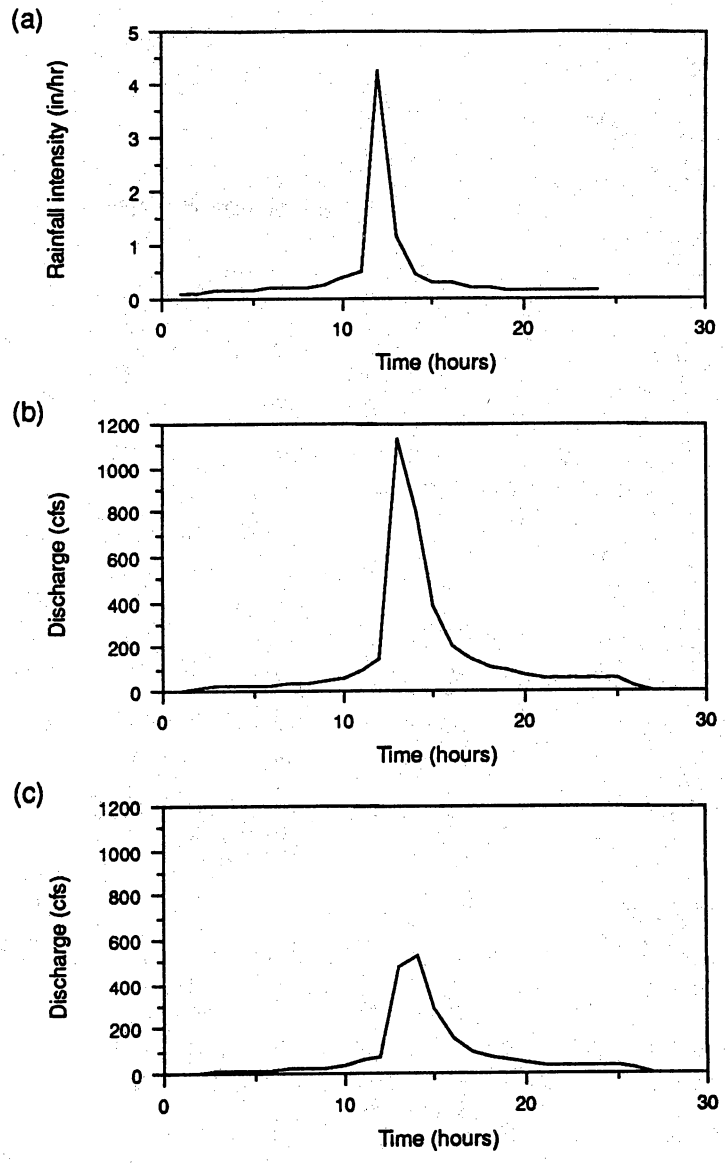


Figure 9. Flood hydrograph analysis for Camp Mabry including (a) 100-yr 24-hr SCS Type II distributed rainfall intensity and 100-yr flood hydrographs near the camp boundary for (b) the eastern stream (point A, fig. 8) and (c) the western stream (point B, fig. 8).

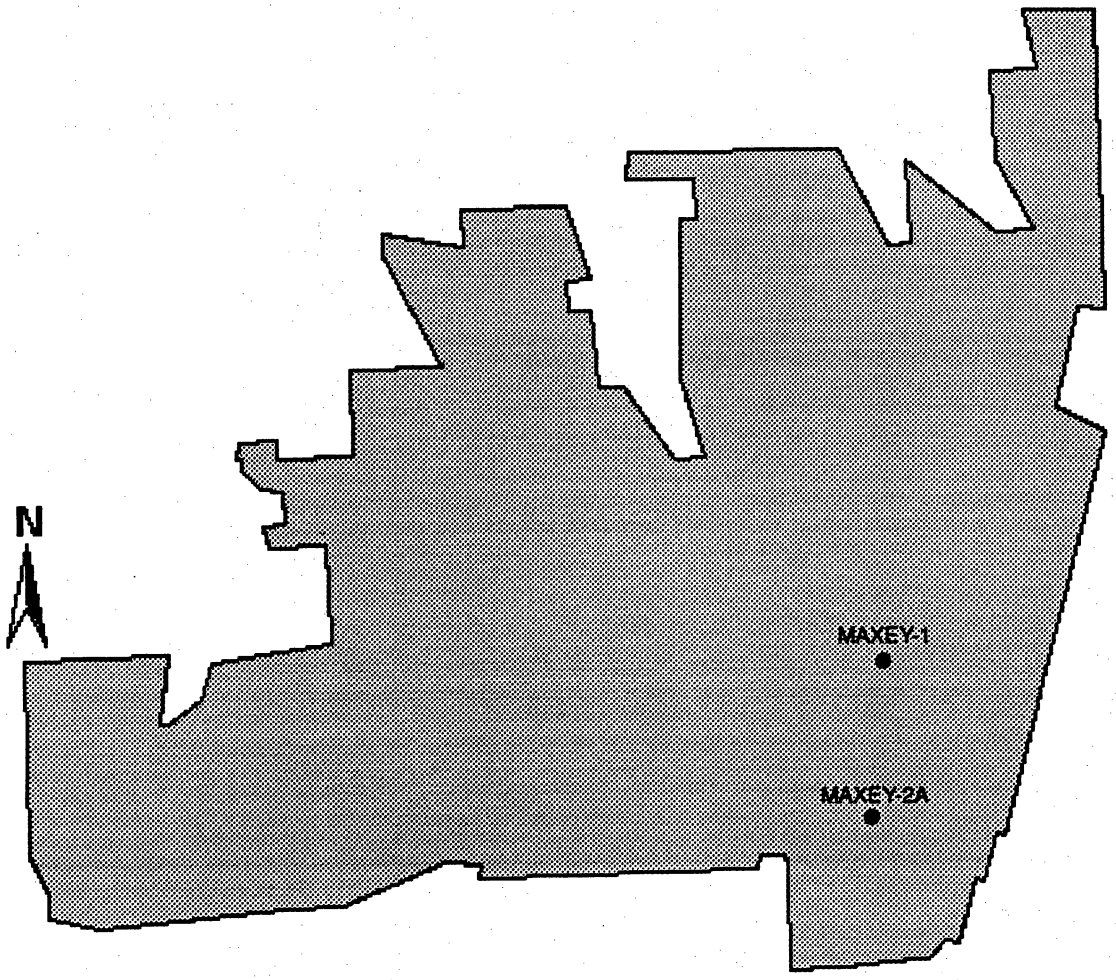


Figure 10. Location of monitor wells drilled on Camp Maxey.

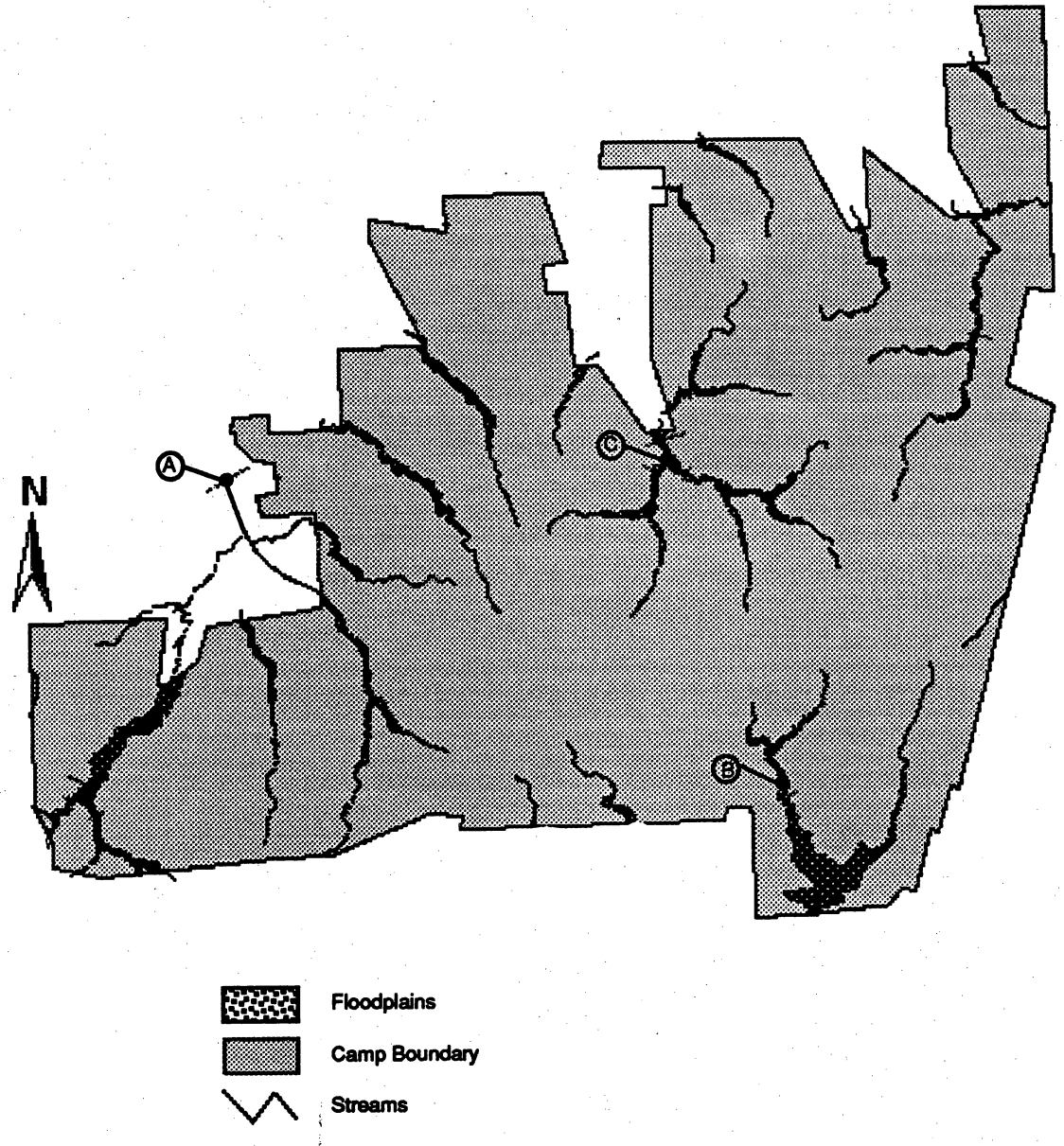


Figure 11. One-hundred year floodplains on Camp Maxey. Points A, B, and C refer to 100-yr flood hydrographs in figure 12.

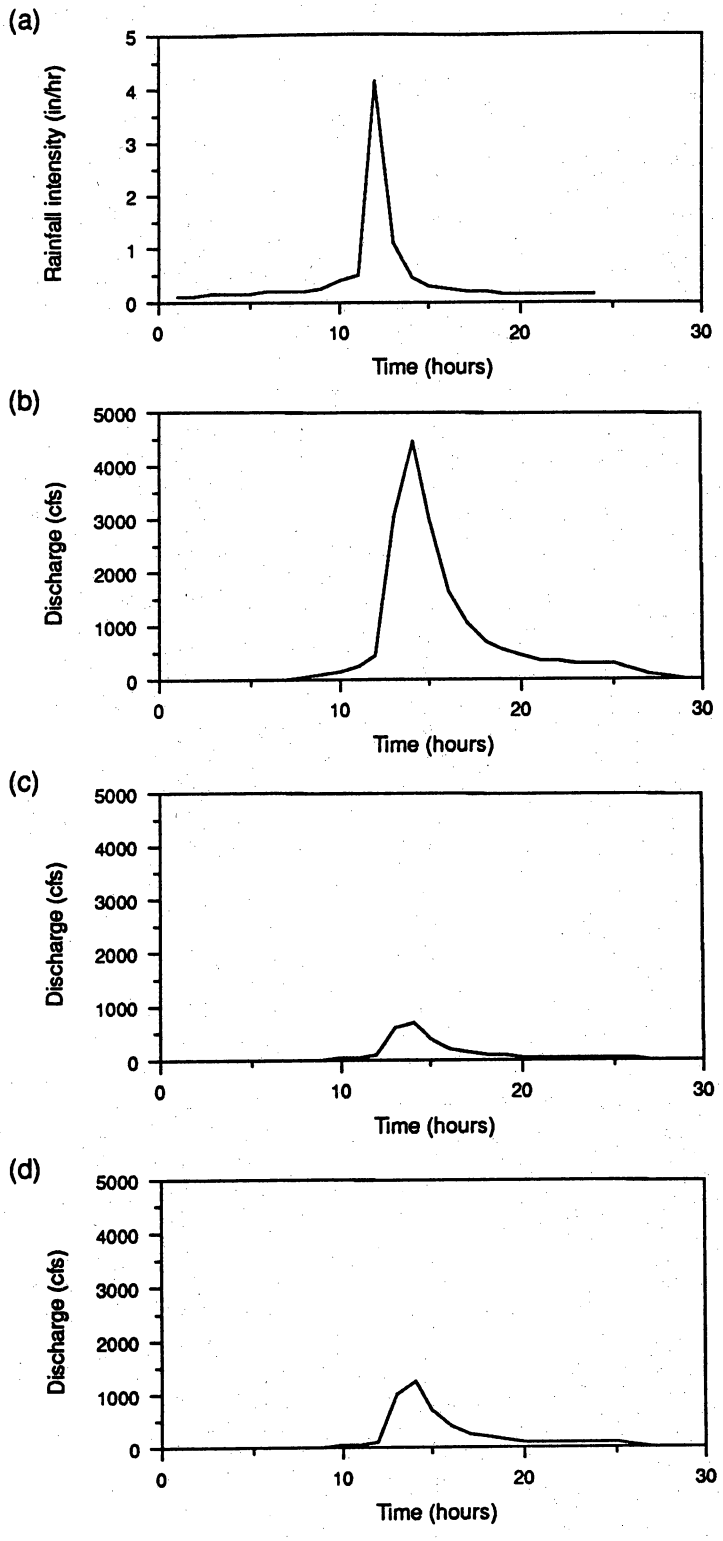


Figure 12. Flood hydrograph analysis for Camp Maxey including (a) 100-yr 24-hr SCS Type II distributed rainfall intensity and the 100-yr flood hydrographs near the camp boundary for (b) a north-west tributary to Pat Mayse Lake (point A, fig. 11), (c) the stream that feeds into Lamar Lake (point B, fig. 11), and (d) a northern tributary to Pat Mayse Lake (point C, fig. 11).

