# STRUCTURAL GEOMETRY OF THE LATE <br> PALEOZOIC THRUSTING IN THE HARTSHORNE, HIGGINS, ADAMSON AND GOWEN QUADRANGLES, SOUTHEASTERN OKLAHOMA 

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## CHAPTER I

## INTRODUCTION

Located in the southeastern corner of Oklahoma and western Arkansas is one of the best developed foreland basins. The Arkoma Basin was formed during the Pennsylvanian Ouachita Orogeny. The basin developed as a result of the collision between the Llanoria plate and the southern edge of the North American plate. The Arkoma Basin is bounded by the Ozark uplift to the north and the Ouachita Mountains to the south (Fig. 1).

The Ouachita Mountains are divided into three sections. These sections are the anticline and syncline dominated Central Belt, the Broken Bow Uplift and the fold and thrust dominated region known as the Frontal Belt (Fig. 2). The Frontal Belt is bordered by the Winding Stair thrust fault to the south and the Choctaw thrust fault to the north. The Choctaw Fault is the leading edge thrust to a system of imbricate thrust faults within the Frontal Belt and it acts as one of the limbs to a well developed triangle zone within the Arkoma Basin. The north dipping Carbon backthrust acts as the other limb of the triangle zone (Cemen et al., 2001).

The study area is located between the Arkoma Basin and the Ouachita Mountains and includes parts of Townships 4 and 5 North and Ranges 16 to 18 East and lies within the Adamson, Gowen, Hartshorne and Higgins quadrangles. Previous studies applied in
the vicinity of the study area concentrated on evaluation and understanding the structural features located in the subsurface (Akhtar 2005, Sagnak 1996, Kaldirim 2004, Hadaway 2004, and Collins 2006).


Fig. 1: Geologic provinces in parts of Oklahoma and Arkansas with the general location of thesis area. (Johnson, 1988, Modified from Cemen, 2003 and Collins, 2006)


Fig. 2: Geological provinces in the Ouachita Mountains and the Arkoma Basin. (Cemen et al., 2001).

Statement of Purpose

Since the mid-1990's many previous M.S. thesis projects examined the subsurface structural geology of an area that extended from Wister Lake to the Hartshorne Gas Field (Akthar 1995, Sagnak 1996, Ronck 1996, Evans 1997, Mehdi 1998, McPhail 2001, Kaldirim 2004, Hadaway 2004, Collins 2006). These projects relied on the use of well $\log$ data, scout cards completion information and 2-D seismic lines. As a result, cross sections were constructed to describe the structural geometry of the subsurface. These cross sections proposed that the triangle zone consisted of the southward dipping

Choctaw fault that acted as the southern limb of the triangle zone and the northward dipping Carbon backthrust being the northern limb, with the Lower Atokan Detachment (L.A.D.) being the triangle zones base. Bellow the L.A.D. was a duplex system that thrusted the Spiro Sandstone into stacked thrust sheets. This duplex system had varying numbers of sharply dipping horses with no deformation within them. Above the L.A.D. was an area of little deformation where the middle Atokan units are relatively undisturbed.

The main purpose of this thesis is to provide a better understanding of the subsurface structural geometry of the Wilburton Gas Field area using well log data and 3D seismic data provided by Devon Energy Corporation. This study also addressed the sequence stratigraphy of the Lower Atokan Spiro reservoir in the area using wireline logs of the wells drilled for gas production.

## Methods of Investigation

To define the subsurface structural geometries seven cross sections were constructed. In addition, structural contour maps of the Spiro thrust sheets and isopach maps of each of the thrust sheets were constructed using the Geoplus Petra Software. Restoration of the cross sections and shortening calculations were done using the key bed method. The Spiro Sandstone was chosen as the key bed because of its sheet like depositional pattern and its wide distribution across the area.

Depositional and sequence stratigraphic modeling for this study was primarily based upon three datasets that include: 1) an extensive collection of wireline well $\operatorname{logs} 2$ ) isopach maps 3) published studies on the Spiro and other Atokan units.

The primary curves from well logs used in the interpretations were gamma ray curve because of their high resolution and sensitivity to intercalated sandstone and shale units. Log motifs of specific intervals were compared with published studies on the geological interpretation of well logs (Rider, 1986). Gamma ray motifs were analyzed for upward coarsening or fining patterns, serration, blocky versus curvy character and API values.

Isopach maps published in Gross et al., (1995) were used to identify thickness patterns of sedimentary packages. These maps were compared with published studies of barrier islands, such as Rampino and Sanders (1981) and Galloway and Hobday (1996). Published studies on the Spiro Sandstone (Hess, 1995; Lumsden et al., 1971) were used to test the interpretations made from the aforementioned datasets.


To develop the cross sections and the maps needed for this study, the following tools and methods were used:

1) Topographic maps of the Adamson, Gowen, Hartshorne and Higgins quadrangles obtained from the United States Geological Survey (Suneson and Hemish, 1989).
2) Geologic maps of the Adamson, Gowen, Hartshorne and Higgins quadrangles were obtained from the Oklahoma Geological Survey. These maps were used to describe the surface geology of the area and help develop a simplified surface geologic map using the Canvas drafting software (Fig. 3) (Plate 1).
3) 3D seismic lines were provided by Devon Energy Corporation. These seismic lines were used to describe the subsurface structure of the study area in more detail.
4) 3D seismic was used to provide a detailed account of the thrust sheet geometry and exact location. This was possible by matching the well location and depth with the 3D seismic image that was provided by Devon Energy Corporation.
5) Raster images of well logs and well data donated by Devon Energy Corporation. These raster images and well data were downloaded into the Geoplus Petra software and used to establish the location of each well, the type of well (gas, oil, water), the total depth of each well, deviation data and top of the Spiro sandstone.
6) Paper copies of certain wells were obtained from the Oklahoma City Geological Society Log Library. These were used to identify certain stratigraphic units.
7) "Scout tickets" were obtained from the Oklahoma City Geological Society log library to assist in the location of the positions of the Spiro, Brazil and Red Oak sandstones.
8) To establish the location of certain deviated wells on the cross sections, Boak's Method of minimum curvature was used (Boak's, 1992).
9) The Spiro sandstone isopach map and Spiro thrust sheet maps were created with the Geoplus Petra software program.

