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

Interim Report

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<table>
<thead>
<tr>
<th>CONTENTS</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>METHODS</td>
<td>1</td>
</tr>
<tr>
<td>Monitor Well Installation</td>
<td>2</td>
</tr>
<tr>
<td>Floodplain Analysis</td>
<td>2</td>
</tr>
<tr>
<td>CAMP BARKELEY</td>
<td>4</td>
</tr>
<tr>
<td>Drilling Reports</td>
<td>4</td>
</tr>
<tr>
<td>Floodplain Analysis</td>
<td>4</td>
</tr>
<tr>
<td>CAMP BOWIE</td>
<td>5</td>
</tr>
<tr>
<td>Drilling reports</td>
<td>5</td>
</tr>
<tr>
<td>Floodplain analysis</td>
<td>5</td>
</tr>
<tr>
<td>CAMP MABRY</td>
<td>5</td>
</tr>
<tr>
<td>Drilling reports</td>
<td>5</td>
</tr>
<tr>
<td>Floodplain analysis</td>
<td>6</td>
</tr>
<tr>
<td>CAMP MAXEY</td>
<td>6</td>
</tr>
<tr>
<td>Drilling reports</td>
<td>6</td>
</tr>
<tr>
<td>Floodplain analysis</td>
<td>6</td>
</tr>
<tr>
<td>CAMP SWIFT</td>
<td>7</td>
</tr>
<tr>
<td>Drilling reports</td>
<td>7</td>
</tr>
<tr>
<td>Floodplain analysis</td>
<td>7</td>
</tr>
<tr>
<td>FORT WOLTERS</td>
<td>7</td>
</tr>
<tr>
<td>Drilling reports</td>
<td>7</td>
</tr>
<tr>
<td>Floodplain analysis</td>
<td>8</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>8</td>
</tr>
<tr>
<td>APPENDIX</td>
<td>11</td>
</tr>
</tbody>
</table>
FIGURES

1. Locations of monitor wells drilled on Camp Barkeley.
2. One-hundred year flood hydrographs for Camp Barkeley.
3. Floodplain map for Camp Barkeley.
4. Locations of monitor wells drilled on Camp Bowie.
5. One-hundred year flood hydrographs for Camp Bowie.
6. Floodplain map for Camp Bowie.
7. Locations of monitor wells drilled on Camp Mabry.
8. One-hundred year flood hydrographs for Camp Mabry.
9. Floodplain map for Camp Mabry.
10. Locations of monitor wells drilled on Camp Maxey.
11. One-hundred year flood hydrographs for Camp Maxey.
12. Floodplain map for Camp Maxey.
13. Locations of monitor wells drilled on Camp Swift.
14. Floodplain map for Camp Swift.
15. Locations of monitor wells drilled on Fort Wolters.
16. One-hundred year flood hydrographs for Fort Wolters.
17. Floodplain map for Fort Wolters.
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):

$$ t_p = C_l \left( \frac{L}{\sqrt{s}} \right)^n $$

where $C_l$ 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 \( C_l \) 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 \( L, L_f \), and \( s \) from USGS 1:24000 topographic sheets. We estimated the routing travel time constant, \( K \), using (Linsley and others, 1949, p. 465-541):

\[
K = \frac{bL\sqrt{A}}{\sqrt{s}}
\]

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 northwest tributary to Rocky Creek (fig. 17d for point C in fig 16).

REFERENCES


ESRI, 1993, Cell-based modeling with Grid: ArcInfo user's guide, Environmental Systems Research Institute, Redmond, California, variously paginated.


Herschfield, D. M., 1961, Rainfall frequency atlas of the United States, for durations from 30 minutes to 24 hours and return periods from 1 to 100 years: U.S. Weather Bureau, Technical Report 40.


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. Monitor 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
# WELL REPORT

## 1) OWNER
- Texas National Guard

## 2) ADDRESS OF WELL
- Taylor
- Camp Barkeley
- Buffalo Gap
- Buffalo Gap
- Texas
- 79508

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

## 5) GRID #
- 30-41-5

## 7) DRILLING METHOD (Check):
- [] Driven
- [] Air Rotary
- [] Mud Rotary
- [] Bored
- [] Air Hammer
- [] Cable Tool
- [] Jetted
- [] Other
- Augered

## 8) Borehole Completion (Check):
- [] Open Hole
- [] Straight Wall
- [] Underreamed
- [] Gravel Packed
- [] Other

## 9) CEMENTING DATA:
- [Rule 338.44(1)]
- Cemented from
- 4" Above Surface
- ft. to 1.0 ft.
- No. of Sacks Used
- 3.5
- 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)]
- Pitts 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

---

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 resubmission.