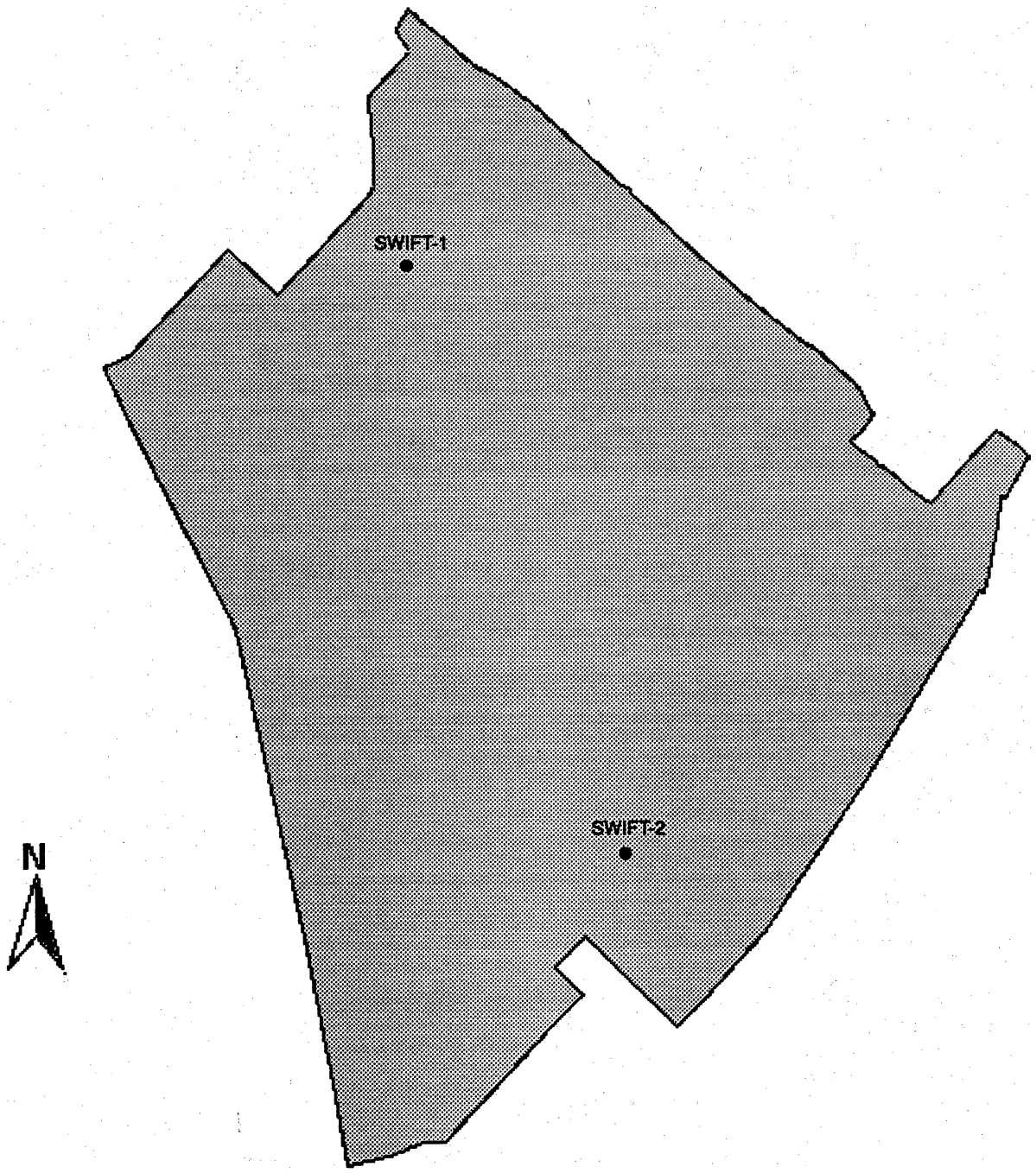


Figure 13. Location of monitor wells drilled on Camp Swift.

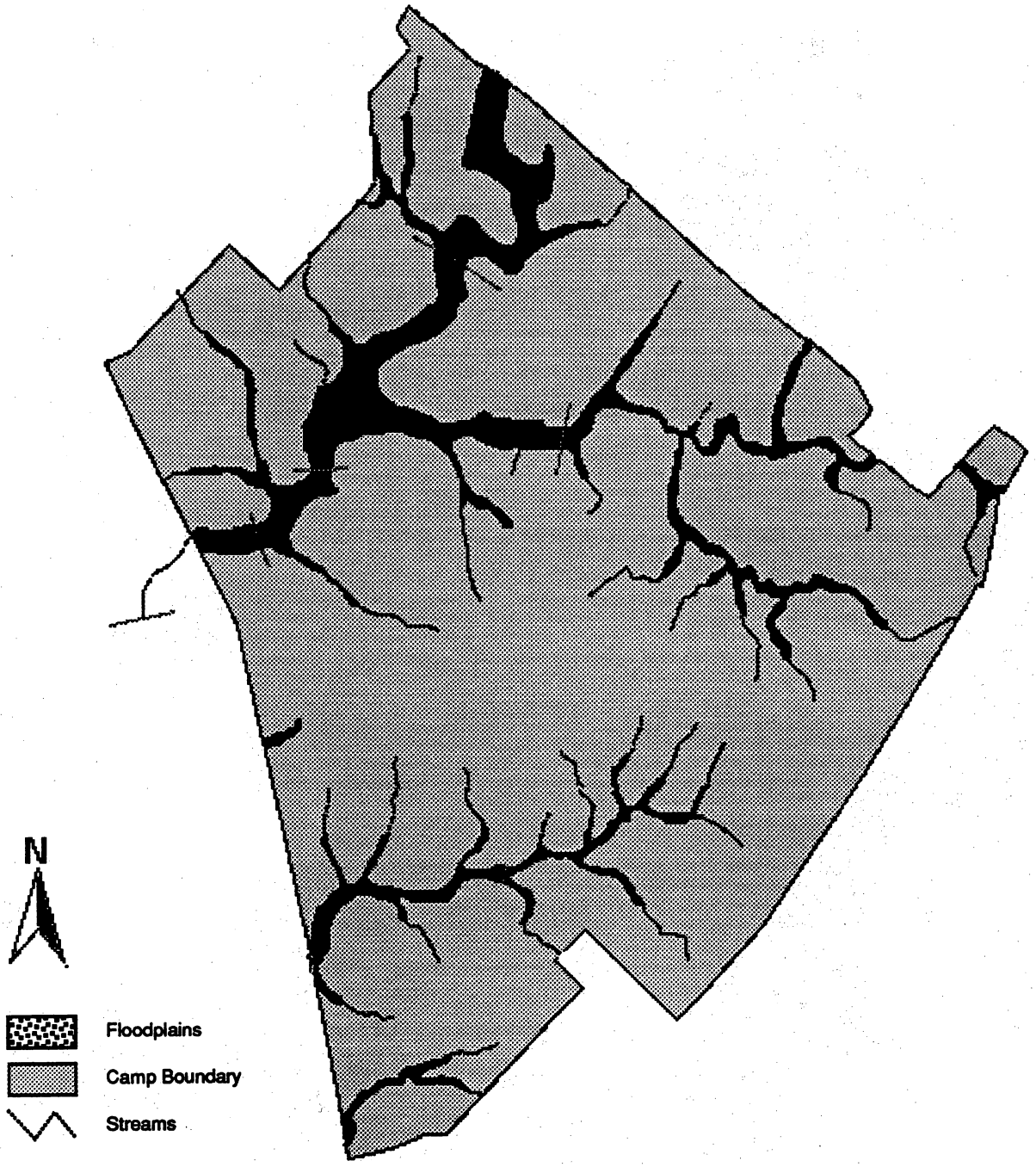


Figure 14. One-hundred year floodplains on Camp Swift.

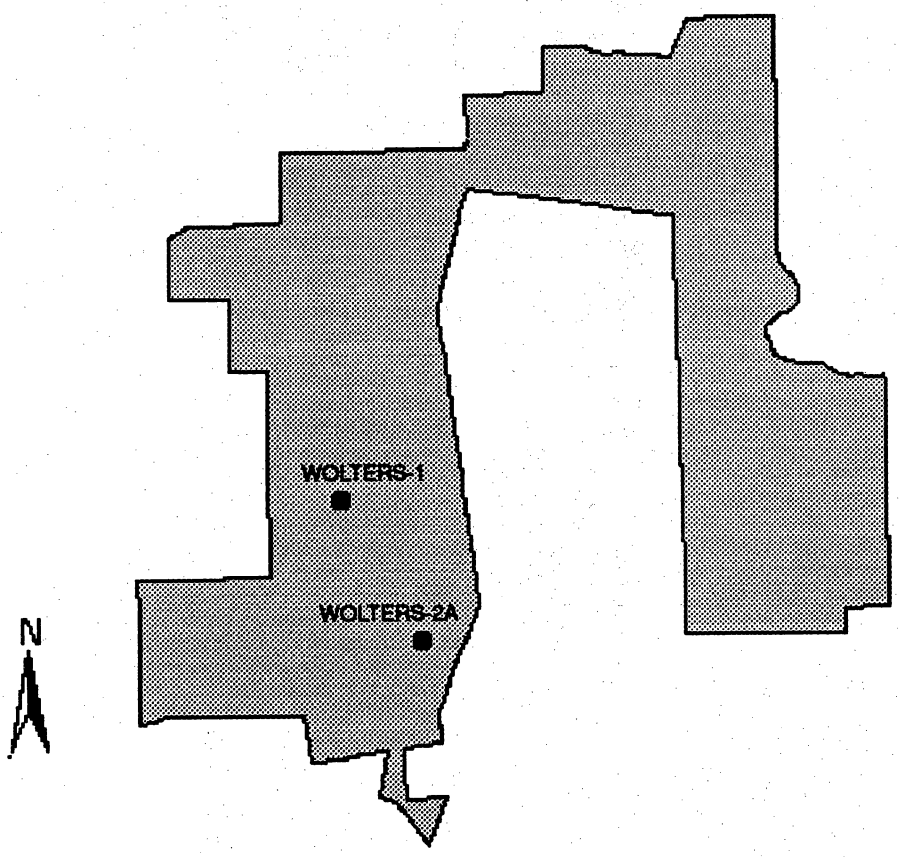


Figure 15. Location of monitor wells drilled on Fort Wolters.

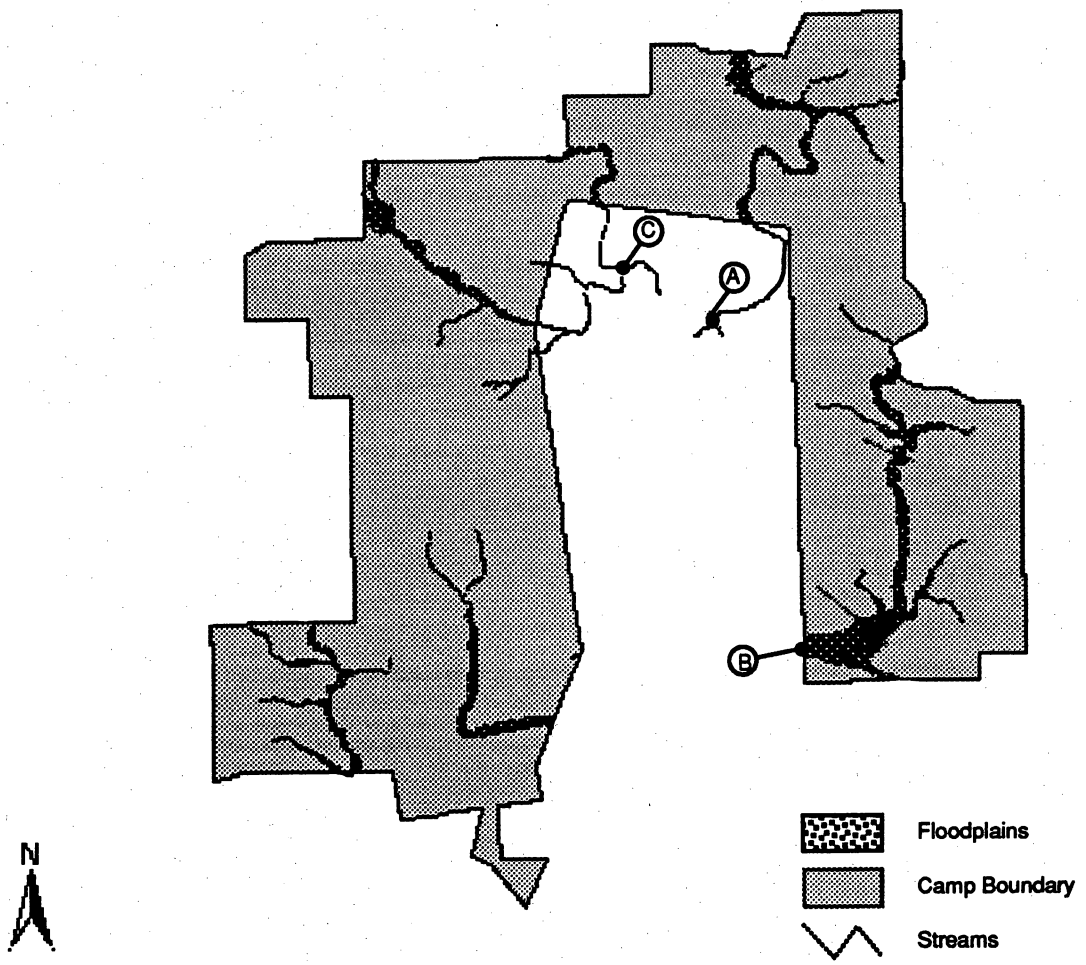


Figure 16. One-hundred year floodplains on Fort Wolters. Points A, B, and C refer to 100-yr flood hydrographs in figure 17.