## Boak's Minimum Curvature Method

During the construction of cross sections wells were encountered that are deviated. To accommodate for the deviation, the Boak's method was used (Fig. 4). The Boaks Method states that the deviated portion of the well is assumed to be a single arc. To determine the vertical depth from the measured depth for the arc ( $\Phi$ ) the following variables are needed (Boak, 1992). (1) The inclination angle in degrees from vertical ( $\alpha$ ), (2) compass bearing in degrees from north ( $\beta$ ) and (3) the survey point number (i) knowing that the Survey point number at the surface is equal to 0 (Hadaway, 2004).

When these variables have been obtained we can calculate $\Phi$ by applying the following equation

$$
\Phi=\cos ^{-1}\left[\left(\cos \alpha_{\mathrm{i}-1}\right)\left(\cos \alpha_{\mathrm{i}}\right)+\left(\sin \alpha_{\mathrm{i}}\right)\left(\sin \alpha_{\mathrm{i}-1}\right)\left(\cos \left(\beta_{\mathrm{i}}-\left(\beta_{\mathrm{i}-1}\right)\right)\right]\right.
$$

The assumed kickoff angle in our study was $20^{\circ}$, while the angle when approaching the end of the well was closer to $40^{\circ}$. When these angles are obtained we can find $\Phi$ by using the equation $S=r \Phi$ were the length of the arc is $(S)$ and the radius is (r). The radius ( r ) is found using the scale of our well and our $20^{\circ}$ and $40^{\circ}$ angles along our circular arc.


Fig. 4: Boak's Minimum Curvature method (Boak, 1992)

## Construction of the Cross section:

In order to develop the seven cross sections and the maps required for this study, a systematic, stepwise approach was used. This approach is separated into two phases.

Phase 1: The preliminary construction of the structural map and cross sections

Tops of the Spiro Sandstone in the footwall of the Choctaw fault were picked from paper copies and raster images of wireline logs were provided by Devon Energy Corporation. This information was inputted into the Geoplus Petra software along with
well locations, the township and ranges, section numbers and the outline of the area of 3D seismic that was donated by Devon Energy Corporation. Petra was used to grid the picked Spiro sandstone tops and constructed a simple structural contour map of the footwall of Choctaw Fault. When the map is closely examined, the areas affected by faulting are detailed by locating the areas where structural contours density increase. This information allowed us to choose the appropriate locations for the construction of the seven cross sections. Information regarding the wells, well depths and the Spiro tops were all transferred onto hand drafted cross sections. The vertical scale that was chosen allowed a $2: 1$ vertical exaggeration to better illustrate the features of the subsurface.

Phase 2: Using the 3D Seismic to find the approximate location of each thrust sheet, backthrust and hidden Spiro units

3D Seismic data provided by Devon Energy Corporation was used to locate individual thrust sheets and the associated Spiro sandstone units located in the footwall of the Choctaw fault zone. 3D seismic was not used to describe the features located in the hanging wall of the Choctaw fault because the Choctaw fault and all faults on its hanging wall generated excessive noise that affected the quality of the seismic data. Most structural features located in the hanging wall of Choctaw were interpreted using well log data, scout cards and surface structural data provided from Devon Energy, Oklahoma City Log Library and surface geology maps. The final stage of the cross section construction involved using the 3D seismic as a tool to approximate the location of all thrusts, backthrusts and hidden Spiro units that were not recognized using well logs.

## Tectonics of the Ouachita Orogeny

Branan (1968) is the first recognized publication to use the name Arkoma Basin for the basinal rocks in southeastern Oklahoma and Arkansas. Although there are several models explaining the tectonics of the Arkoma Basin (Roeder 1973, Keller \& Cebull 1973, Buchannan \& Johnson 1986), Housknecht and Kecena (1983) is usually recognized as the model that explains most of the observed features. The following is a brief summary of the tectonics of the Ouachita Orogeny based on Housknecht and Kecena (1983).

During the rifting stage (Fig. 5-A) (Fig. 6-A), the southern edge of the North American plate became dominated by passive margin sedimentation. This type of sedimentation would continue until the late Devonian. At that time, the southern part of the North American craton developed a classic shelf-slope-rise geometry, this would continue until the early to middle Paleozoic (Houseknecht \& Kacena, 1983). Sediments deposited on the shelf itself consisted of carbonates with little amounts of mud and sand indicative of a shallow marine environment known as the Arbuckle facies. Darker shales with less sandstones and carbonates are located farther south, away from the shelf. These are indicative of a deep marine environment known as the Ouachita facies (Fig. 7-B) (Houseknecht \& Kacena, 1983).


Fig. 5: Illustration of the paleogeography of Oklahoma during A) Cambrian (510 mya).
B) Mississippian (345 mya). C) Pennsylvanian (315 mya). D) Pennsylvanian (300mya) (Blakey, 2005).


Fig. 6: Tectonic evolution of the Ouachita Mountains and the Arkoma Basin. A: rifting stage. B: Passive Margin. C: Start of the contraction and crustal loading. D: Normal Faulting. E: Final stages of thrusting. (Houseknecht \& Kacena, 1983).

By the middle Devonian to early Mississippian time, the southern edge of the North American oceanic plate started to subduct under the Llanoria plate to the south. It is unknown exactly when the subduction occurred, but there is evidence of wide spread metamorphism during the Devonian that could be attributed to the subduction. In addition there is volcanic debris and volcaniclastic sandstones in the Stanley formation that would support the subduction model (Fig. 5-B)(Fig. 6-C) (Houseknecht \& Kacena, 1983).

In the late Mississippian to early Atokan (Fig. 5-C), the subduction of the oceanic plate continued, but the shelf units that were deposited before were undisturbed except for some detrital material that was being added from the north. During this period deposition of limestones, sandstones and shale continued in a shallow marine to non marine environment. This is indicative of the Atokan facies that includes the Spiro sandstone unit. With increased vertical load and flexural bending being applied due to the northward subduction, the result was an array of normal faults just south of the North American Plate (Houseknecht \& Kacena, 1983). The subsidence caused by the normal faulting as well as the simultaneous deposition of sediments resulted in the abrupt increase in sediment thickness during the early to middle Atokan (Fig. 7) (Houseknecht \& Kacena, 1983).