**COMPANY NAME**
- University of Texas/Bureau of Economic Geology

**WELL DRILLER'S LICENSE NO.**
- 3187-M

**ADDRESS**
- P.O. Box X University Station
- Austin
- Texas
- 78701

**Signed**
- [Signature]

**(Licensed Well Driller)**
- [Signature]

(Registered Driller Trainee)

Jordan Fornan

---

Please attach electric log, chemical analysis, and other pertinent information, if available.
STICK UP PVC CASING: 3.0
WELL PAD: 2.5'x2.5'x4"
HOLE DIAMETER: 7 7/8"

LOCKING WELL GUARD
PVC 2" WELL CAP

CEMENT PLUG: 0.0-1.0

GROUT: 1.0-31.8

BENTONITE PLUG: 31.8-33.3

SAND (20/40) PACK:
33.3-49.8

2" (.010) PVC SCREEN:
39.8-49.8

FALL IN:
49.8-53.5

TOTAL DEPTH OF CORING FROM SURFACE TO T.D.: 53.5

LEGEND:
BACKFILL
BENTONITE PLUG
CEMENT
GRAVEL & SAND
SAND
PVC PIPE
STEEL CASING
GROUT
FALL IN
### State of Texas
#### WELL REPORT

**Camp Barkeley #2**

1) **OWNER**: Texas National Guard  
2) **ADDRESS**: P.O. Box 5218  
   **Austin**, **Texas** 78763  
3) **County**: Taylor  
   **Camp Barkeley**, **Buffalo Gap**  
   **Buffalo Gap**, **Texas** 79508  
4) **GRID**: 30-41-5

#### 3) TYPE OF WORK (Check):  
- New Well
- Deepening
- Reconditioning
- Plugging

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

5) **WELL LOG**:  
   **WELL LOG**:  
   **Date Drilling**:
   - Started: 2/13  
   - Completed: 2/14
   **DIA. (In.)**
   **From (ft.)**
   **To (ft.)**
   - 7.76  
   - 93.15
   **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

6) **DIAMETER OF HOLE**
   - Surface: 93.15

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

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

9) **CASING, BLANK PIPE, AND WELL SCREEN DATA**
   - **DIA. (In.)**
   - **New or Used**
   - **Steel, Plastic, etc. Perf., Slotted, etc.**
   - **Screen Mfr., if commercial**
   - **Setting (ft.)**
   - **From**
   - **To**
   - **Gage Casting Screen**
   - 2
   - N
   - PVC Schedule 40 riser
   - 78.5
   - 88.5
   - 0.10

10) **CEMENTING DATA**
    - **Cemented from**
    - **to**
    - **ft.**
    - **No. of Sacks Used**
    - **Method used**
    - **Cemented by**
    - **Distance to septic system field lines or other concentrated contamination**
    - **N/A**

11) **SURFACE COMPLETION**
    - **N/A**

12) **PACKERS**
    - **Type**
    - **Depth**

---

**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  
**WELL DRILLER'S LICENSE NO.**: 3187-M

**ADDRESS**: P.O. Box X University Station  
   **Austin**, **Texas** 78701

**Signed**: James Doss (Signed)  
   (Registered Driller Trainee)

---

**TNRCC-0198 (Rev. 11-01-94)**
WATER MONITOR SCHEMATIC
CAMP BARKELEY #2
DRILL DATE: 2/14/95
NATIONAL GUARD PROJECT

STICK UP PVC CASING 2.5

HOLE DIAMETER: 7 7/8"

PVC 2" WELL CAP

OPEN HOLE: 0.0-27.1

BACKFILL: 27.1-66.3

BENTONITE PLUG: 66.3-67.3

SAND (20/40) PACK: 67.3-88.5

2" (.010) PVC SCREEN: 78.5-88.5

FALL IN: 88.5-93.15

TOTAL DEPTH OF CORING FROM SURFACE TO T.D.: 93.15

LEGEND:
BACKFILL
BENTONITE PLUG
CEMENT
GRAVEL & SAND
SAND
PVC PIPE
STEEL CASING
GROUT
FALL IN
# State of Texas
## WELL REPORT
### Camp Bowie #1

<table>
<thead>
<tr>
<th>1) OWNER</th>
<th>Texas National Guard</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADDRESS</td>
<td>P.O. Box 5218</td>
</tr>
<tr>
<td></td>
<td>Austin TX 78763</td>
</tr>
</tbody>
</table>

| 2) ADDRESS OF WELL:       | Camp Bowie Rt. 3 Box 181-A |
|                          | Brownwood Texas 76801-9734 |

| 3) TYPE OF WORK (Check):  | • New Well  □ Deepening |
|                          | • Reconditioning □ Plugging |