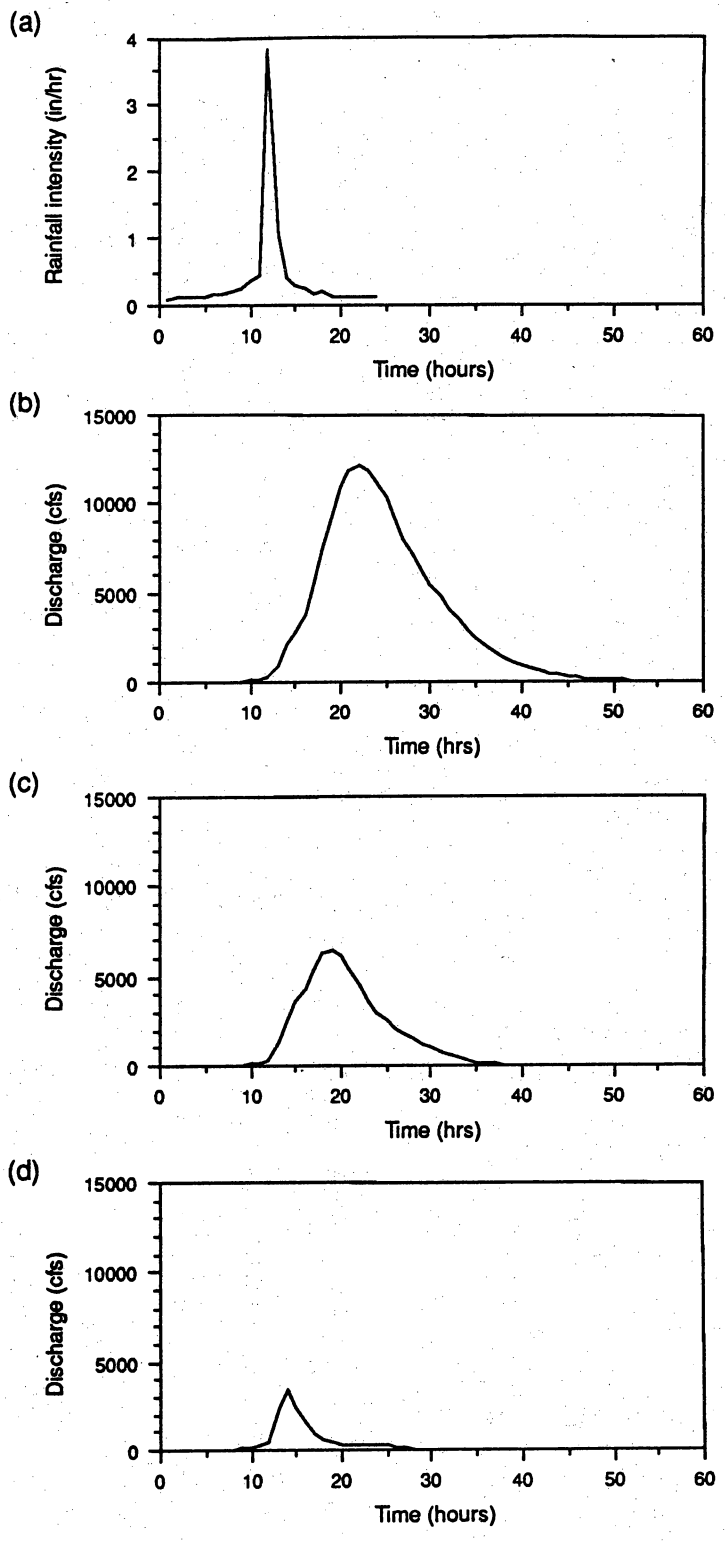


Figure 17. Flood hydrograph analysis for Fort Wolters including (a) 100-yr 24-hr SCS Type II distributed rainfall intensity and the 100-yr flood hydrographs near the camp boundary for (b) Rocky Creek (point A, fig. 16), (c) Rippy Branch (point B, fig. 16), and (d) a north-west tributary to Rocky Creek (point C, fig. 16).

Appendix

Drilling Reports and Well Schematics

Send original copy by certified mail to: **TNRCC, P.O. Box 13087, Austin, TX 78711-3087**

Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas WELL REPORT

Camp Barkeley #1

Texas Water Well Drillers Advisory Council
P.O. Box 13087
Austin, Texas 78711-3087
512-239-0530

1) OWNER Texas National Guard (Name) **ADDRESS** P.O. Box 5218 (Street or RFD) Austin (City) Tx (State) 78763 (Zip)

2) ADDRESS OF WELL: County Taylor — Camp Barkeley Buffalo Gap (Street, RFD or other) Buffalo Gap (City) Texas (State) 79508 (Zip) **GRID #** 30-41-5

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Monitor ☐ Environmental Soil Boring ☐ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☒ Testwell

If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) ●
32° 19' 39"
99° 52' 2"
N

6) WELL LOG:
Date Drilling: Started 12/3 19 95 Completed 12/3 19 95

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
7 7/8	Surface	53.5

7) DRILLING METHOD (Check): ☐ Driven ☐ Air Rotary ☐ Mud Rotary ☒ Bored ☐ Air Hammer ☐ Cable Tool ☐ Jetted ☒ Other Augered

From (ft.)	To (ft.)	Description and color of formation material
0.0	3.5	Brown top soil with caliche
3.5	53.5	Red clay spotted with green intervals

8) Borehole Completion (Check): ☐ Open Hole ☒ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other

If Gravel Packed give interval . . . from _____ ft. to _____ ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
2"	N	PVC Schedule 40 riser	3.0' Above Surface	39.8	
2"	N	PVC Schedule 40 screen	39.8	49.8	.010

(Use reverse side if necessary)

9) CEMENTING DATA: [Rule 338.44(1)]

Cemented from 4" Above Surface ft. to 1.0 ft. No. of Sacks Used 3.5
_____ ft. to _____ ft. No. of Sacks Used _____
Method used Hand Poured
Cemented by Drill Crew
Distance to septic system field lines or other concentrated contamination N/A ft.
Method of verification of above distance N/A

10) SURFACE COMPLETION

☒ Specified Surface Slab Installed [Rule 338.44 (2) (A)]
☒ Specified Steel Sleeve Installed [Rule 338.44 (3)(A)]
☐ Pitless Adapter Used [Rule 338.44 (3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

11) WATER LEVEL:

Static level _____ ft. below land surface Date _____
Artesian flow _____ gpm. Date _____

12) PACKERS: Type Depth

13) TYPE PUMP:
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other _____
Depth to pump bowls, cylinder, jet, etc., _____ ft.

14) WELL TESTS:
Type test: ☐ Pump ☐ Bailer ☐ Jetted
Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☐ No
Type of water? _____ Depth of strata _____
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME University of Texas/Bureau of Economic Geology (Type or Print) WELL DRILLER'S LICENSE NO. 3187-M

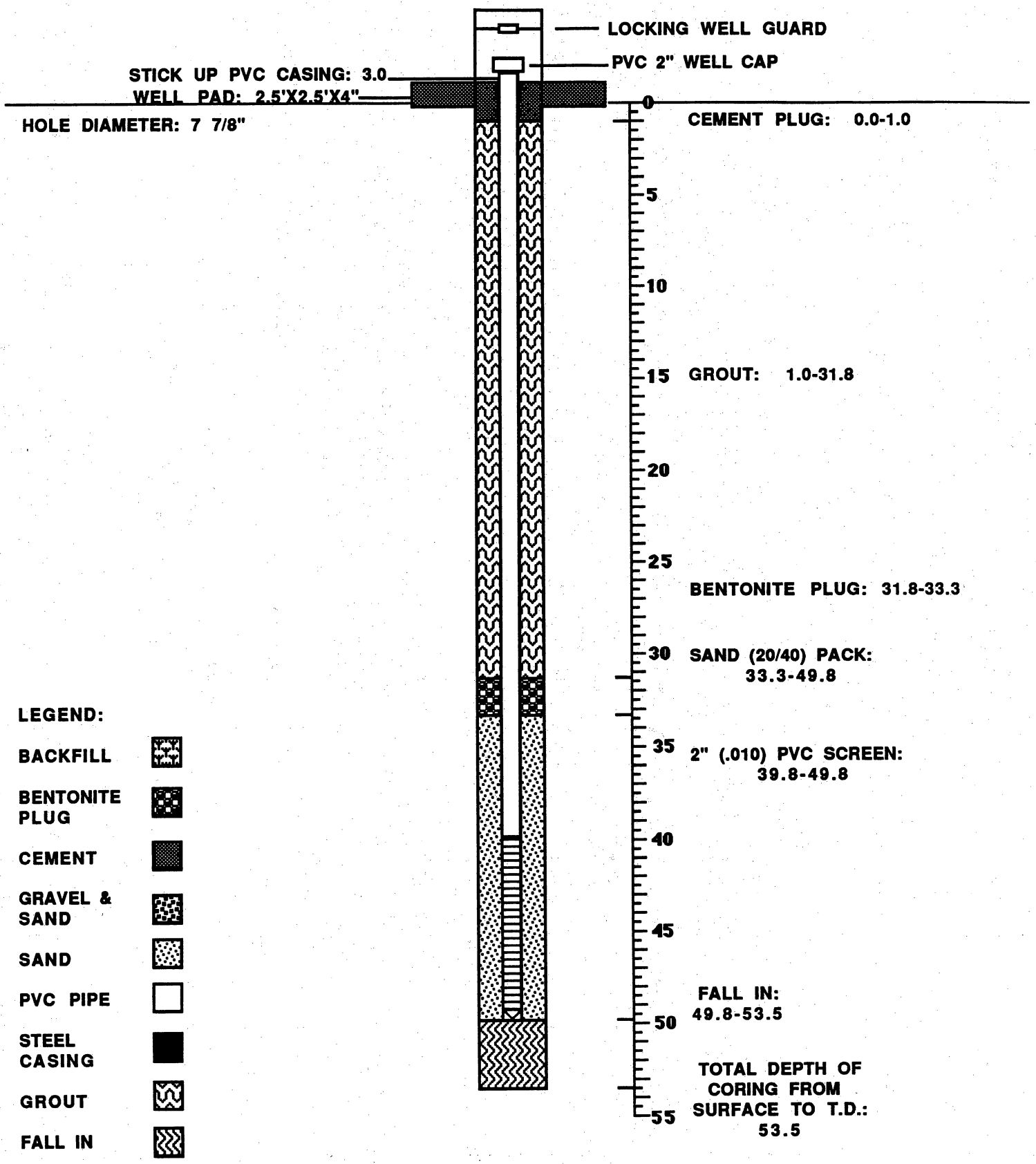
ADDRESS P.O. Box X University Station (Street or RFD) Austin (City) Texas (State) 78701 (Zip)

(Signed) _____ James Doss (Licensed Well Driller)

(Signed) _____ Jordan Forman (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

WATER MONITOR SCHEMATIC
CAMP BARKELEY #1
DRILL DATE: 12/3/95
NATIONAL GUARD PROJECT



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State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
P.O. Box 13087
Austin, Texas 78711-3087
512-239-0530

Camp Barkeley #2

1) OWNER Texas National Guard (Name) **ADDRESS** P.O. Box 5218 (Street or RFD) Austin (City) Tx (State) 78763 (Zip)

2) ADDRESS OF WELL: County Taylor — Camp Barkeley Buffalo Gap (Street, RFD or other) — Buffalo Gap (City) — Texas (State) — 79508 (Zip) — **GRID #** 30-41-5

3) TYPE OF WORK (Check):
☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Monitor ☐ Environmental Soil Boring ☐ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☒ Testwell

If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) ●
32° 19' 39"
99° 52' 2"
N

6) WELL LOG:
Date Drilling: Started 2/13 19 96 Completed 2/14 19 96

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
7 7/8	Surface	93.15

7) DRILLING METHOD (Check): ☐ Driven
☐ Air Rotary ☐ Mud Rotary ☒ Bored
☐ Air Hammer ☐ Cable Tool ☐ Jetted
☒ Other Augared

From (ft.)	To (ft.)	Description and color of formation material
0.0	3.4	Brown soil with caliche
3.4	8.4	Brown sandy soil
8.4	13.4	Light red sandy clay
13.4	91.0	Red clay spotted with green intervals
91.0	93.2	Very hard grey rock

(Use reverse side if necessary)

8) Borehole Completion (Check): ☐ Open Hole ☒ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other

If Gravel Packed give interval . . . from _____ ft. to _____ ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
2"	N	PVC Schedule 40 riser	2.5' Above Surface	78.5	
2"	N	PVC Schedule 40 screen	78.5	88.5	.010

9) CEMENTING DATA: [Rule 338.44(1)]

Cemented from _____ ft. to _____ ft. No. of Sacks Used _____
_____ ft. to _____ ft. No. of Sacks Used _____
Method used N/A
Cemented by
Distance to septic system field lines or other concentrated contamination N/A ft.
Method of verification of above distance N/A

10) SURFACE COMPLETION N/A
☐ Specified Surface Slab Installed [Rule 338.44 (2) (A)]
☐ Specified Steel Sleeve Installed [Rule 338.44 (3)(A)]
☐ Pitless Adapter Used [Rule 338.44 (3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

11) WATER LEVEL:
Static level _____ ft. below land surface Date _____
Artesian flow _____ gpm. Date _____

12) PACKERS: Type Depth

13) TYPE PUMP:
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other
Depth to pump bowls, cylinder, jet, etc., _____ ft.