By the late Atokan most of the major structural deformation had stopped. Thin skinned thrust developed as the subduction complex continued to collide with the North American plate. As a result of the collision the Ouachita Mountains were uplifted. Deposition during this time consisted of shallow marine, fluvial and deltaic sediments. Tectonic activity was relatively little sine the Desmoinesian except for some minor thrust faulting and folding (Fig. 6-E) (Houseknecht \& Kacena, 1983).


Fig. 7: Pie chart explaining the depositional history and the coinciding Stratigraphic frame work of the Arkoma Basin in southeastern Oklahoma (Houseknecht \& McGilvery, 1990)

## CHAPTER II

## STRATIGRAPHY OF THE ARKOMA BASIN

## Pre Pennsylvanian Rock Units

The Arkoma Basin contains strata ranging from the Cambrian to the Pennsylvanian (Fig. 8). These deposits form a nonconformity with the underlying crystalline Proterozoic basement. The oldest sedimentary unit in the basin is the Upper Cambrian Timbered Hills Group. This group includes the Reagan Sandstone and the Honey Creek Limestone. These grade into the Cambrian-Lower Ordovician Arbuckle Group which includes the Fort Sill Limestone, the Royer Dolomite, and the Signal Mountain Limestone. These are overlain conformably by the upper Ordovician rock units of the Arbuckle Group. These include the Butterfly Dolomite, the McKenzie Hill Formation, the Cool Creek Formation, the Kindblade Formation, and the West Spring Creek Formation. These formations represent a shallow marine deposition, and contain shallow marine faunal assemblages that include trilobites, brachiopods, mollusks, and sponges.

The Middle and Late Ordovician strata consists of the Simpson Group, Viola


Fig. 8: Stratigraphy of the Arkoma Basin (reproduced from Cemen et al., (2001).

Group, and the Sylvan Shale. The Simpson Group illustrates a change in the depositional environment. This group contains skeletal calcarenites, skeletal carbonates, mudstones, sandstones, and shales. The overlying Viola Group contains limestones and nodular chert-rich mudstones. There is a facies change from Viola Group into the Sylvan Shale which contains graptolites and chitinozoans and indicates deeper water conditions.

The Silurian and early Devonian Periods contain the Hunton Group. The Hunton Group contains carbonates composed of skeletal mudstones and skeletal calcarenites. A regional unconformity separates the Hunton carbonates from the overlying upper Devonian Woodford Shale. The Woodford is an organic fissile shale with beds of vitreous and siliceous chert (Ham, 1978). This unconformity is interpreted as a sequence
boundary and suggests a relative-drop in sea-level in the Arkoma Basin.
The Mississippian is represented by the Caney Shale, which is a dark organic shale that contains phosphate nodules. The Springer Shale is an informal unit equivalent to the Caney Shale of the upper Mississippi/lower Pennsylvanian. The Springer differs from the Caney by the appearance of siderite or clay-ironstone beds (Ham, 1978). A more detailed interpretation of the Pre-Pennsylvanian rocks is available by Johnson (1988), Ham (1978).

## Pennsylvanian Rock Units

The Pennsylvanian rock units (Fig. 8) are significant to this study because they are penetrated by wells that are used to construct the cross sections. The Pennsylvanian is represented by the Morrowan, Atokan, and Desmoinesian series.

The Morrowan rocks of the Arkoma Basin are the Cromwell Sandstone, the Union Valley Limestone, and the Wapanucka Limestone. They are approximately 300 feet thick in the north and 1000 feet thick in the south of the basin (Johnson, 1988). The Wapanucka Formation of the upper Morrowan series consists of various shoal limestones, spiculites, shales and sandstones (Grayson, Jr., 1979). Overlying the Wapanucka Formation is the sub-Spiro shale. Wapanucka Limestone is exposed on the southern side of the Choctaw Fault. This can be seen at Limestone ridge (Sutherland, 1988) and the study area.

Atokan strata lie conformably on top of Morrowan strata and are were divided into three units (Lower, Middle and Upper Atokan). This division was based on
depositional histoy of the basin in response to structural events of that period (Sutherland, 1988). The Atokan strata can range in thickness from hundreds of feet in the northern part of the Arkoma Basin to 10,000ft (Sutherland, 1988).

The Spiro Formation is considered the base of the Early Atokan within the Arkoma Basin. The Spiro crops out to the south of the Choctaw Fault within the study area. Further description of the Spiro will be provided in Chapter III.

After the deposition of the lower Atokan units, the Arkoma Basin transitioned from a stable shelf to a tectonic foredeep (Houseknecht and McGilvery, 1990). The Middle Atokan is composed of the Shay, Cecil, Brazil, Panola, Red Oak and Fanshawe sandstones that formed the from sediment deposited within thick units of shale (Fig. 8) (Cemen et al., 2001). The units are fine grained, lithic to sublithic arenites, which accumulated most of their detritus material from the eastern portion of the Ouachita Oroginic belt (Houseknecht and McGilvery, 1990).

The Krebs group of the lower Desmoinesian is composed of the Hartshorne Sandstone, McAlester Formation, Savanna Sandstone and Boggy Formation. In the study area, the Krebs group crops out in the northern part of the basin.

## CHAPTER III

## SEDIMENTOLOGY OF THE ATOKAN FORMATION

The Atokan Formation is composed mostly of deep marine shale deposits. It contains several sands. The Spiro sandstone is the lowermost sand unit of the Atoka Formation. Mahaffie (1994) defined sheet sands as most closely "resembling fan lobe deposits and are characterized in outcrop by their laterally-continuous, tabular external geometries". The Atoka Formation contains the Spiro sandstone unit. This unit has been interpreted as a sheet sand (Lumsden et al., 1971). The Spiro is an important reservoir sand unit. It is used in structural reconstructions because of its well recognized e-log and seismic signature. The Spiro is also the most productive gas reservoir in the Atokan Basin.

## Sedimentology of the Spiro Sandstone

The Spiro Sandstone is a very fine-medium grained arenite (Lumsden et al., 1971) (Hess \& Cleaves, 1995). It is moderately to well-sorted and is primarily composed of quartz clasts (>95\%) (Houseknecht and McGilvery, 1990). It is also a sheet sand and is laterally extensive, making it a useful marker bed for structural reconstruction. The thickness of the Spiro Sandstone ranges between 100 feet in the deeper parts of the basin
in the south to zero where it pinches out in the north. Although no detailed biostratigraphic analysis of the Spiro microfauna has been done, based on underlying shales the unit is dated as Morrowan in age (Mc Caleb, 1963). Fossils within the Spiro include crinoids, bryozoans, brachiopods and other shelf fauna (Lumsden et al., 1971).