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

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

<table>
<thead>
<tr>
<th>5) GRID #</th>
<th>41-17-9</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>6) WELL LOG:</th>
<th>Dia. (in.)</th>
<th>From (ft.)</th>
<th>To (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Started</td>
<td>7/7/6</td>
<td>3.7</td>
<td>8.7</td>
</tr>
<tr>
<td>Completed</td>
<td>23.6</td>
<td>33.9</td>
<td>44.2</td>
</tr>
<tr>
<td></td>
<td>Pilot bitted</td>
<td>Pilot bitted</td>
<td>Pilot bitted</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>From (ft.)</th>
<th>To (ft.)</th>
<th>Description and color of formation material</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>3.7</td>
<td>Dark brown topsoil</td>
</tr>
<tr>
<td>3.7</td>
<td>8.7</td>
<td>Dark brown clay</td>
</tr>
<tr>
<td>8.7</td>
<td>13.7</td>
<td>Light brown clay &amp; sand caliche</td>
</tr>
<tr>
<td>13.7</td>
<td>23.6</td>
<td>Light brown sand, small pebbles &amp; caliche</td>
</tr>
</tbody>
</table>

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

| 8) Borehole Completion (Check): | □ Open Hole  □ Straight Wall  |
|                                | □ Undrained  □ Gravel Packed  □ Other |

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

<table>
<thead>
<tr>
<th>9) CASING, BLANK PIPE, AND WELL SCREEN DATA:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth (ft.)</td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>10) SURFACE COMPLETION:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Specified Surface Slab Installed [Rule 338.44 (2) (A)]</td>
</tr>
<tr>
<td>□ Specified Steel Sleeve Installed [Rule 338.44 (3)(A)]</td>
</tr>
<tr>
<td>□ Pinless Adapter Used [Rule 338.44 (3)(b)]</td>
</tr>
<tr>
<td>□ Approved Alternative Procedure Used [Rule 338.71]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>11) WATER LEVEL:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static level ft. below land surface Date</td>
</tr>
<tr>
<td>Artesian flow gpm. Date</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>12) PACKERS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type Depth</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>COMPANY NAME</th>
<th>University of Texas/Bureau of Economic Geology</th>
</tr>
</thead>
<tbody>
<tr>
<td>WELL DRILLER'S LICENSE NO.</td>
<td>3187-M</td>
</tr>
<tr>
<td>ADDRESS</td>
<td>P.O. Box X University Station</td>
</tr>
<tr>
<td></td>
<td>Austin TX 78701</td>
</tr>
</tbody>
</table>

Signed (Licensed Well Driller)  

(Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.
**State of Texas**  
**WELL REPORT**  

**Camp Bowie #2**  

<table>
<thead>
<tr>
<th>1) OWNER</th>
<th>Texas National Guard</th>
<th>ADDRESS</th>
<th>P.O. Box 5218</th>
<th>Austin</th>
<th>Tx</th>
<th>78763</th>
</tr>
</thead>
<tbody>
<tr>
<td>2) ADDRESS OF WELL:</td>
<td></td>
<td></td>
<td>Camp Bowie Rt. 3 Box 181-A</td>
<td>Brownwood</td>
<td>Texas</td>
<td>78801-9734</td>
</tr>
<tr>
<td>County</td>
<td>Brown</td>
<td>City</td>
<td>(State or RFD)</td>
<td>(City)</td>
<td>(State)</td>
<td>(Zip)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3) **TYPE OF WORK** (Check):  
- [x] New Well  
- [ ] Deepening  
- [ ] Reconditioning  
- [ ] Plugging  

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

5) **GRID #**  
41-17-8  

6) **WELL LOG:**  

<table>
<thead>
<tr>
<th>Date Drilling:</th>
<th>Dia. (in.)</th>
<th>From (ft.)</th>
<th>To (ft.)</th>
<th>Description and color of formation material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Started</td>
<td>7 7/8</td>
<td>3/8</td>
<td>6.5</td>
<td>Brown topsoil</td>
</tr>
<tr>
<td>Completed</td>
<td>3 7/8</td>
<td>6.5</td>
<td>101.2</td>
<td>Weathered limestone</td>
</tr>
<tr>
<td></td>
<td>2 7/8</td>
<td>6.5</td>
<td>101.2</td>
<td>Red stone, chert</td>
</tr>
<tr>
<td></td>
<td>1 7/8</td>
<td>6.5</td>
<td>101.2</td>
<td>Soft clay with sandstone</td>
</tr>
<tr>
<td></td>
<td>2 7/8</td>
<td>6.5</td>
<td>101.2</td>
<td>Red sand, small pebbles</td>
</tr>
<tr>
<td></td>
<td>2 7/8</td>
<td>6.5</td>
<td>101.2</td>
<td>Brown sands with grey clay</td>
</tr>
<tr>
<td></td>
<td>2 7/8</td>
<td>6.5</td>
<td>101.2</td>
<td>Brown clay, pebbles</td>
</tr>
</tbody>
</table>

7) **DRILLING METHOD** (Check):  
- [x] Driven  
- [ ] Air Rotary  
- [ ] Mud Rotary  
- [ ] Bored  
- [ ] Air Hammer  
- [ ] Cable Tool  
- [ ] Jetted  
- [ ] Other  
  Augered  