14) WELL TESTS:
Type test: ☐ Pump ☐ Bailer ☐ Jetted
Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☐ No
Type of water? _____ Depth of strata _____
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

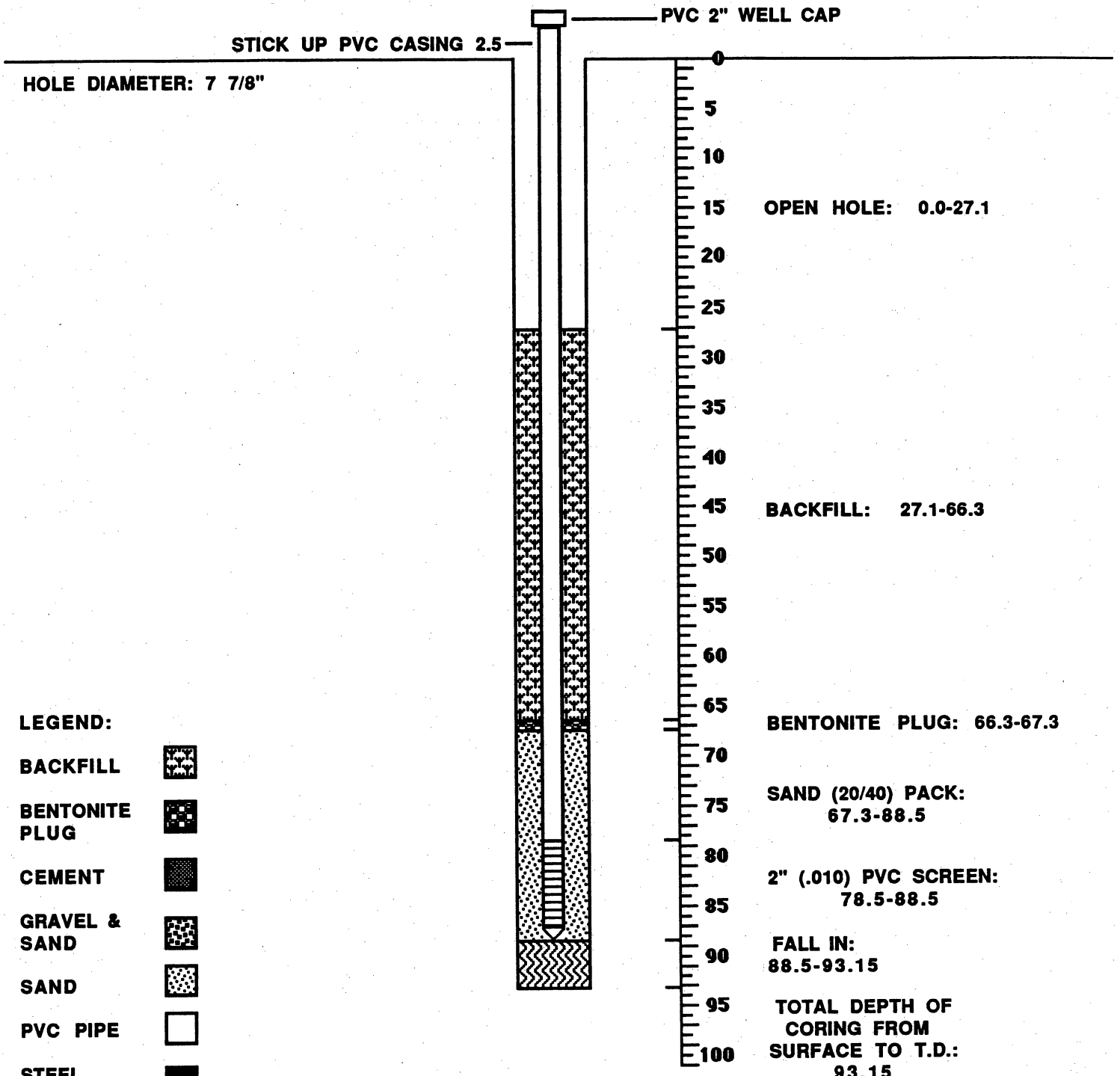
COMPANY NAME University of Texas/Bureau of Economic Geology (Type or Print) **WELL DRILLER'S LICENSE NO.** 3187-M

ADDRESS P.O. Box X University Station (Street or RFD) Austin (City) Texas (State) 78701 (Zip)

(Signed) James Doss (Licensed Well Driller) **(Signed)** Jordan Forman (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

WATER MONITOR SCHEMATIC
CAMP BARKELEY #2
DRILL DATE: 2/14/95
NATIONAL GUARD PROJECT



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ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
P.O. Box 13087
Austin, Texas 78711-3087
512-239-0530

Camp Bowie #1

1) OWNER Texas National Guard (Name) **ADDRESS** P.O. Box 5218 (Street or RFD) Austin (City) Tx (State) 78763 (Zip)

2) ADDRESS OF WELL: County Brown Camp Bowie Rt. 3 Box 181-A (Street, RFD or other) Brownwood (City) Texas (State) 76801-9734 (Zip) **GRID #** 41-17-9

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Monitor ☐ Environmental Soil Boring ☐ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☒ Testwell

If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) 31° 38' 42" 98° 54' 2" N

6) WELL LOG: Date Drilling: Started 1/25 19 96 Completed 1/25 19 96

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
7 7/8	Surface	53.8

7) DRILLING METHOD (Check): ☐ Driven ☐ Air Rotary ☐ Mud Rotary ☒ Bored ☐ Air Hammer ☐ Cable Tool ☐ Jetted ☒ Other Augered

From (ft.)	To (ft.)	Description and color of formation material
0.0	3.7	Dark brown topsoil
3.7	8.7	Dark brown clay
8.7	13.7	light brown clay & sand caliche
13.7	23.6	Light brown sand, small pebbles & caliche
23.6	33.9	Pilot bitted
33.9	44.2	Grey shale
44.2	53.8	Pilot bitted

(Use reverse side if necessary)

8) Borehole Completion (Check): ☐ Open Hole ☒ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other

If Gravel Packed give interval . . . from _____ ft. to _____ ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
2"	N	1 - 2" x 5' PVC riser	2.5' Above Surface	0.9	.010
2"	N	3 - 2" x 10' PVC riser	0.9	30.9	.010
2"	N	1 - 2" x 10' PVC screen	30.9	40.9	.010
2"	N	1 - 2" x 6" point			

9) CEMENTING DATA: [Rule 338.44(1)]

Cemented from 4" Above Surface ft. to 1.0 ft. No. of Sacks Used 3

_____ ft. to _____ ft. No. of Sacks Used _____

Method used Hand Poured

Cemented by Drill Crew

Distance to septic system field lines or other concentrated contamination N/A ft.

Method of verification of above distance N/A

10) SURFACE COMPLETION

☒ Specified Surface Slab Installed [Rule 338.44 (2) (A)]

☒ Specified Steel Sleeve Installed [Rule 338.44 (3)(A)]

☐ Pitless Adapter Used [Rule 338.44 (3)(b)]

☐ Approved Alternative Procedure Used [Rule 338.71]

11) WATER LEVEL:

Static level _____ ft. below land surface Date _____

Artesian flow _____ gpm. Date _____

12) PACKERS: Type Depth

13) TYPE PUMP: ☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other _____

Depth to pump bowls, cylinder, jet, etc., _____ ft.

14) WELL TESTS: Type test: ☐ Pump ☐ Bailer ☐ Jetted

Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) WATER QUALITY: Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☐ No

Type of water? _____ Depth of strata _____

Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

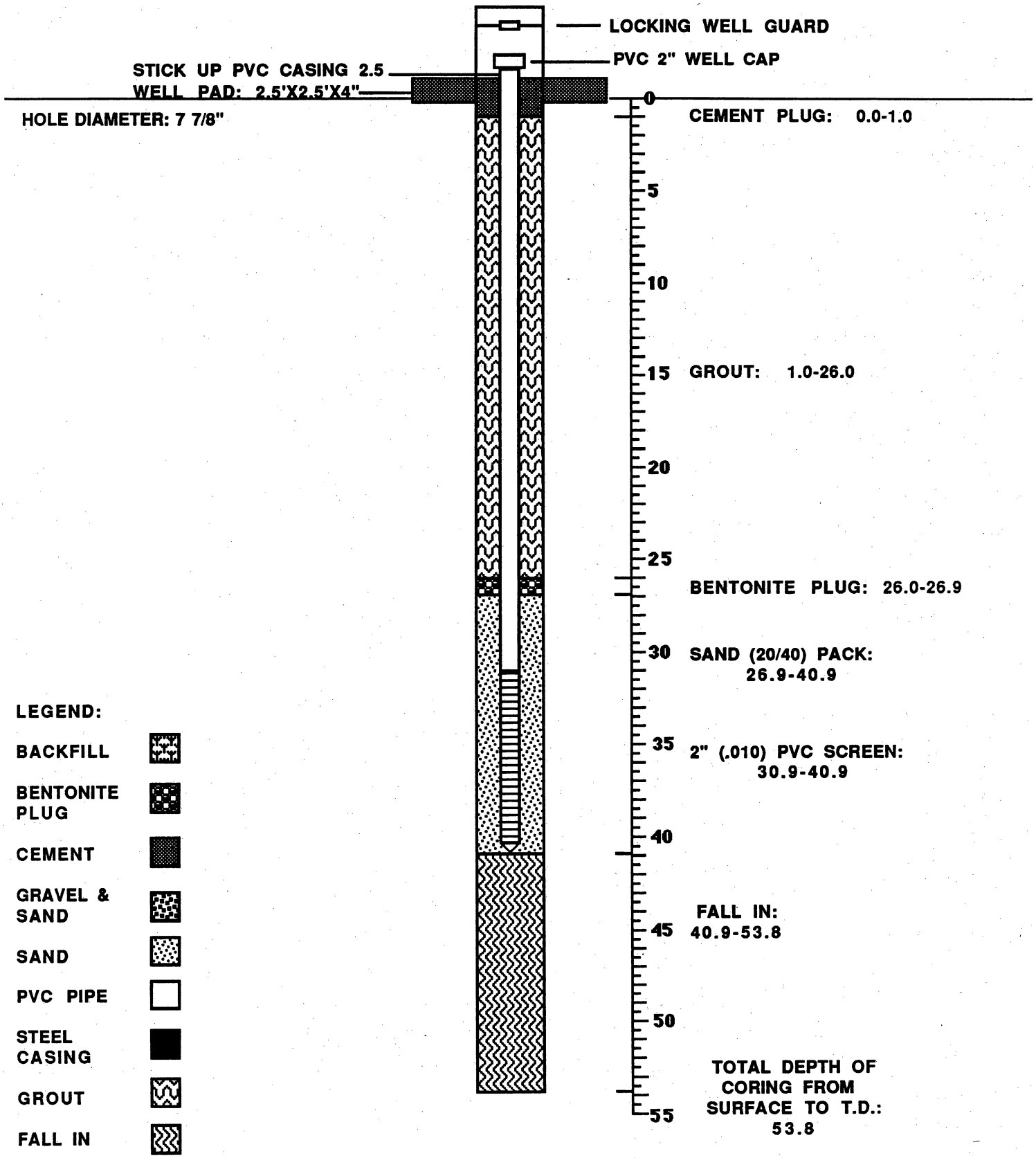
COMPANY NAME University of Texas/Bureau of Economic Geology (Type or Print) WELL DRILLER'S LICENSE NO. 3187-M

ADDRESS P.O. Box X University Station (Street or RFD) Austin (City) Texas (State) 78701 (Zip)

(Signed) _____ James Doss (Licensed Well Driller) **(Signed)** _____ Jordan Forman (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

WATER MONITOR SCHEMATIC
CAMP BOWIE #1
DRILL DATE: 1/25/96
NATIONAL GUARD PROJECT



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State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
P.O. Box 13087
Austin, Texas 78711-3087
512-239-0530

Camp Bowie #2

1) OWNER Texas National Guard (Name) **ADDRESS** P.O. Box 5218 (Street or RFD) Austin (City) Tx (State) 78763 (Zip)

2) ADDRESS OF WELL: County Brown Camp Bowie Rt. 3 Box 181-A (Street, RFD or other) Brownwood (City) Texas (State) 76801-9734 (Zip) **GRID #** 41-17-8

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Monitor ☐ Environmental Soil Boring ☐ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☒ Testwell

If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) 31° 38' 0" 98° 55' 35" N

6) WELL LOG: Date Drilling: Started 1/11 19 96 Completed 2/8 19 96

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
7 7/8	Surface	8.5
3 7/8	8.5	101.2

7) DRILLING METHOD (Check): ☐ Driven ☐ Air Rotary ☐ Mud Rotary ☒ Bored ☐ Air Hammer ☒ Cable Tool ☐ Jetted ☒ Other Augered

From (ft.)	To (ft.)	Description and color of formation material
0.0	8.5	Brown topsoil
8.5	19.6	Weathered limestone
19.6	24.6	Red stone, chert
24.6	25.2	Soft clay with sandstone
25.2	76.4	Red sand, small pebbles
76.4	95.2	Brown sands with grey clay
95.2	101.2	Brown clay, pebbles

(Use reverse side if necessary)

8) Borehole Completion (Check): ☐ Open Hole ☒ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other

If Gravel Packed give interval . . . from _____ ft. to _____ ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
2"	N	PVC Schedule 40 riser	2.5' Above Surface	81.2	
2"	N	PVC Schedule 40 screen	81.2	101.2	.010

9) CEMENTING DATA: [Rule 338.44(1)]

Cemented from 4" Above Surface ft. to 1.0 ft. No. of Sacks Used 3.5

_____ ft. to _____ ft. No. of Sacks Used _____

Method used Hand Poured

Cemented by Drill Crew

Distance to septic system field lines or other concentrated contamination N/A ft.