Lumsden et al (1971) divided the Spiro into eight lithofacies based on data from cores, drill cuttings, and outcrop. His lithofacies scheme is described below;

## 1. Shale Facies

"The shale facies has silt stringers and was distant from sources of sediment supply, it was deposited in offshore parts of the shelf" (Lumsden et al., 1971).

## 2. Poteau Facies

"These are very fine grained and tightly cemented sands. Indications of shallow water deposition include bioturbation and interbedded sandstones and muds characteristic of lagoonal deposition" (Lumsden et al., 1971).

## 3. South Red Oak Facies

"Sandstones in this facies are similar in grain size to the Poteau Facies but differ in porosity, lighter color, thickness, and presence of cross bedding" (Lumsden et al., 1971).

## 4. Kinta Facies

"This facies was formed by the reworking of the Foster Sands by a transgression. It consists of a light-gray, uniformly thick, even-bedded sand" (Lumsden et al., 1971).

## 5. North Red Oak Facies

"This facies is a southern extension of the Kinta Facies and also has characteristics of the South Red Oak and Wilburton Facies. Fossil fragments are abundant, and this is
interpreted as a complex of beach, bar, tidal flat, tidal channel, and lagoonal environments" (Lumsden et al., 1971).

## 6. West Kinta Facies

"This is a thin interval showing a decrease in grain size and an increase in calcite cement" (Lumsden et al., 1971).

## 7. Wilburton Facies

"Sand in this Wilburton Facies is light colored, fine grained and very fossiliferous" (Lumsden et al., 1971).
8. Limestone Facies
"Clastic quartz decreases and calcareous grains increase as the Spiro forms a gradational contact with the underlying Wapanucka Limestone" (Lumsden et al., 1971).

## Sequence Stratigraphy of the Spiro Sandstone

Two sequence stratigraphic models were studied to understand the depositional history of the Spiro Sandstone. According to Lumsden et al (1971) the Spiro was deposited during a transgression, Hess (1995) agrees with this interpretation and further describes the depositional history of the Spiro Sandstone as part of the reworking of the older Foster sands that had been either deposited directly over the Sub-Spiro shale, or it was deposited over the Wapanucka limestone as part of the filling of the incised valleys created during the Low Stand and subsequent shelf exposure.

The model proposed here is based upon 1) Well log signatures 2) Fossil fauna and 3) Architecture of the Spiro Sandstone. 164 well logs (See Appendix A for Well names
and locations) were examined for log motifs that would best characterize the Spiro Sandstone. The typical Gamma Ray motif (Fig. 9) is slightly serrated, blocky, with a sharp base and upward fining profile. The serration is interpreted as clay rich horizons within the sandstone, the blocky profile is characteristic of high net:gross sheet sands, the sharp base suggests an erosional contact with the underlying strata, and the upward fining suggests retrogradation. These characteristics (fining upwards of a shallow-marine sand) suggest a transgression where parasequences would be back-stepping (Van Wagoner et al, 1990). The sharp erosional base is interpreted as a flooding surface.


Fig. 9: Gamma Ray profiles of the Spiro Sandstone from the Wilburton Gas Field showing upwards fining.


Fig. 10: Isopach map of the Spiro Sandstone in the study area (Reproduced from Gross et al., 1995).

The Spiro is exceptionally fossiliferous and contains a shelf assemblage that includes crinoids, bryozoans, and brachiopods. Transgressive systems tracts are known for their faunal abundance. Lowstand deposition is centered in the deeper parts of the basin, and the shelf is exposed. Due to these conditions shelf faunas are rare and impoverished, producing a scanty fossil record. These observations also support the deposition of the Spiro Sandstone during a transgression.

The strongest evidence for the Spiro Sandstone being part of a Transgressive Systems Tract comes from the architecture of the Spiro Deposits. Isopach maps of the Spiro Sandstone by Gross et al. (1995) shows a trend of barrier islands (Fig. 10). The laterally extensive sheet like geometry of the Spiro Sandstone is attributed to the reworking of older Foster Sands during a transgression. The Spiro Sandstone incises the
older Sub-Spiro Shale and the Wapanucka Limestone. This erosional contact is interpreted as a ravinement surface created during a transgression. The proposed Transgressive system tract model (Fig. 11) is similar to the model by Hess (1995).


Basinward $\qquad$
$\qquad$

1) Wapanucka Limestone
2) Shoreface Foster Sands
3) Deltaic Foster Sands
4) Sub-Spiro Shale
5) Barrier Island Foster Sands


Regression

Wapanucka Limestone
2) Shoreface Foster Sands
3) Deltaic Foster Sands
4) Sub-Spiro Shale
5) Barrier Island Foster Sands


1) Wapanucka Limestone
2) Shoreface Foster Sands
3) Deltaic Foster Sands
4) Sub-Spiro Shale
5) Barrier Island Foster Sands
6) Fluvial Channels Exposing the underlying Wapanucka Limestone

$\stackrel{\text { Transgression }}{ }$
7) Wapanucka Limestone
8) Minor Spiro Sandstone thickening caused by the reworking of an ancient delta
9) Minor Spiro Sandstone thickening caused by the reworking of an ancient barrier island
10) Thickening caused by the filling of fluvial channels during the transgression
11) Sub-Spiro Shale

Fig. 11: Sequence stratigraphic model of the Spiro Sandstone deposition

## CHAPTER IV

## GENERAL GEOMETRY OF THRUST SYSTEMS

The study area is intensely deformed by several large thrusts. Before these thrusts are discussed in detail, this section introduces the reader to some important components of thrust systems. A thrust system contains many thrust faults closely spaced from each other and are connected at depth to a common detachment surface (Boyer and Elliot, 1982) (Marshak and Woodward, 1986). As a result of the increasing stresses being applied in a fold and thrust belt, the subsurface will most commonly develop imbricate fans, backthrusts, duplex structures, triangle zones and lateral ramps (Boyer and Elliot, 1982). The following is a short description of these features.