8) **Borehole Completion** (Check):  
- [ ] Open Hole  
- [x] Straight Wall  

  If Gravel Packed give Interval ... from  
  ft. to  

9) **CASING, BLANK PIPE, AND WELL SCREEN DATA:**  

<table>
<thead>
<tr>
<th>Dia. (In.)</th>
<th>New or Used Steel, Plastic, etc.</th>
<th>Setting (ft.)</th>
<th>Gage Casting Screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>2&quot; N</td>
<td>PVC Schedule 40 riser</td>
<td>81.2</td>
<td>101.2 .010</td>
</tr>
<tr>
<td>2&quot; N</td>
<td>PVC Schedule 40 screen</td>
<td>81.2</td>
<td>101.2 .010</td>
</tr>
</tbody>
</table>

9) **CEMENTING DATA:**  

<table>
<thead>
<tr>
<th>Dia. or Used Steel, Plastic, etc.</th>
<th>Setting (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c' Above Surface ft. to 1.0 ft.</td>
<td>No. of Sacks Used 3.5</td>
</tr>
<tr>
<td>ft. to 10.0 ft.</td>
<td>No. of Sacks Used</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Method used</th>
<th>Cemented by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand Poured</td>
<td>Drill Crew</td>
</tr>
</tbody>
</table>

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

Method of verification of above distance N/A ft.  

10) **SURFACE COMPLETION**  

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

11) **WATER LEVEL:**  

<table>
<thead>
<tr>
<th>Artesian flow gpm.</th>
<th>Date</th>
</tr>
</thead>
</table>

12) **PACKERS:**  

<table>
<thead>
<tr>
<th>Type</th>
<th>Depth</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>COMPANY NAME</th>
<th>University of Texas/Bureau of Economic Geology</th>
<th>WELL DRILLER'S LICENSE NO.</th>
<th>3187-M</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADDRESS</td>
<td>P.O. Box X University Station</td>
<td>Austin</td>
<td>Texas</td>
</tr>
<tr>
<td>Signed</td>
<td>James Doss (Signed)</td>
<td>(Registered Driller Trainee)</td>
<td>Jordan Forman</td>
</tr>
</tbody>
</table>

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.

**TNRCC COPY**
STATE OF TEXAS
WELL REPORT

Camp Mabry #1

1) OWNER: Texas National Guard
2) ADDRESS OF WELL: Camp Mabry 2210 W. 35th Street
   County: Travis
   City: Austin
   State: Texas
   Zip: 78703

3) TYPE OF WORK (Check):
   [ ] New Well
   [X] Deepening
   [ ] Reconditioning
   [ ] Plugging

4) PROPOSED USE (Check):
   [ ] Monitor
   [X] 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"

6) WELL LOG:
   Date Drilling:
   Started: 10/11
   Completed: 19
   Depth (ft):
   43.4
   41
   37.8
   Diameter of Hole
   From (ft):
   To (ft):
   Description and color of formation material
   N/A Rock Bitted

7) DRILLING METHOD (Check):
   [X] Air Rotary
   [ ] Mud Rotary
   [ ] Bored
   [ ] Cable Tool
   [ ] Jetted
   [ ] Air Hammer
   [ ] Other

8) Borehole Completion (Check):
   [X] 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 (ft.)
   To (ft.)
   Gage
   Casting Screen
   4"
   N
   4 1/2" - 4" x 10' PVC Riser

9) CEMENTATION DATA: [Rule 338.44(1)]
   Cemented from...
   ft. to...
   No. of Sacks Used
   4

   Method used
   Hand Poured

   Cemented by
   Drill Crew

   Distance to septic system field lines or other concentrated contaminations
   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)]
   Flexi 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

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
WELL DRILLER'S LICENSE NO: 3187-M

ADDRESS: P.O. Box X University Station
AUSTIN, TEXAS 78701

(Signed)
James Doss
Registered Driller Trainer

(TNRCC COPY)

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

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

LEGEND:
GROUT & PORTLAND CEMENT MIX
BACKFILL
BENTONITE PLUG
CEMENT
GRAVEL & SAND
SAND
PVC PIPE
STEEL CASING
GROUT
FALL IN
## WELL REPORT