Method of verification of above distance N/A

10) SURFACE COMPLETION

☒ Specified Surface Slab Installed [Rule 338.44 (2) (A)]

☒ Specified Steel Sleeve Installed [Rule 338.44 (3)(A)]

☐ Pitless Adapter Used [Rule 338.44 (3)(b)]

☐ Approved Alternative Procedure Used [Rule 338.71]

11) WATER LEVEL:

Static level _____ ft. below land surface Date _____

Artesian flow _____ gpm. Date _____

12) PACKERS: Type Depth

13) TYPE PUMP: ☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other _____

Depth to pump bowls, cylinder, jet, etc., _____ ft.

14) WELL TESTS: Type test: ☐ Pump ☐ Bailer ☐ Jetted

Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) WATER QUALITY: Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☐ No

Type of water? _____ Depth of strata _____

Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

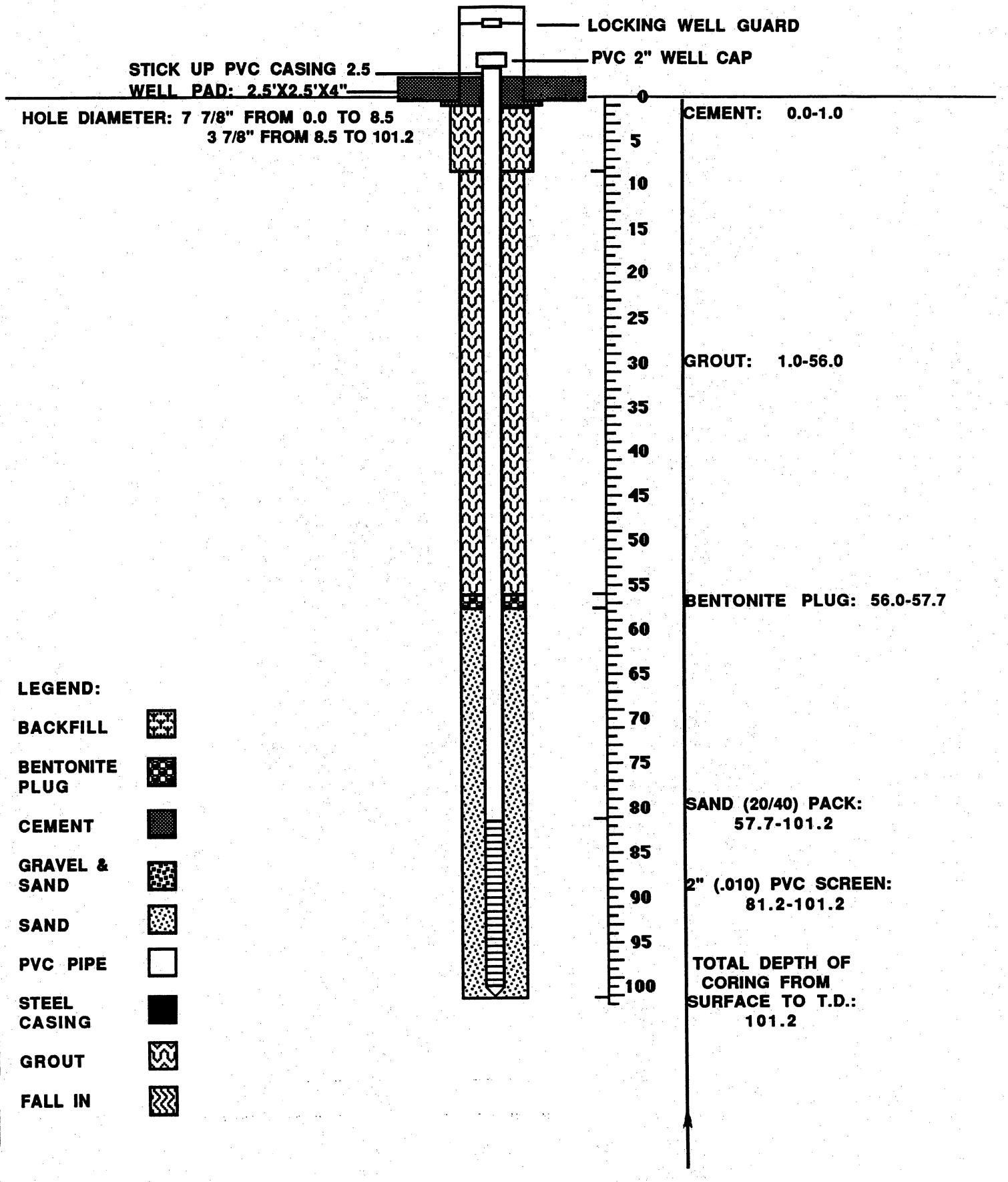
COMPANY NAME University of Texas/Bureau of Economic Geology (Type or Print) **WELL DRILLER'S LICENSE NO.** 3187-M

ADDRESS P.O. Box X University Station (Street or RFD) Austin (City) Texas (State) 78701 (Zip)

(Signed) _____ James Doss (Licensed Well Driller) (Signed) _____ Jordan Forman (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

WATER MONITOR SCHEMATIC
CAMP BOWIE #2
DRILL DATE: 2/8/96
NATIONAL GUARD PROJECT



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State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
P.O. Box 13087
Austin, Texas 78711-3087
512-239-0530

Camp Mabry #1

1) OWNER Texas National Guard (Name) **ADDRESS** P.O. Box 5218 (Street or RFD) Austin (City) Tx (State) 78763 (Zip)

2) ADDRESS OF WELL: County Travis — Camp Mabry 2210 W. 35th Street (Street, RFD or other) Austin (City) Texas (State) 78703 (Zip) **GRID #** 58-42-6

3) TYPE OF WORK (Check):
☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Monitor ☐ Environmental Soil Boring ☐ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☒ Testwell
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) 30° 18' 50" / 97° 45' 53" N

6) WELL LOG:
Date Drilling: Started 10/11 19 95 Completed ____ 19__

DIAMETER OF HOLE		
Dia. (in.)	From (ft.)	To (ft.)
7 7/8	Surface	41.
4 3/4	41.	122.2
3 7/8	122.2	151.45

7) DRILLING METHOD (Check): ☐ Driven ☐ Air Rotary ☒ Mud Rotary ☐ Bored ☐ Air Hammer ☒ Cable Tool ☐ Jetted ☐ Other ____

From (ft.)	To (ft.)	Description and color of formation material
		N/A Rock Bitted

8) Borehole Completion (Check): ☒ Open Hole ☒ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other ____
If Gravel Packed give interval . . . from ____ ft. to ____ ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
4"	N	4 1/2" - 4"x10' PVC Riser	1.8' Above Surface	41.4'	

(Use reverse side if necessary)

9) CEMENTING DATA: [Rule 338.44(1)]
Cemented from 4" Above Surface ft. to 2 ft. No. of Sacks Used 4
____ ft. to ____ ft. No. of Sacks Used ____
Method used Hand Poured
Cemented by Drill Crew
Distance to septic system field lines or other concentrated contamination N/A ft.
Method of verification of above distance N/A

10) SURFACE COMPLETION
☒ Specified Surface Slab Installed [Rule 338.44 (2) (A)]
☒ Specified Steel Sleeve Installed [Rule 338.44 (3)(A)]
☐ Pitless Adapter Used [Rule 338.44 (3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

11) WATER LEVEL:
Static level ____ ft. below land surface Date ____
Artesian flow ____ gpm. Date ____

12) PACKERS: Type Depth

13) TYPE PUMP:
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other ____
Depth to pump bowls, cylinder, jet, etc., ____ ft.

14) WELL TESTS:
Type test: ☐ Pump ☐ Bailer ☐ Jetted
Yield: ____ gpm with ____ ft. drawdown after ____ hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☐ No
Type of water? ____ Depth of strata ____
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME University of Texas/Bureau of Economic Geology (Type or Print) **WELL DRILLER'S LICENSE NO.** 3187-M

ADDRESS P.O. Box X University Station (Street or RFD) Austin (City) Texas (State) 78701 (Zip)

(Signed) ____ (Licensed Well Driller) James Doss

(Signed) ____ (Registered Driller Trainee) Jordan Forman

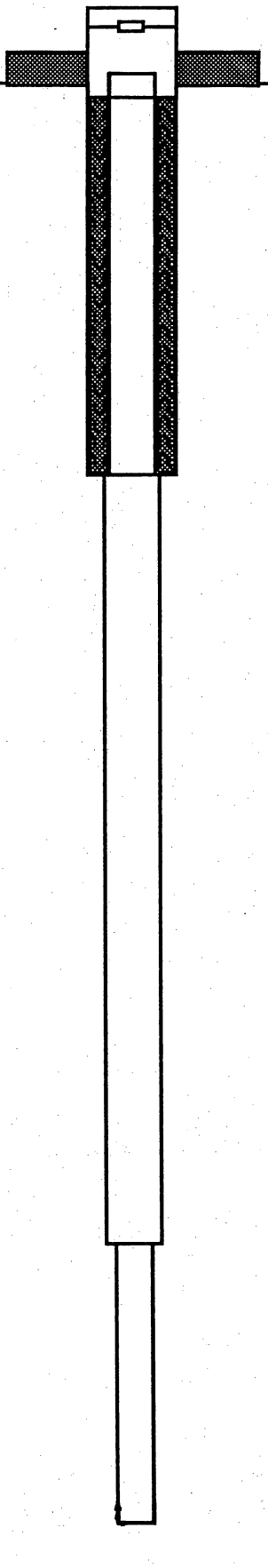
Please attach electric log, chemical analysis, and other pertinent information, if available.

WATER MONITOR SCHEMATIC
CAMP MABRY #1
DRILL DATE: 10/11/95
NATIONAL GUARD PROJECT

STICK UP PVC CASING 1.8'

WELL PAD: 4'X4'X4"

HOLE DIAMETER:
7 7/8" SURFACE TO 41.4'
4 3/4" FROM 41.4' TO 122.21'
3 7/8" FROM 122.21' TO 151.65'



STEEL SLEEVE: 2'
BELOW SURFACE

GROUT & PORTLAND
CEMENT MIX: 0.0'- 41.1'

LEGEND:

- GROUT & PORTLAND CEMENT MIX
- BACKFILL
- BENTONITE PLUG
- CEMENT
- GRAVEL & SAND
- SAND
- PVC PIPE
- STEEL CASING
- GROUT
- FALL IN

TOTAL DEPTH OF
CORING FROM
SURFACE TO T.D.:
151.65'

Send original copy by certified mail to: TNRCC, P.O. Box 13087, Austin, TX 78711-3087

Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
P.O. Box 13087
Austin, Texas 78711-3087
512-239-0530

Camp Maxey #1

1) **OWNER** Texas National Guard (Name) **ADDRESS** P.O. Box 5218 (Street or RFD) Austin (City) Tx (State) 78763 (Zip)

2) **ADDRESS OF WELL:** County Lamar; Camp Maxey Rt. 1 Box 169 (Street, RFD or other); Powderly (City); Texas (State); 75473-0169 (Zip); **GRID #** 17-12-5

3) **TYPE OF WORK (Check):** ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) **PROPOSED USE (Check):** ☒ Monitor ☐ Environmental Soil Boring ☐ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☒ Testwell

If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) 33° 47' 40" 95° 32' 31"

6) **WELL LOG:** Date Drilling: Started 11/11 19 95 Completed 11/11 19 95

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
7 7/8	Surface	8.5
3 1/4	8.5	53.

7) **DRILLING METHOD (Check):** ☐ Driven ☐ Air Rotary ☐ Mud Rotary ☒ Bored ☐ Air Hammer ☒ Cable Tool ☐ Jetted ☒ Other Augered

From (ft.)	To (ft.)	Description and color of formation material
		N/A ROCK BITTED

8) **Borehole Completion (Check):** ☐ Open Hole ☒ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other

If Gravel Packed give interval . . . from _____ ft. to _____ ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia (In.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
2"	N	PVC Schedule 40 - 20'	2.5' Above Surface	43.1	.010
2"	N	PVC Schedule 40 - 10'	43.1	53.1	.010

(Use reverse side if necessary)

9) **CEMENTING DATA:** [Rule 338.44(1)]

Cemented from 4" Above Surface ft. to 2.0 ft. No. of Sacks Used 3

_____ ft. to _____ ft. No. of Sacks Used _____

Method used Hand Poured

Cemented by Drill Crew

Distance to septic system field lines or other concentrated contamination N/A ft.