## Imbricate Fans

When increasing stress affects a certain area, the resulting stresses allow for faults to be created. These imbricate thrust faults are created deep within the basin at a common detachment surface and move upsection to shallower depths (Fig. 12). There are two types of imbricate fan thrust faults. 1) Leading Imbricate Fault System: The first type of thrust faults have most of the displacement in the leading thrust which would leave the footwall with the most displacement (Fig. 12-A); and 2) Trailing Imbricate Fans of thrust faults have most displacement at the trailing thrust, leaving the bulk of the displacement in the hanging wall of the leading edge thrust fault (Fig. 12-B).


## Backthrusts

Backthrusting is a phenomenon where a fault forms in a direction that opposes the regional movement of the major thrusts (Butler, 1987). These structural features can develop at the leading-edge of the thrust sheet when a barrier becomes an obstacle for the thrust sheet to move forward and therefore creating a release for the extra energy in the form of a backthrust (Butler, 1987). Backthrusts are a major factor in the creation of
triangle zones in many thrust belts around the world (Fig. 13) (Butler, 1987). Backthrusts may also be created if the propagation rate exceeds the displacement rate (Bulter, 1987).


Fig. 13: A) A 3D representation of the relationship between forethrusts and backthrusts. B) A plan view of the relationship between forethrusts and backthrusts (Butler, 1987)

Webel (1987) proposed three types of backthrusting in the Rocky Mountain foldthrust belt. Type I of these backthrusts can be seen in all tepee structures and triangle zones. These are low angle thrusts faults that are located ahead of the leading thrust fault and dipping in the opposite angle (Fig. 14-A)(Webel, 1987).

Type II backthrusts are relatively high angle thrusts and are created behind the trace of the major thrust faults (Fig. 14-B). They illustrate pop up structures that are created when a snakehead fold passes over a subsurface ramp. Type III backthrusts are strongly associated with basement arches, angle of ramping and listric normal faulting (Webel, 1987). Backthrusts of this nature are low angled gravity induced backthrusts that are activated when a listric normal fault is created. The normal fault was induced because of the high angle ramp that was created as a result of a basement arch. The resulting high angle ramp allowed for an incipient backthrust to glide down the ramp to create a shallow backthrust (Fig. 14-C).


Fig. 14: A) Illustration of the Type I Backthrusts associated with Tepee structures and Triangle Zones. B) Illustration of Type II backthrusts. C) Illustration of a Type III Backthrust showing a gravity induced slide resulting from a basement arch increasing the steepness of the ramp angle. (Webel, 1987)

## Duplex Structures

Duplex structures are imbricate fans that are created from a common basal detachment and cut up section to meet at a higher detachment. The bottom basal detachment in a duplex structure is called a floor thrust while the upper basal detachment is labeled the roof thrust. As the imbricate fans cut up section from the floor thrust to the roof thrust a feature with thrusts bounding it from all direction will develop. This structure is called a horse. Duplexes are a combination of horses that have formed due to the compression or thrusting in an area (McClay, 1992)(Fig. 15).


Fig. 15: Terminology associated with Duplex's (McClay, 1992)

Figure 12 shows three different duplex structures of Boyer and Elliot (1982);

1) Hinterland Dipping Duplex (Fig. 12-C): The fault slip is less than the deformed fault length (McClay, 1992). The horses in the duplex dip in the direction of the hinterland.
2) Foreland Dipping Duplex (Fig. 12-E): The fault slip is larger than the deformed fault length (McClay, 1992). The horses dip towards the foreland rather than the hinterland.
3) Antiformal Stack: The fault slip is equal to that of the deformed fault length (McClay, 1992). Each horse is thrusted up onto the other giving way to stacked formation (Fig. 12-D).

## Triangle Zones

The term Triangle zones was first used by Peter Gordy in an internal report to describe the structural characteristics of the eastern margin of the Canadian Cardillera (Jones, 1996). They are usually the result of two opposite dipping thrust faults, associated with a basal detachments surface thus creating a triangle shape. The geometry of the triangle zone can be attributed to the continuation of the fold and thrust belt convergence and deformation. Butler (1987) stated that when convergence gets close to the foreland then deformation in the direction of the stress starts to decrease but the stresses continue to build. This built up stress then gives way to inherent thrusts and backthrusts (Butler, 1987).

Couzens and Wiltschko (1994) classified triangle zones into three types (Fig. 16):

1. Type I: The triangle zone is characterized by two opposite dipping thrusts that are symmetrical to each other and are floored by a single detachment surface.
2. Type II: The triangle zone is characterized by two opposing thrust systems that are asymmetrical to each other and are floored by a single detachment surface.
3. Type III: The triangle zone is characterized by two opposing thrust systems that are asymmetrical to each other and are floored by two detachment surfaces.


Fig. 16: Triangle zone geometry (Couzens and Wiltschko, 1998)

## Lateral Ramps

Lateral ramps were first introduced to describe a tectonic ramp that is parallel to the direction of thrusting (Boyer and Elliot, 1982) (Fig. 17). But lateral ramps have been observed to disrupt stratigraphic levels along strike and decollment changes (Pohn, 2000).


Fig. 17: Illustration of surface geological map and two cross sections. A-A' is showing the duplex structure and direction of thrusting. B-B' is showing two lateral ramps (Boyer \& Elliott, 1982).

The association of lateral ramps with thrust faulting is accomplished due to the fact that thrust faults can either die out to the flanks of the thrusting (Fig. 18-A), or the thrust sheet can distribute the stress from one fault to another via a lateral ramp (Fig. 18B) (Pohn, 2000). Four types of lateral ramps are proposed by Pohn (2000). The geometry of the first lateral ramp can be considered the simplest. This is where parallel sided ramps are connected to a horizontal decollement (Fig. 19-A), the second being parallel sided ramps connected to a dipping decollement surface (Fig. 19-B), the third is a horizontal decollement surface with converging ramps (Fig. 19-C), finally the convergent sided ramps with the dipping decollement surface (Fig. 19-D) (Pohn, 2000).

Lateral ramps are features that do not often outcrop to the surface but they can be observed using seismic reflection. These seismic reflection lines can illustrate that cross strike faults in the subsurface can form the foundations or deflecting buttress of lateral ramps (Pohn, 2000). Surface expressions of certain geological features can supply clues as to the location of lateral ramping in the area. These surface features are:

1. The distinct change in folds magnitude or the sudden termination of a fold (Pohn, 2000).
2. A sudden change in the magnitude of a fault (Pohn, 2000).
3. Basin interruption due to cross strike border faults (Pohn, 2000).