### State of Texas

#### WELL REPORT

**Camp Maxey #1**

<table>
<thead>
<tr>
<th>1) OWNER</th>
<th>Texas National Guard</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADDRESS</td>
<td>P.O. Box 5218</td>
</tr>
<tr>
<td>CITY</td>
<td>Austin</td>
</tr>
<tr>
<td>STATE</td>
<td>TX</td>
</tr>
<tr>
<td>ZIP</td>
<td>78763</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2) ADDRESS OF WELL:</th>
</tr>
</thead>
<tbody>
<tr>
<td>County</td>
</tr>
<tr>
<td>Address</td>
</tr>
<tr>
<td>City</td>
</tr>
<tr>
<td>State</td>
</tr>
<tr>
<td>Zip</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3) TYPE OF WORK (Check):</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Well</td>
</tr>
<tr>
<td>Deepening</td>
</tr>
<tr>
<td>Reconditioning</td>
</tr>
<tr>
<td>Plugging</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4) PROPOSED USE (Check):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitor</td>
</tr>
<tr>
<td>Environmental Soil Boring</td>
</tr>
<tr>
<td>Domestic</td>
</tr>
<tr>
<td>Industrial</td>
</tr>
<tr>
<td>Irrigation</td>
</tr>
<tr>
<td>Injection</td>
</tr>
<tr>
<td>Public Supply</td>
</tr>
<tr>
<td>De-watering</td>
</tr>
<tr>
<td>Testwell</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>5) Grid #</th>
</tr>
</thead>
<tbody>
<tr>
<td>17-12-5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6) WELL LOG:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Drilling:</td>
</tr>
<tr>
<td>Started</td>
</tr>
<tr>
<td>Completed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diameter of Hole</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dia. (In)</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>7 7/8</td>
</tr>
<tr>
<td>3 1/4</td>
</tr>
</tbody>
</table>

**Description and color of formation material:** N/A ROCK BITTED

<table>
<thead>
<tr>
<th>7) DRILLING METHOD (Check):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driven</td>
</tr>
<tr>
<td>Air Rotary</td>
</tr>
<tr>
<td>Mud Rotary</td>
</tr>
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<tr>
<td>Air Hammer</td>
</tr>
<tr>
<td>Cable Tool</td>
</tr>
<tr>
<td>Jetted</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8) Borehole Completion (Check):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Hole</td>
</tr>
<tr>
<td>Straight Well</td>
</tr>
<tr>
<td>Opened</td>
</tr>
<tr>
<td>Undrilled</td>
</tr>
<tr>
<td>Gravel Packed</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

If Gravel Packed give interval... from _______ to _______.

<table>
<thead>
<tr>
<th>9) CEMENTING DATA:</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Rule 338.4(4)[1]]</td>
</tr>
</tbody>
</table>

Cemented from _______ ft. to _______ ft.

<table>
<thead>
<tr>
<th>10) SURFACE COMPLETION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specified Surface Slab Installed [Rule 338.44 (2) (A)]</td>
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<td>Pitless Adapter Used [Rule 338.44 (3)(B)]</td>
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<td>Approved Alternative Procedure Used [Rule 338.71]</td>
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</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>Depth</td>
</tr>
</tbody>
</table>

---

**Please attach electric log, chemical analyses, and other pertinent information, if available.**
# WELL REPORT

## Camp Maxey #2A

### 1) OWNER
- **Texas National Guard**

### 2) ADDRESS OF WELL:
- **County:** Lamar
- **Address:** Camp Maxey Rt. 1 Box 169
- **City:** Powderly
- **State:** Texas
- **Zip:** 75473-0169

### 3) TYPE OF WORK (Check):
- New Well
- Reconditioning

### 4) PROPOSED USE (Check):
- Monitor
- Environmental Soil Boring
- Domestic
- De-watering
- Testwell

### 5) GRID #
- 17-12-8

### 6) WELL LOG:

<table>
<thead>
<tr>
<th>Date Drilling</th>
<th>Dia. (In.)</th>
<th>From (ft.)</th>
<th>To (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Started</td>
<td>7 7/8</td>
<td>3 1/4</td>
<td>40.15</td>
</tr>
<tr>
<td>Completed</td>
<td>11/11</td>
<td>7.2</td>
<td>7.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>From (ft.)</th>
<th>To (ft.)</th>
<th>Description and color of formation material</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>7.2</td>
<td>Red &amp; gray clay</td>
</tr>
<tr>
<td>7.2</td>
<td>30.0</td>
<td>Red clay, large rocks, gravel, some fractures</td>
</tr>
<tr>
<td>30.0</td>
<td>43.7</td>
<td>Light tan clay with sand &amp; black mottled clay</td>
</tr>
<tr>
<td>43.7</td>
<td>48.6</td>
<td>Light tan clay with sand mottled with gray clay</td>
</tr>
<tr>
<td>48.6</td>
<td>53.5</td>
<td>Washed out sand</td>
</tr>
<tr>
<td>53.5</td>
<td>60.15</td>
<td>Large pebbles, tan clay, grey shale, brown clay</td>
</tr>
</tbody>
</table>

### 7) DRILLING METHOD (Check):
- Driven
- Air Rotary
- Mud Rotary
- Bored
- Air Hammer
- Cable Tool
- Jetted

### 8) Borehole Completion (Check):
- Open Hole
- Straight Wall

### CASING, BLANK PIPE, AND WELL SCREEN DATA:

<table>
<thead>
<tr>
<th>From (ft.)</th>
<th>To (ft.)</th>
<th>Setting (ft.)</th>
<th>Gage Casting Screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>New or Used</td>
<td>Steel, Plastic, etc.</td>
<td>Perforated, slotted, etc.</td>
<td>Screen Mig., if commercial</td>
</tr>
<tr>
<td>2&quot; N 5-2&quot; * 10&quot; PVC riser</td>
<td>40.0</td>
<td>.010</td>
<td></td>
</tr>
<tr>
<td>2&quot; N 2-2&quot; * 10&quot; PVC riser</td>
<td>50.0</td>
<td>.010</td>
<td></td>
</tr>
</tbody>
</table>