Method of verification of above distance N/A

10) **SURFACE COMPLETION**

☒ Specified Surface Slab Installed [Rule 338.44 (2) (A)]

☒ Specified Steel Sleeve Installed [Rule 338.44 (3)(A)]

☐ Pitless Adapter Used [Rule 338.44 (3)(b)]

☐ Approved Alternative Procedure Used [Rule 338.71]

11) **WATER LEVEL:**

Static level _____ ft. below land surface Date _____

Artesian flow _____ gpm. Date _____

12) **PACKERS:** Type Depth

13) **TYPE PUMP:**

☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder

☐ Other _____

Depth to pump bowls, cylinder, jet, etc., _____ ft.

14) **WELL TESTS:**

Type test: ☐ Pump ☐ Bailer ☐ Jetted

Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) **WATER QUALITY:**

Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☐ No

Type of water? _____ Depth of strata _____

Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

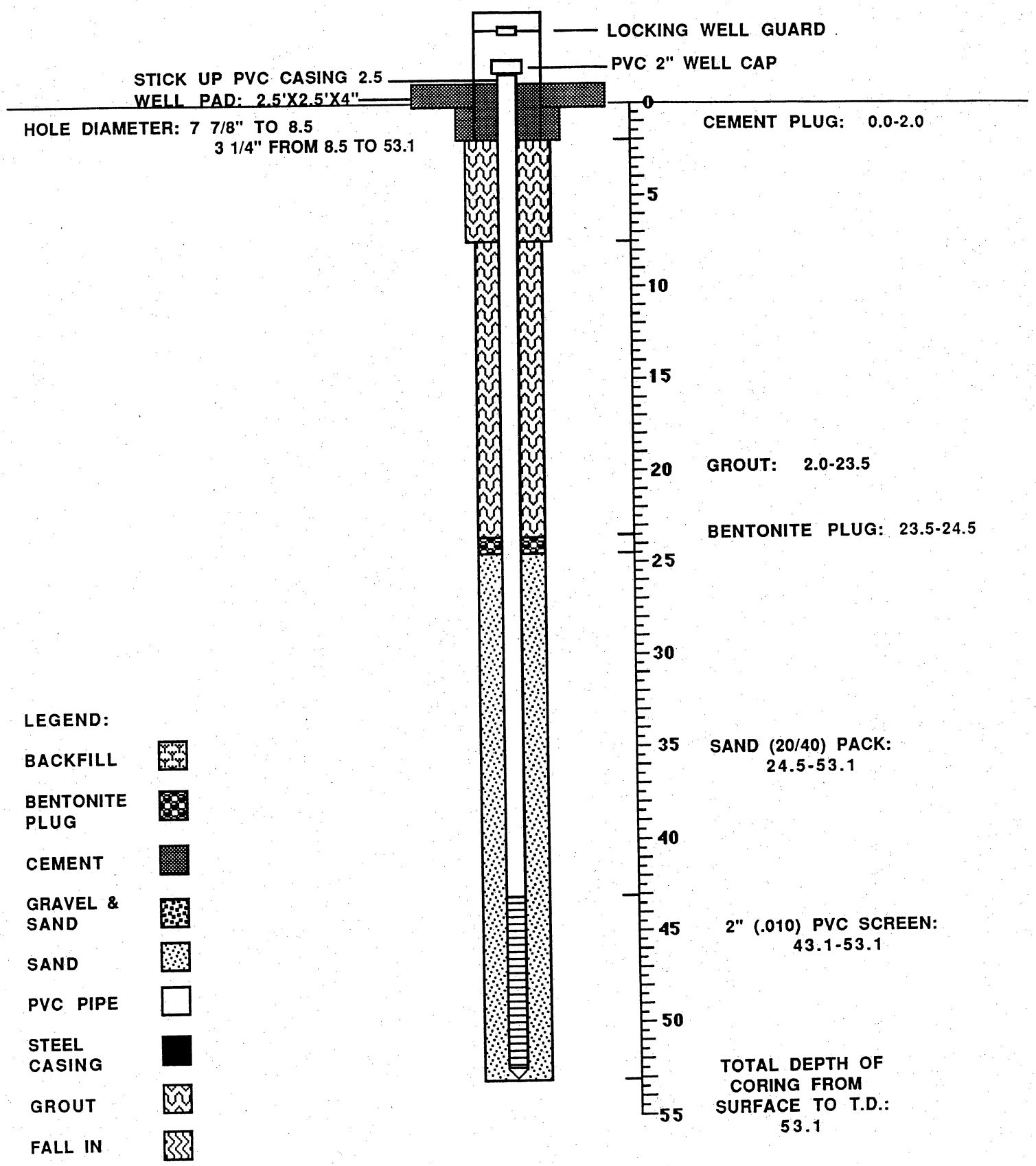
COMPANY NAME University of Texas/Bureau of Economic Geology (Type or Print) **WELL DRILLER'S LICENSE NO.** 3187-M

ADDRESS P.O. Box X University Station (Street or RFD) Austin (City) Texas (State) 78701 (Zip)

Signed James Doss (Licensed Well Driller) **Signed** Jordan Forman (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

WATER MONITOR SCHEMATIC
CAMP MAXEY #1
DRILL DATE: 11/11/95
NATIONAL GUARD PROJECT



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ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
P.O. Box 13087
Austin, Texas 78711-3087
512-239-0530

Camp Maxey #2A

1) OWNER Texas National Guard (Name) **ADDRESS** P.O. Box 5218 (Street or RFD) Austin (City) Tx (State) 78763 (Zip)

2) ADDRESS OF WELL: County Lamar — Camp Maxey Rt. 1 Box 169 (Street, RFD or other) Powderly (City) Texas (State) 75473-0169 (Zip) **GRID #** 17-12-8

3) TYPE OF WORK (Check):
☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Monitor ☐ Environmental Soil Boring ☐ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☒ Testwell

If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) 33° 46' 57" / 95° 32' 38" N

6) WELL LOG:
Date Drilling: Started 11/7 19 95 Completed 11/11 19 95

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
7 7/8	Surface	7.2
3 1/4	7.2	60.15

7) DRILLING METHOD (Check): ☐ Driven ☐ Air Rotary ☒ Mud Rotary ☒ Bored ☐ Air Hammer ☒ Cable Tool ☐ Jetted ☐ Other

From (ft.)	To (ft.)	Description and color of formation material
0.0	7.2	Red & grey clay
7.2	30.0	Red clay, large rocks, gravel, some fractures
30.0	43.7	Light tan clay with sand & black mottled clay
43.7	48.6	Light tan clay with sand mottled with grey clay
48.6	53.5	Washed out sand
53.5	60.15	Large pebbles, tan clay, grey shale, brown clay

(Use reverse side if necessary)

8) Borehole Completion (Check): ☐ Open Hole ☒ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other

If Gravel Packed give interval . . . from ____ ft. to ____ ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
2"	N	5 - 2" x 10' PVC riser	2.5' Above Surface	40.0	.010
2"	N	2 - 2" x 10' PVC riser	40.0	50.0	.010

9) CEMENTING DATA: [Rule 338.44(1)]

Cemented from 4" Above Surface ft. to 2.1 ft. No. of Sacks Used 3

____ ft. to ____ ft. No. of Sacks Used ____

Method used Hand Poured

Cemented by Drill Crew

Distance to septic system field lines or other concentrated contamination N/A ft.

Method of verification of above distance N/A

10) SURFACE COMPLETION

☒ Specified Surface Slab Installed [Rule 338.44 (2) (A)]

☒ Specified Steel Sleeve Installed [Rule 338.44 (3)(A)]

☐ Pitless Adapter Used [Rule 338.44 (3)(b)]

☐ Approved Alternative Procedure Used [Rule 338.71]

11) WATER LEVEL:

Static level ____ ft. below land surface Date ____

Artesian flow ____ gpm. Date ____

12) PACKERS: Type Depth

13) TYPE PUMP:
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other

Depth to pump bowls, cylinder, jet, etc., ____ ft.

14) WELL TESTS:
Type test: ☐ Pump ☐ Bailer ☐ Jetted

Yield: ____ gpm with ____ ft. drawdown after ____ hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☐ No

Type of water? ____ Depth of strata ____

Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

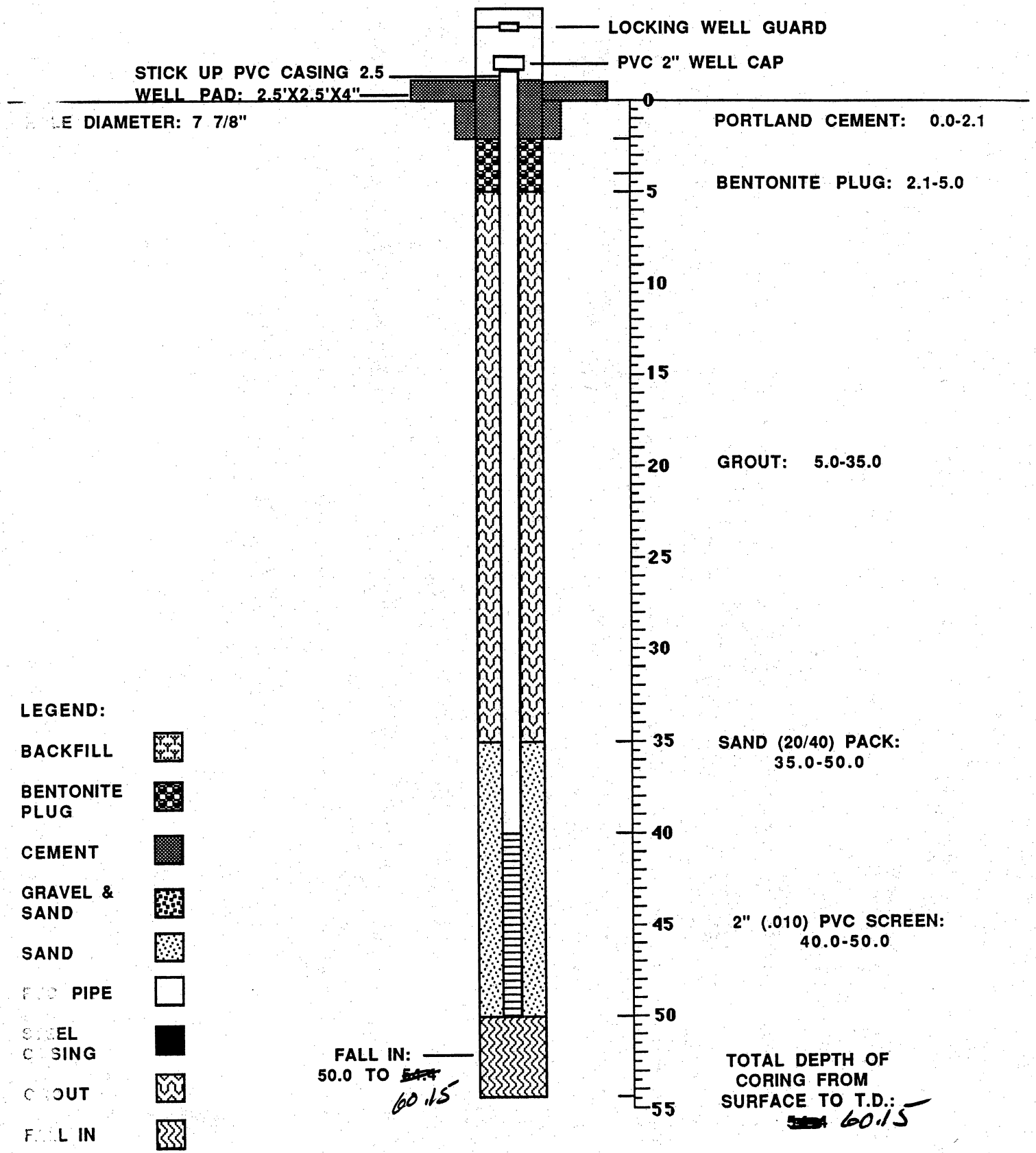
COMPANY NAME University of Texas/Bureau of Economic Geology (Type or Print) WELL DRILLER'S LICENSE NO. 3187-M

ADDRESS P.O. Box X University Station (Street or RFD) Austin (City) Texas (State) 78701 (Zip)

Signed James Doss (Licensed Well Driller) **Signed** Jordan Forman (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

WATER MONITOR SCHEMATIC
CAMP MAXEY #2A
DRILL DATE: 11/11/95
NATIONAL GUARD PROJECT



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State of Texas WELL REPORT

Texas Water Well Drillers Advisory Council
P.O. Box 13087
Austin, Texas 78711-3087
512-239-0530

Camp Swift #1

1) OWNER Texas National Guard (Name) **ADDRESS** P.O. Box 5218 (Street or RFD) Austin (City) Tx (State) 78763 (Zip)

2) ADDRESS OF WELL: County Bastrop — Camp Swift Rt. 2, Box 151-X (Street, RFD or other) Bastrop (City) Texas (State) 78602-9737 (Zip) **GRID #** 58-46-8

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Monitor ☐ Environmental Soil Boring ☐ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☒ Testwell

If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) ●
30° 17' 14"
97° 18' 26"
N

6) WELL LOG:
Date Drilling: Started 10/31 19 95 Completed 11/1 19 95

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
3 1/4	Surface	57.05

7) DRILLING METHOD (Check): ☐ Driven ☐ Air Rotary ☐ Mud Rotary ☐ Bored ☐ Air Hammer ☐ Cable Tool ☐ Jetted ☒ Other Rock bit

From (ft.)	To (ft.)	Description and color of formation material
		N/A Rock Bitted

8) Borehole Completion (Check): ☐ Open Hole ☒ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other

If Gravel Packed give interval . . . from _____ ft. to _____ ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
2"	N	PVC Schedule 40 - 40'	2' Above Surface	35.0 '	
2"	N	PVC Schedule 40 - 20'	35.0'	55.0'	.010

(Use reverse side if necessary)

9) CEMENTING DATA: [Rule 338.44(1)]

Cemented from 4" Above Surface ft. to 3.05 ft. No. of Sacks Used 4

_____ ft. to _____ ft. No. of Sacks Used _____

Method used Hand Poured

Cemented by Drill Crew

Distance to septic system field lines or other concentrated contamination N/A ft.