Fig. 18: 3D view of the formation of Lateral ramps, A) Showing the fault dying out to the flanks of thrusting. B) The lateral progression from one fault to another via a lateral ramp (Pohn, 2000).


Fig. 19: Lateral ramp geometries. Arrows show direction of movement. A) Parallel side ramps connected to a horizontal decollement. B) Parallel sided ramps to a dipping decollement. C) Converging lateral ramps on a horizontal decollement. D) Convergent sided lateral ramps on dipping decollement (Pohn, 2000).

## CHAPTER V

## STRUCTURAL GEOLOGY OF THE FRONTAL OUACHITAS-ARKOMA BASIN TRANZITION ZONE

Although many workers studied the geology of the Ouachita Mountains and the Arkoma Basin, first subsurface structural interpretations of the transition zone were only published in the 80 's. Arbenz (1984) proposed the presence of a decollement deep below the surface. He mapped a south-dipping imbricate fault system that was accompanied by a backthrust that established a triangle zone (Fig. 20).


Fig. 20: Illistration of the subsurface in the transition zone. (Arbenz, 1984)(Arbenz, 1989)

Many controversial interpretation of the transition zone were proposed in the late 1980's and early 1990's. Hardie (1988) was the first to describe the geometrical relationship between the Blanco thrust fault to the north and the Choctaw thrust fault to the south in the vicinity of Hartshorne, Oklahoma (Fig. 21-A).

Milliken (1988) suggested the presence of a "bi-vergent" imbricate thrust system that was floored by a detachment surface at depth (Fig. 21-B). The presence of this deep detachment surface was agreed upon by Camp and Ratcliff (1989), they also identified the presence of a thick triangle zone with a deep detachment.


Fig. 21: A) Illustration of the subsurface as presented by Hardie (1988), B) Illustration of the subsurface as presented by Milliken (1988), Camp \& Ratcliff (1989).

Reeves and others (1990) interpreted a thin triangle zone floored by two northdirected duplex structures (Sunneson, 1995). He suggested that there was a decollement surface that separated the duplex structures and that the deep decollement is in Lower Atokan Strata (Fig. 22-A).

Perry and Suneson (1990) interpreted a seismic section that showed not one but two triangle zones. One of these triangle zones was located above the shallow detachment surface. The other triangle zone was located between the shallow detachment surface and the deep detachment surface was accompanied by imbricate thrusts (Fig. 22 B).


Fig. 22: A) Illustration of the subsurface as presented by Reeves and others (1990), B) Illustration of the subsurface as presented by Perry and Suneson (1990)

Wilkerson and Wellman (1993) proposed the presence of a thin triangle zone in the Hartshorne area. The floor of the triangle zone is the roof thrust of the duplex structure that they named the Gale Buckeye thrust system (Fig. 23). They also discovered tear faulting and a series of blind imbricate thrusts located near the base of the duplex structure.


Fig. 23: Illustration of the subsurface as presented by Wilkerson and Wellman (1993)

In the early 1990's, gas exploration in the western part of the Arkoma Basin became very important. The Wilburton Gas Field was the center of the exploration activity. With a grant from the Oklahoma Center for Advancement in Science and

Technology (OCAST), Dr. Ibrahim Cemen of Oklahoma State University, School of Geology and his student started a subsurface structural study of the Wilburton Gas Field and surrounding areas. The purpose of this study was to examine the structural geometry of the transition zone between the frontal Ouachitas and the Arkoma Basin.

Cemen, Sagnak and Akthar (2001) summarized the structural geology work in the Wilburton Gas Field and proposed a well developed triangle zone in the Wilburton Gas Field area. This triangle zone has the Choctaw Fault as its southern flank, while the backthrust fault known as the Carbon fault is the northern flank of the triangle zone. A detachment surface called the Lower Atokan Detachment (L.A.D.) is the base of the triangle Zone. The LAD is the roof thrust for a deeper duplex structure and the Springer detachment is the floor thrust. This duplex structure has a number of hinterland dipping horses (Fig. 24).


## CHAPTER VI

## STRUCTURAL GEOLOGY OF THE STUDY AREA

The study area is dominated by structural features that are consistent with the contraction that the Transition zone experienced during the Pennsylvanian. To understand the structural geology of the study area, seven cross sections were constructed (Fig. 3). Four of these cross sections are oriented parallel to the tectonics transport direction. These four cross sections were constructed to illustrate the position of the triangle zone and duplex structure within the study area. Within the triangle zone, the Carbon Fault is the northern most backthrust. This backthrust is only present on cross sections A-A' (Fig. 27), B-B' (Fig. 28) and C-C' (Fig. 29). Cross section W2-W2’ (Fig. 32) does not extend far enough north to cross it. The major structural feature in the area is the Choctaw Fault. This fault separates the highly deformed, tightly folded and faulted Frontal Ouachitas from the mildly deformed, broadly folded Arkoma Basin. The three remaining cross sections were constructed perpendicular to the tectonic transport direction. This was directed at detecting the amount of lateral movement that may have been present in the footwall of the Choctaw Fault.



The four NW-SE cross sections that were oriented perpendicular to the strike of Choctaw are divided into four zones (Fig. 25). These zones are chosen based on the structural features that are present. They are also transferred to the three NE-SW cross sections that are oriented roughly parallel to the Choctaw fault. The NE-SW cross sections could display zones 2 and 3 while zone 4 only appears on the southern most cross section W3-W3' (Fig. 26).

Zone 1:

This area encompasses the Carbon Fault and all features that lie north of it. As previously mentioned Zone 1 is only displayed in cross sections A-A’ (Fig. 27), B-B` (Fig. 28) and C-C' (Fig. 29), since the remaining cross sections did not extend far enough to the north. The 3D seismic does not extend far enough to the north to display the Carbon fault as well. All information obtained for this area is from previous studies and surface structural geology maps (Suneson et al., 1996).

The Carbon fault dips at about $50^{\circ}$ at the surface. The angle decreases at depth and the fault becomes almost horizontal at around -1700 ft. The Pennsylvanian McAlester, Atoka and Hartshorne are exposed at the surface of the hanging wall of the Carbon Fault (Fig. 3).