### 9) CEMENTING DATA:

- Cemented from 4" Above Surface ft. to 2.1 ft.
- No. of Sacks Used 3
- Method used Hand Poured
- Cemented by Drill Crew
- Distance to septic system field lines or other concentrated contamination N/A ft.

### 10) SURFACE COMPLETION:

- Specified Surface Slab Installed [Rule 338.44 (2) (A)]
- Specified Steel Sleeve Installed [Rule 338.44 (3) (A)]
- Pitsless Adapter Used [Rule 338.44 (3) (B)]
- Approved Alternative Procedure Used [Rule 338.71]

### 11) WATER LEVEL:

- Static level ft. below land surface
- Artesian flow gpm.

### 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 rereporting.

**COMPANY NAME:** University of Texas/Bureau of Economic Geology

**WELL DRILLER'S LICENSE NO.:** 3187-M

**ADDRESS:** P.O. Box X University Station

**City:** Austin

**State:** Texas

**Zip:** 78701

**Signed:** James Doss (Signed)

**Licensed Well Driller:** 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

STICK UP PVC CASING 2.5
WELL PAD: 2.5'X2.5'X4''
D.I. DIAMETER: 7 7/8''

LOCKING WELL GUARD
PVC 2'' WELL CAP

PORTLAND CEMENT: 0.0-2.1
BENTONITE PLUG: 2.1-5.0
GROUT: 5.0-35.0
SAND (20/40) PACK: 35.0-50.0
2'' (.010) PVC SCREEN: 40.0-50.0
TOTAL DEPTH OF CORING FROM SURFACE TO T.D.: 60.15

LEGEND:
BACKFILL
BENTONITE PLUG
CEMENT
GRAVEL & SAND
SAND
HOG PIPE
STEEL CASING
GROUT
FALL IN

FALL IN: 50.0 TO 60.15
State of Texas
WELL REPORT

Camp Swift #1

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

2) ADDRESS OF WELL:
   County Bastrop
   Address Camp Swift R.2, Box 151-X
   Bastrop (Street or RFD or other)
   Texas 78602-9737 (City)
   (State) (Zip)

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

4) PROPOSED USE (Check):
   ☑ Monitor
   ☐ Environmental Soil Boring
   ☐ Industrial
   ☐ Irrigation
   ☐ Injection
   ☐ Public Supply
   ☐ De-watering
   ☐ Testwell
   If Public Supply well, plans submitted to the TNRCC:
   ☑ Yes
   ☑ No
   5) Grid # 58-46-8
      30° 17' 14" N
      97° 18' 26" W

6) WELL LOG:
   Date Drilling:
   Started 10/31/96
   Completed 11/1/96
   Dia. (in.) 3 1/4
   From (ft.) Surface
   To (ft.) 57.05

   Description and color of formation material
   N/A Rock Bitted

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

8) Borehole Completion (Check):
   ☑ Open Hole
   ☐ Straight Wall
   ☑ Undereamed
   ☐ Gravel Packed
   ☐ Other

   If Gravel packed give interval.... from...

   CASING, BLANK PIPE, AND WELL SCREEN DATA:

   Dia. (in.) New or Used
   2" N PVC Schedule 40 - 40'
   Steel, Plastic, etc.
   Perf., Slotted, etc.
   Screen Mgr., if commercial
   Setting (ft.) From To
   2" N PVC Schedule 40 - 20'
   2" N PVC Schedule 40 - 20'
   2.0' Setting N.A.
   35.0' Setting N.A.
   .010 Setting N.A.

9) CEMENTING DATA:
   [Rule 338.44(1)]
   Cemented from 4" Above Surface 3.05 ft.
   To ft.
   ft.
   No. of Sacks Used 4
   No. of Sacks Used N.A.
   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)

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 resubmission.