Method of verification of above distance N/A

10) SURFACE COMPLETION

☒ Specified Surface Slab Installed [Rule 338.44 (2) (A)]

☒ Specified Steel Sleeve Installed [Rule 338.44 (3)(A)]

☐ Pitless Adapter Used [Rule 338.44 (3)(b)]

☐ Approved Alternative Procedure Used [Rule 338.71]

13) TYPE PUMP:

☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder

☐ Other _____

Depth to pump bowls, cylinder, jet, etc., _____ ft.

14) WELL TESTS:

Type test: ☐ Pump ☐ Bailer ☐ Jetted

Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

11) WATER LEVEL:

Static level _____ ft. below land surface Date _____

Artesian flow _____ gpm. Date _____

15) WATER QUALITY:

Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☐ No

Type of water? _____ Depth of strata _____

Was a chemical analysis made? ☐ Yes ☐ No

12) PACKERS:

Type	Depth

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

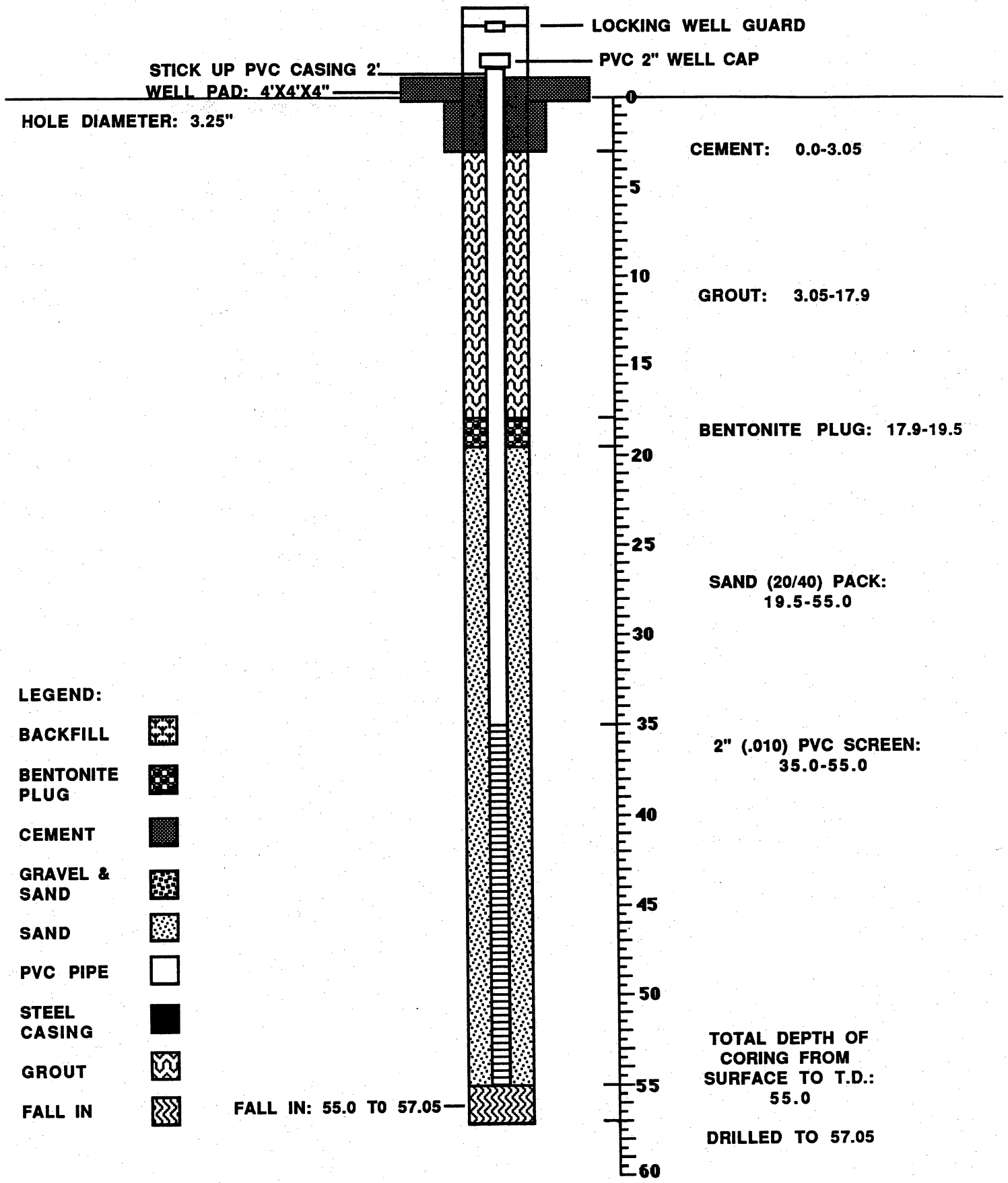
COMPANY NAME University of Texas/Bureau of Economic Geology (Type or Print) **WELL DRILLER'S LICENSE NO.** 3187-M

ADDRESS P.O. Box X University Station (Street or RFD) Austin (City) Texas (State) 78701 (Zip)

(Signed) _____ (Licensed Well Driller) James Doss **(Signed)** _____ (Registered Driller Trainee) Jordan Forman

Please attach electric log, chemical analysis, and other pertinent information, if available.

WATER MONITOR SCHEMATIC
CAMP SWIFT #1
DRILL DATE: 11/1/95
NATIONAL GUARD PROJECT



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State of Texas WELL REPORT

Texas Water Well Drillers Advisory Council
P.O. Box 13087
Austin, Texas 78711-3087
512-239-0530

Camp Swift #2

1) OWNER Texas National Guard (Name) ADDRESS P.O. Box 5218 (Street or RFD) Austin (City) Tx (State) 78763 (Zip)

2) ADDRESS OF WELL: County Bastrop — Camp Swift Rt. 2, Box 151- (Street, RFD or other) Bastrop (City) Texas (State) 78602-9737 (Zip) GRID # 58-54-3

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Monitor ☐ Environmental Soil Boring ☐ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) 30° 14' 32" / 97° 17' 9" N

6) WELL LOG: Date Drilling: Started 1/3 19 96 Completed 1/3 19 96

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
7 7/8	Surface	50.95

7) DRILLING METHOD (Check): ☐ Driven ☐ Air Rotary ☐ Mud Rotary ☐ Bored ☐ Air Hammer ☐ Cable Tool ☐ Jetted ☒ Other Augered

From (ft.)	To (ft.)	Description and color of formation material
0.0	13.5	Light brown sand
13.5	23.5	Light brown, red and grey clay
23.5	28.5	Dark brown clay with sand
28.5	48.5	Light black flakey sand & clay
48.5	50.75	Grey and dark brown clay
50.75	50.95	Grey rock

8) Borehole Completion (Check): ☐ Open Hole ☒ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other
If Gravel Packed give interval . . . from ____ ft. to ____ ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
2"	N	PVC Schedule 40 - 50'	2.5' Above Surface	40.9	
2"	N	PVC Schedule 40 - 10'	40.9	50.9'	.010

(Use reverse side if necessary)

9) CEMENTING DATA: [Rule 338.44(1)]
Cemented from 4" Above Surface ft. to 1.0 ft. No. of Sacks Used 2
____ ft. to ____ ft. No. of Sacks Used ____
Method used Hand Poured
Cemented by Drill Crew
Distance to septic system field lines or other concentrated contamination N/A ft.
Method of verification of above distance N/A

10) SURFACE COMPLETION
☒ Specified Surface Slab Installed [Rule 338.44 (2) (A)]
☒ Specified Steel Sleeve Installed [Rule 338.44 (3)(A)]
☐ Pitless Adapter Used [Rule 338.44 (3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

11) WATER LEVEL:
Static level ____ ft. below land surface Date ____
Artesian flow ____ gpm. Date ____

12) PACKERS: Type Depth

13) TYPE PUMP:
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other
Depth to pump bowls, cylinder, jet, etc., ____ ft.

14) WELL TESTS:
Type test: ☐ Pump ☐ Bailer ☐ Jetted
Yield: ____ gpm with ____ ft. drawdown after ____ hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☐ No
Type of water? ____ Depth of strata ____
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME University of Texas/Bureau of Economic Geology (Type or Print) WELL DRILLER'S LICENSE NO. 3187-M

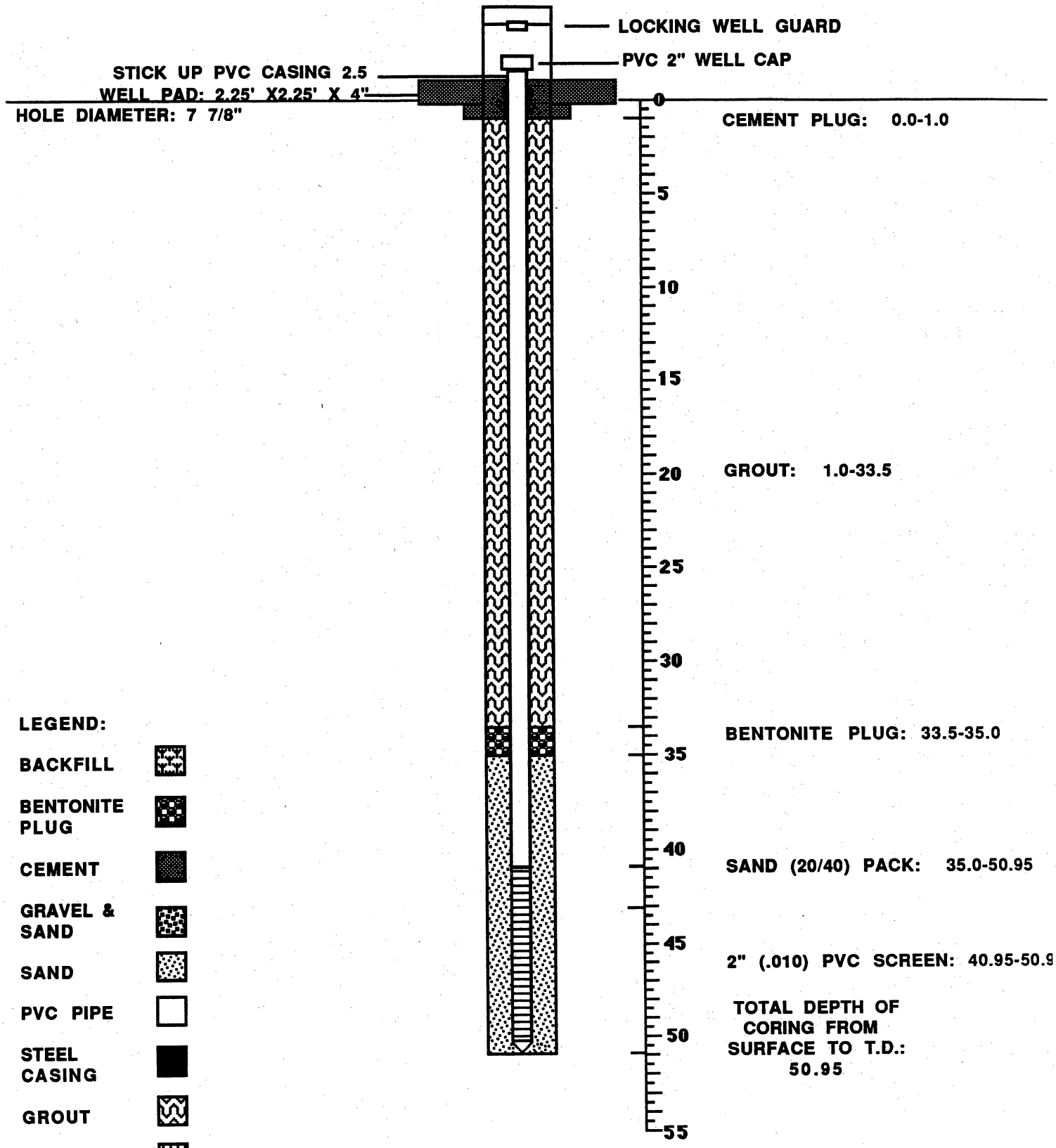
ADDRESS P.O. Box X University Station (Street or RFD) Austin (City) Texas (State) 78701 (Zip)

(Signed) James Doss (Licensed Well Driller) (Signed) Jordan Forman (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

TNRCC-0199 (Rev. 11-01-94) TNRCC COPY

WATER MONITOR SCHEMATIC
CAMP SWIFT #2
DRILL DATE: 1/3/96
NATIONAL GUARD PROJECT



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ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
P.O. Box 13087
Austin, Texas 78711-3087
512-239-0530

Fort Wolters #2A

1) OWNER Texas National Guard (Name) **ADDRESS** P.O. Box 5218 (Street or RFD) Austin (City) Tx (State) 78763 (Zip)

2) ADDRESS OF WELL: County Parker — Fort Wolters Rt. 4 Bldg 1202 (Street, RFD or other) Mineral Wells (City) Texas (State) 76067-9500 (Zip) **GRID #** 31-16-3

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Monitor ☐ Environmental Soil Boring ☐ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☒ Testwell

If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) 32° 52' 6" — 98° 2' 6"

6) WELL LOG:

Date Drilling: Started 12/4 19 95 — Completed 12/5 19 95

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
7 7/8	Surface	52.