Zone 2:

This zone is located south of the Carbon fault which is interpreted as a backthrust (Cemen et al., 2001). Geological maps by Suneson et al., (1996) contain small strike-slip faults to the south of the surface trace of the Carbon fault. These types of structures do not seem to have any affect on Zone 3 that lies deeper within the footwall of Choctaw.

The surface formations that are located in this area are mostly Pennsylvanian McAlester, Hartshorne, Atoka and Savannah, with a layer of Quaternary covering them in certain areas (Fig. 3).

Within the footwall of Choctaw at around - 4000ft we come across the Red Oak Formation and the Brazil Formation at a depth of -5000ft. Abnormal fractures within these formations were critical in the discovery of a feature that can be described as a shallow thrust. This shallow thrust was not present in former cross sections that were studied (Hadaway, 2005) (Collins, 2006) and it was not seen on the well log data. This shallow thrust-That was named the Middle Atokan Thrust (M.A.T.) - was only visible through the use of 3D seismic where the thrust seem to be originating as a splay from the Choctaw fault and is present at -9500 ft . The M.A.T. increases in dip angle as it cuts up section into shallower depths. The M.A.T. appears to be younger in age in comparison to the Choctaw Fault, as there is no visible Spiro unit within the thrust wedge between the Choctaw Fault and the M.A.T. This shallow thrust is well observed in cross sections W2W2' (Fig. 32) but it becomes less apparent in the eastern most cross section C-C` (Fig. 29). Various numbers of out of sequence thrusts splay from the M.A.T. and displace the Brazil and Red Oak layers. These backthrusts dip in the foreland direction at angle of about $65^{\circ}$.

Zone 3:
The footwall of the Choctaw fault contains a well developed duplex structure. The roof thrust of the duplex structure is the Lower Atokan Detachment (L.A.D.). The L.A.D. serves as the base of the triangle zone that is located in the transition zone (Cemen et al.,
2001). The floor thrust of the duplex structure is known as the Springer detachment (Cemen et al., 2001). The Springer detachment drops in elevation the further south you move and becomes the Woodford detachment (Cemen et al., 2001). The cause for the rise and fall of the detachment surfaces is the normal faulting in the pre- Pennsylvanian units.

The Springer detachment rises from a depth of about -13000 ft and continues to rise to about -9000 ft in the northern part of the study area. At the northern end of the duplex, the Springer detachment rises and gently folds the Spiro units. The duplex structure contains five to seven horses. The 3D seismic data indicates that the thrust faults in the duplex structure had a decreased angle of dip when compared to the cross sections constructed by Mehdi (1998), Hadaway (2005) and Collins (2006).

The duplexes contained many small backthrusts within the horses themselves. At first, it was thought that these backthrusts were actually tear faults or even a major flower structure that had developed from deep within the pre-Pennsylvanian layers and extended to affect the Red Oak and Brazil formations. But these findings could not be confirmed when combined with the 3D seismic data.

The backthrusts appear to be younger than the south dipping thrusts that developed the horses. The north dipping backthrusts were causes minor displacements when compared to the displacement of the actual horses. These backthrusts might have caused the Spiro sandstone unit to increase in thickness. This increase in thickness can be seen in cross sections W1-W1' (Fig. 31), where the Spiro thickness in this unit is at 561 ft when compared to the average amounts of Spiro thickness of about $250 \mathrm{ft}-300 \mathrm{ft}$.

The lateral ramps that are present are more likely caused by the movement of the thrust sheet atop of each other and the shifting from one thrust sheet to another similar to
the geometry proposed by Boyer and Elliot (1982) (Fig. 25). This can be seen on cross sections D-D' (Fig. 30), W1-W1' (Fig. 31) and Cross section W3-W3' (Fig. 33)

At the northern end of the duplex is a horst structure that drops the level of the Spiro unit below $-10,500 \mathrm{ft}$. This system of normal faults is located relatively north of the study area, outside the range of the 3D seismic data. A combination of cross sections developed prior to this study (Collins, 2006) (Hadaway, 2005), and well $\log$ data, assisted in the location of these normal faults.

The overall trend of the duplex is consistent with the findings of Collins (2006) where the Spiro formation and the duplexes are at shallower depths to the east of the study area while the farther west the duplex structure becomes deeper.

Zone 4:
The northern edge of this zone is also the northern border that separates the Frontal Belt of the Ouachita Mountains from the Arkoma Basin. This border is known as the hinterland dipping Choctaw thrust fault. The Choctaw fault cuts through the study area and trends west-southwest to east-northeast. It is the leading edge thrust in a break forward style imbricate thrust system that encompasses many faults on its hanging wall (Cemen et al., 2001). At the surface, the Choctaw fault has a relatively high dip angle of about $70^{\circ}$ and as the fault moves deeper within the basin the dip angle becomes shallower. The dip angle is almost horizontal at depths of about -8500 ft where the Choctaw fault acts as a detachment surface to a system of imbricate faults that include the Pine Mountain Fault, Ti Valley Fault (Cemen et al., 2001).

The surface geology south of the Choctaw fault shows many assemblages of thrust faults, anticline and syncline pairs and some strike slip faults. The strike slip faults seem to not be deep enough to affect zone 3 and the duplex structure. Surface geological maps (Fig. 3) indicate that the Pennsylvanian Atoka formation, Johns Valley, Springer and Spiro/Wapanucka package crop out at the south of the trace of the Choctaw Fault.

Although all the cross sections running roughly east-west did not penetrate Zone 4, cross section W3-W3' (Fig. 33) did intersect the Choctaw Fault. Because of the acute angle of intersection, the Choctaw fault and Spiro units within the hanging wall of Choctaw had a large surface expression. This relative increase was adjusted for in the subsurface.

Unfortunately because of the number of thrusts located within the hanging wall of Choctaw and the close proximity of these faults to each other, the ability to use the 3D seismic was lost as the Choctaw fault created too much of a noise factor to be able to make an accurate seismic interpretation. Therefore, all data gathered on the hanging wall of the cross sections was created using well log information and scout cards.