COMPANY NAME University of Texas/Bureau of Economic Geology
   WELL DRILLER'S LICENSE NO. 3187-M

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

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

Please attach electric log, chemical analysis, and other pertinent information, if available.
## Camp Swift #2

### 1) OWNER
- **Texas National Guard**

### 2) ADDRESS OF WELL:
- **County:** Bastrop
- **Address:** Camp Swift Rt. 2, Box 151-
- **City:** Bastrop
- **State:** Texas
- **Zip:** 78602-9737

### 3) TYPE OF WORK (Check):
- New Well
- Deepening
- Reconditioning
- Pugging

### 4) PROPOSED USE (Check):
- Industrial
- Irrigation
- Injection
- Public Supply
- De-watering
- Testwell

### 5) GRID:
- **Grid #:** 58-54-3
- **Degree:** 30° 14' 32"
- **Minute:** 17° 5'

### 6) WELL LOG:
- **Data Drilling:**
  - Started: 1/3
  - Completed: 1/3
  - Dia. (in.): 7 7/8
  - From (ft.): 0.0
  - To (ft.): 50.95
  - Surface: 7.75

<table>
<thead>
<tr>
<th>From (ft.)</th>
<th>To (ft.)</th>
<th>Description and color of formation material</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>13.5</td>
<td>Light brown sand</td>
</tr>
<tr>
<td>13.5</td>
<td>23.5</td>
<td>Light brown, red and grey clay</td>
</tr>
<tr>
<td>23.5</td>
<td>28.5</td>
<td>Dark brown clay with sand</td>
</tr>
<tr>
<td>28.5</td>
<td>48.5</td>
<td>Light black flakey sand &amp; clay</td>
</tr>
<tr>
<td>48.5</td>
<td>50.75</td>
<td>Grey and dark brown clay</td>
</tr>
<tr>
<td>50.75</td>
<td>50.95</td>
<td>Grey rock</td>
</tr>
</tbody>
</table>

### 7) DRILLING METHOD (Check):
- Air Rotary
- Mud Rotary
- Bored
- Air Hammer
- Cable Tool
- Jetted
- Other
- Augered
- N

### 8) Borehole Completion (Check):
- Open Hole
- Straight Wall
- Undrained
- Gravel Packed
- Other

### CASING, BLANK PIPE, AND WELL SCREEN DATA:

<table>
<thead>
<tr>
<th>Dia. (in.)</th>
<th>New or Used Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial Setting (ft.)</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>2&quot;</td>
<td>PVC Schedule 40 - 15'</td>
<td>40.9</td>
<td></td>
</tr>
<tr>
<td>2&quot;</td>
<td>PVC Schedule 40 - 15'</td>
<td>50.9</td>
<td>.010</td>
</tr>
</tbody>
</table>

### 9) CEMENTING DATA: [Rule 338.44(1)]
- Cemented from 4' Above Surface: ft. to 1.0 ft.
- No. of Sacks Used: 2

- 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)]
- Pittress 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

Are you 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 re-submittal.

**COMPANY NAME:** University of Texas/Bureau of Economic Geology

**WELL DRILLERS LICENSE NO.:** 3187-M

**ADDRESS:** P.O. Box X

**City:** Austin

**State:** Texas

**ZIP:** 78701

(Signed) [License Well Driller]

[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

STICK UP PVC CASING 2.5
WELL PAD: 2.25' X 2.25' X 4'
HOLE DIAMETER: 7 7/8''
LOCKING WELL GUARD
PVC 2'' WELL CAP

CEMENT PLUG: 0.0-1.0
GROUT: 1.0-33.5
BENTONITE PLUG: 33.5-35.0
SAND (20/40) PACK: 35.0-50.95
2'' (.010) PVC SCREEN: 40.95-50.9
TOTALDEPTH OF CORING FROM SURFACE TO T.D.: 50.95

LEGEND:
BACKFILL
BENTONITE PLUG
CEMENT
GRAVEL & SAND
SAND
PVC PIPE
STEEL CASING
GROUT
FALL IN
1) OWNER: Texas National Guard
   ADDRESS: P.O. Box 5218
   Mineral Wells, Texas 76067-9500
   GRID #: 31-16-3

2) ADDRESS OF WELL:
   County: Parker
   Street, RFD or other: Fort Wolters Rt. 4 Bidg 1202
   City: Mineral Wells
   State: Texas
   Zip: 76067-9500

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

4) PROPOSED USE (Check):
   ☑ Monitor
   ☑ Environmental Soil Boring
   ☑ Rural Domestic
   ☑ Public Supply
   ☑ De-watering
   ☐ Testwell

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

5) DRILLING METHOD (Check):
   ☑ Driven
   ☑ Air Rotary
   ☑ Mud Rotary
   ☑ Bored
   ☑ Air Hammer
   ☑ Cable Tool
   ☑ Jetted
   ☑ Other
   ☑ Augered

6) WELL LOG:
   Date Drilling:
   Started: 12/4
   Completed: 12/5
   Dia. (ft.)
   From (ft.)
   To (ft.)
   Description and color of formation material
   0.0
   Brown top soil
   3.5
   Tan clay with caliche
   18.5
   Clay, gravel, sand, water
   23.5
   Shale and sand

7) Borehole Completion (Check):
   ☑ Open Hole
   ☑ Straight Wall

   if Gravel Pack give interval... from ______ ft. to ______ ft.