7) DRILLING METHOD (Check): ☐ Driven ☐ Air Rotary ☐ Mud Rotary ☒ Bored ☐ Air Hammer ☒ Cable Tool ☐ Jetted ☒ Other Augered

From (ft.)	To (ft.)	Description and color of formation material
0.0	3.5	Brown top soil
3.5	18.5	Tan clay with caliche
18.5	23.5	Clay, gravel, sand, water
23.5	52.2	Shale and sand

(Use reverse side if necessary)

8) Borehole Completion (Check): ☐ Open Hole ☒ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other

If Gravel Packed give interval . . . from _____ ft. to _____ ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
2"	N	PVC Schedule 40 - 20'	2.5' Above Surface	20.5	
2"	N	PVC Schedule 40 - 10'	20.5	30.5	.010
2"	N	PVC Schedule 40 - 20'	30.5	50.2	

9) CEMENTING DATA: [Rule 338.44(1)]

Cemented from 4" Above Surface ft. to 3.0 ft. No. of Sacks Used 4

_____ ft. to _____ ft. No. of Sacks Used _____

Method used Hand Poured

Cemented by Drill Crew

Distance to septic system field lines or other concentrated contamination N/A ft.

Method of verification of above distance N/A

10) SURFACE COMPLETION

☒ Specified Surface Slab Installed [Rule 338.44 (2) (A)]

☒ Specified Steel Sleeve Installed [Rule 338.44 (3)(A)]

☐ Pitless Adapter Used [Rule 338.44 (3)(b)]

☐ Approved Alternative Procedure Used [Rule 338.71]

11) WATER LEVEL:

Static level _____ ft. below land surface Date _____

Artesian flow _____ gpm. Date _____

12) PACKERS: Type Depth

13) TYPE PUMP:

☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other _____

Depth to pump bowls, cylinder, jet, etc., _____ ft.

14) WELL TESTS:

Type test: ☐ Pump ☐ Bailer ☐ Jetted

Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) WATER QUALITY:

Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☐ No

Type of water? _____ Depth of strata _____

Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME University of Texas/Bureau of Economic Geology (Type or Print) WELL DRILLER'S LICENSE NO. 3187-M

ADDRESS P.O. Box X University Station (Street or RFD) Austin (City) Texas (State) 78701 (Zip)

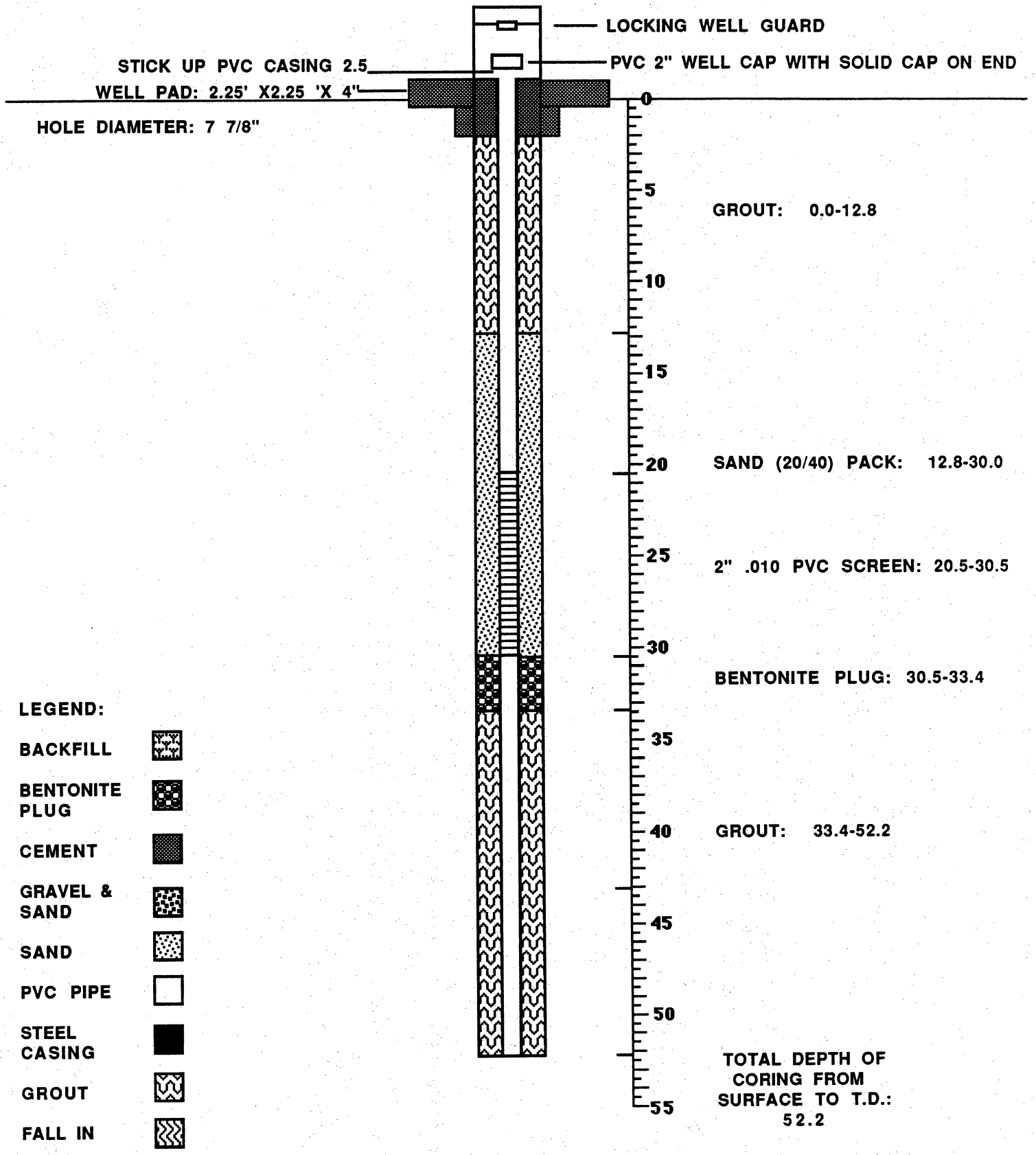
(Signed) _____ James Doss (Licensed Well Driller)

(Signed) _____ Jordan Forman (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

TNRCC-0199 (Rev. 11-01-94) TNRCC COPY

WATER MONITOR SCHEMATIC
FORT WOLTERS #2A
DRILL DATE: 12/5/95
NATIONAL GUARD PROJECT



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State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
P.O. Box 13087
Austin, Texas 78711-3087
512-239-0530

Fort Wolters #1

1) OWNER Texas National Guard (Name) **ADDRESS** P.O. Box 5218 (Street or RFD) Austin (City) Tx (State) 78763 (Zip)

2) ADDRESS OF WELL: County Parker — Fort Wolters Rt. 4 Bldg 1202 (Street, RFD or other) Mineral Wells (City) Texas (State) 76067-9500 (Zip) **GRID #** 31-16-2

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Monitor ☐ Environmental Soil Boring ☐ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☒ Testwell

If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) 32° 51' 34" / 98° 2' 31" N

6) WELL LOG:
Date Drilling: Started 11/28 19 95 Completed 12/1 19 95

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
7 7/8	Surface	9.3
3 1/4	9.3	73.9

7) DRILLING METHOD (Check): ☐ Driven ☐ Air Rotary ☐ Mud Rotary ☒ Bored ☐ Air Hammer ☒ Cable Tool ☐ Jetted ☒ Other Augered, N/X Wireline

From (ft.)	To (ft.)	Description and color of formation material
0.0	3.6	Red, sandy clay
3.6	54.1	Sandstone, weathered limestone
54.1	73.9	Grey shale

(Use reverse side if necessary)

8) Borehole Completion (Check): ☐ Open Hole ☒ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other

If Gravel Packed give interval . . . from _____ ft. to _____ ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
2"	N	PVC Schedule 40 - 65'	2.5' Above Surface	63.9	
2"	N	PVC Schedule 40 - 10'	63.9	73.9	.010

9) CEMENTING DATA: [Rule 338.44(1)]

Cemented from 4" Above Surface ft. to 3.0 ft. No. of Sacks Used 3

_____ ft. to _____ ft. No. of Sacks Used _____

Method used Hand Poured

Cemented by Drill Crew

Distance to septic system field lines or other concentrated contamination N/A ft.

Method of verification of above distance N/A

10) SURFACE COMPLETION

☒ Specified Surface Slab Installed [Rule 338.44 (2) (A)]

☒ Specified Steel Sleeve Installed [Rule 338.44 (3)(A)]

☐ Pitless Adapter Used [Rule 338.44 (3)(b)]

☐ Approved Alternative Procedure Used [Rule 338.71]

11) WATER LEVEL:

Static level _____ ft. below land surface Date _____

Artesian flow _____ gpm. Date _____

12) PACKERS: Type Depth

13) TYPE PUMP:
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other _____
Depth to pump bowls, cylinder, jet, etc., _____ ft.

14) WELL TESTS:
Type test: ☐ Pump ☐ Bailer ☐ Jetted
Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☐ No
Type of water? _____ Depth of strata _____
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

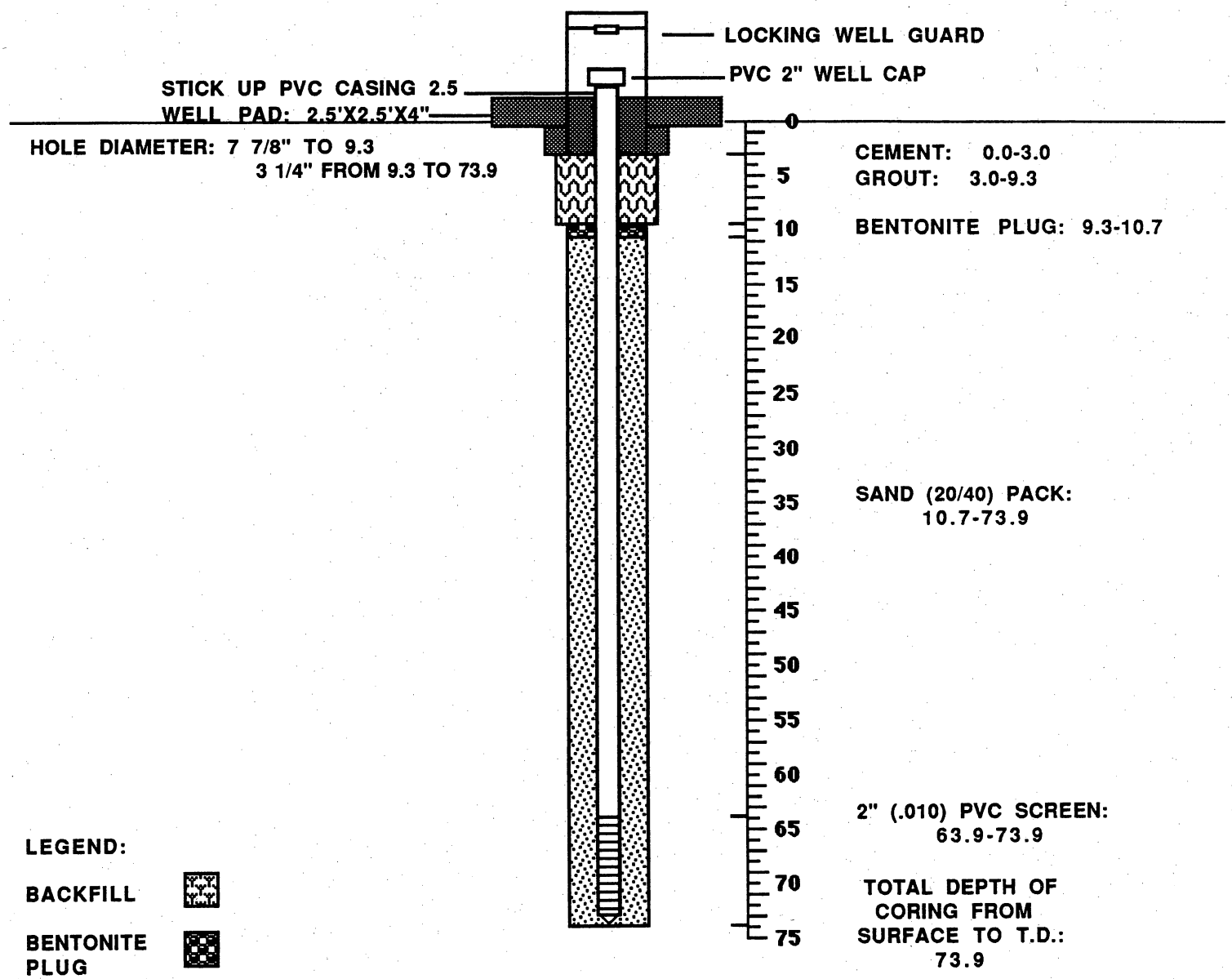
COMPANY NAME University of Texas/Bureau of Economic Geology (Type or Print) **WELL DRILLER'S LICENSE NO.** 3187-M

ADDRESS P.O. Box X University Station (Street or RFD) Austin (City) Texas (State) 78701 (Zip)

Signed _____ (Licensed Well Driller) James Doss **(Signed)** _____ (Registered Driller Trainee) Jordan Forman

Please attach electric log, chemical analysis, and other pertinent information, if available.

WATER MONITOR SCHEMATIC
FORT WOLTERS #1
DRILL DATE: 12/1/95
NATIONAL GUARD PROJECT



LEGEND:

- BACKFILL
- BENTONITE PLUG
- CEMENT
- GRAVEL & SAND
- SAND
- PVC PIPE
- STEEL CASING
- GROUT
- FALL IN