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:
   Dia. (in.)
   From (ft.)
   To (ft.)
   Setting (ft.)
   Gage Casting Screen
   New or Used
   Steel, Plastic, etc.
   Percent, Bveled, etc.
   Screen Mfg., if commercial
   2'
   PVC Schedule 40 - 20'
   2'
   PVC Schedule 40 - 10'
   2'
   PVC Schedule 40 - 20'

9) CEMENTING DATA:
   [Rule 338.44(a)]
   Cemented from ______ 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
   Method of verification of above distance N/A

10) SURFACE COMPLETION:
   ☑ Specified Surface Slat Installed [Rule 338.44 (2) (A)]
   ☑ Specified Steel Sleeve Installed [Rule 338.44 (3)(A)]
   ☑ Pits Adapter Used [Rule 338.44 (3)(B)]
   ☐ Approved Alternative Procedure Used [Rule 338.71]

11) WATER LEVEL:
   Static level ______ ft. below land surface
   Artesian flow _______ gpm.

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
WELL DRILLERS LICENSE NO. 3187-M

ADDRESS: P.O. Box X University Station
Austin, Texas 78701

(Signed) James Doss (Signed)
(Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.
WATER MONITOR SCHEMATIC
FORT WOLTERS #2A
DRILL DATE: 12/5/95
NATIONAL GUARD PROJECT

STICK UP PVC CASING 2.5
WELL PAD: 2.25' X 2.25' X 4''
HOLE DIAMETER: 7 7/8''

LOCKING WELL GUARD
PVC 2'' WELL CAP WITH SOLID CAP ON END

0

GROUT: 0.0-12.8

12.8-30.0

SAND (20/40) PACK:

2.010 PVC SCREEN: 20.5-30.5

30.5-33.4

BENTONITE PLUG:

33.4-52.2

TOTAL DEPTH OF CORING FROM SURFACE TO T.D.: 52.2

LEGEND:

BACKFILL
BENTONITE PLUG
CEMENT
GRAVEL & SAND
SAND
PVC PIPE
STEEL CASING
GROUT
FALL IN
ATTENTION OWNER: Confidentiality
Privilege Notice on Reverse Side

State of Texas
WELL REPORT

1) OWNER
Texas National Guard
(Owner)

2) ADDRESS OF WELL:
P.O. Box 5218
Fort Wolters Rt. 4 Bidg 1202
Parker
(Street or RFD or other)
Mineral Wells
(City)
Texas
(State)
76067-9500
(Zip)

3) TYPE OF WORK (Check) :

☐ New Well
☐ Deepening
☐ Reconditioning
☐ Plugging

☐ Environmental Soil Boring
☐ Domestic
☐ Industrial
☐ Irrigation
☐ Injection
☐ Public Supply
☐ De-watering
☐ Testwell

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

4) PROPOSED USE (Check) :

☐ Monitor
☐ Air Rotary
☐ Mud Rotary
☐ Bored
☐ Air Hammer
☐ Cable Tool
☐ Jetted
☐ Other

Augered, N/X Wireline

GRID #: 31-16-2

5) Latitude: 32° 51' 34"

Longitude: 98° 2' 31"

6) WELL LOG:

Date Drilling: 11/28/95

Started: 11/28/95 1995
Completed: 12/1/95 1995

Diam. (in.)
7 7/8 Surface
3 1/4 9.3 73.9

From (ft.)

To (ft.)

Description and color of formation material

0.0
Red, sandy clay

3.6
Sandstone, weathered limestone

54.1
Grey shale

7) DRILLING METHOD (Check):

☐ Driven
☐ Underreamed
☐ Gravel Packed
☐ Other

Augered, N/X Wireline

8) Borehole Completion (Check):

☐ Open Hole
☐ Straight Wall

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

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)

New or Used

Steel, Plastic, etc.

Screen Mfg., if commercial

Setting (ft.)

From

To

Gage

2" N PVC Schedule 40 - 65'

2" N PVC Schedule 40 - 10'

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

Cemented from Surface 4 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

(Use reverse side if necessary)

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

Depth of strata

Type of water

Was a chemical analysis made? ☐ Yes ☐ No

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

WELL DRILLER'S LICENSE NO. 3187-M

ADDRESS: P.O. Box X University Station

Austin Texas 78701

(Street or RFD)

(City)

(State)

(Zip)

Signed: James Doss (Licensed Well Driller)

Jordan Forman (Registered Driller Trainee)

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

HOLE DIAMETER: 7 7/8" TO 9.3
3 1/4" FROM 9.3 TO 73.9

LOCKING WELL GUARD
STICK UP PVC CASING 2.5
WELL PAD: 2.5'x2.5'x4'
PVC 2" WELL CAP

CEMENT: 0.0-3.0
GROUT: 3.0-9.3
BENTONITE PLUG: 9.3-10.7

SAND (20/40) PACK:
10.7-73.9

2" (.010) PVC SCREEN:
63.9-73.9

TOTAL DEPTH OF
CORING FROM
SURFACE TO T.D.:
73.9

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