## Cross sections restoration and calculation of shortening

To calculate the amount of shortening that had been experienced in the study area, three factors needed to be determined. The First Factor was the method of calculation. Because of the concentric nature of the folds due to the amount of incompetent shale units within the basin (Cemen et al., 2001), the method of restoration that was used is the key bed method. The formation that was chosen as the key bed for the calculations was
the Spiro sandstone unit because it is a sheet like sandstone that extends well within the basin.

The Second Factor to finding the amount of shortening is the sections being calculated. Three areas were chosen to calculate the amount of shortening, they are:

1) The overall duplex structure
2) The minor backthrusts that are located within the duplex structure to calculate the impact these backthrusts had on the overall compression within the duplex.
3) The overall study area that encompasses the duplex structure and the Choctaw imbricate fault structure.

The Third Factor to calculating the shortening was the positioning of the pin line and loose lines. The pin line for was placed north of the duplex structure to symbolize the end of the deformation. To calculate the shortening applied to the overall duplex structure, the loose line was placed further south just beyond the start of the first duplex. This was similarly the case for the calculations for the minor backthrusts within the duplex structure. To calculate the overall shortening, the loose line was placed at the southern edge of the hanging wall where there is no piercing point for the Spiro Sandstone units.

The Fourth Factor is the calculation of shortening. To complete the calculation of shortening applied in an area two variables are needed. 1) Is the final length of the Spiro unit after the deformation had occurred $\left(\mathrm{L}_{\mathrm{f}}\right)$. 2) The original length of Spiro sandstone unit before deformation $\left(\mathrm{L}_{\mathrm{o}}\right)$. This can be achieved by measuring the Spiro units individually. By subtracting the final length of the deformed Spiro $\left(\mathrm{L}_{\mathrm{f}}\right)$ from the original
length of the Spiro before deformation $\left(\mathrm{L}_{\mathrm{o}}\right)$ the result will be the shortening distance. The percent of shortening was calculated using the following equation

$$
\frac{L f-L o}{L o} \times 100 \text { (Table 1). }
$$

| Shortening applied to the overall duplex structure |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | $\mathrm{L}_{\mathrm{f}}(\mathrm{ft})$ | $\mathrm{L}_{0}(\mathrm{ft})$ | $\mathrm{L}_{\mathrm{f}}(\mathrm{ft})-\mathrm{L}_{0}(\mathrm{ft})$ | $\mathrm{L}_{\mathrm{f}}(\mathrm{ft})-\mathrm{L}_{0}(\mathrm{ft}) / \mathrm{L}_{0}(\mathrm{ft})$ | Percentage |
| Cross section A-A' | 45921.6 | 55843.1 | -9921.5 | -0.178 | 17.77 |
| Cross section B-B' | 45372.5 | 55764.7 | -10392.2 | -0.186 | 18.64 |
| Cross section C-C' | 39764.7 | 50745.1 | -10980.4 | -0.216 | 21.64 |
| Cross section W2-W2' | 39137.3 | 46352.9 | -7215.6 | -0.156 | 15.57 |

## Shortening applied due to the backthrusts within the duplex structure

| Cross section A-A' | 45921.6 | 50588.2 | -4666.63 | -0.092 | 9.22 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Cross section B-B' | 45372.6 | 47764.7 | -2392.16 | -0.050 | 5.01 |
| Cross section C-C' | 39764.7 | 41803.9 | -2039.21 | -0.049 | 4.88 |
| Cross section W2-W2' | 39137.3 | 41803.9 | -2666.67 | -0.064 | 6.38 |

## Shortening applied to the overall structure within the study area

| Cross section A-A' | 45921.6 | 97411.8 | -51490.19 | -0.529 | 52.86 |
| :--- | :---: | :---: | :---: | :---: | :--- |
| Cross section B-B' | 45372.6 | 107215.7 | -61843.15 | -0.577 | 57.68 |
| Cross section C-C' | 39764.7 | 87843.1 | -48078.43 | -0.547 | 54.73 |
| Cross section W2-W2' | 39137.3 | 90039.2 | -50901.97 | -0.565 | 56.53 |

Table 1: Excel spread sheet indicating the shortening calculations done on three areas within the study area.






$$
\begin{array}{|l|}
\hline \text { Fig. } 30 \text { (Plate 5): Cross section D-D` } \\
\hline
\end{array}
$$




Fig. 33 (Plate 8): Cross section W3-W3'

## CHAPTER VII

## CONCLUSIONS

South of the Carbon fault is the footwall of the Choctaw fault. The shallow part of the footwall is dominated by the Brazil and Red Oak layers. These layers were essential in locating a shallow splay from the Choctaw fault. This shallow splay was named the Middle Atokan Thrust (M.A.T.) and appeared to have various numbers of out of sequence thrusts. Due to the lack of the Spiro sandstone units within the M.A.T. the thrust was deemed younger in age. This shallow thrust system was well observed on the western 3D seismic lines while it seemed to lose strength on the eastern side of the survey.

Deeper in the footwall of Choctaw, is Zone 3 and the location of a well developed duplex thrust system. These duplexes are hinterland dipping with a dip angle of $\approx 20^{\circ}$ $25^{\circ}$. The roof thrust of the duplex system is the Lower Atokan Detachment (L.A.D.) and the sole thrust is the Springer Detachment. The duplex system becomes shallower as to the north and exhibits some indications of backthrusting within the duplex itself.

Shortening calculations were examined for three specific areas in the study area. The shortening calculation found for the backthrusts that were located within the duplex structure varied from $4 \%$ to $10 \%$. The shortening calculation for the duplex structure was
found to be between $15 \%$ and $21 \%$. The overall shortening that was calculated for the study area was between $52 \%$ and $58 \%$.

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## APPENDIX

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| 3507720090000 | WALLLACE | 4 N | 17E | 15 |  |  |
| 3507720322000 | W PLERBLANCE | 51 | 17E | 36 |  |  |
| 35072038000 | JESSIE BENHETTT | $\underline{1}$ | 18E | 50 |  |  |
| 35077204690000 | HJINTER TUCKER | 9 | 18E | 31 |  |  |
| 35077205450000 | DETIA HOLT | 3 | 17E | 35 |  |  |
| 35077205430000 | STATE | $\underline{1}$ | 18E | 28 |  |  |
| 3507720.510000 | DOBBS STATEUNIT MA | $\underline{1}$ | 18E | 2 |  |  |
| 3507721463000 | MABRY 12 | 4 N | 17E | 12 |  |  |
| 3507721447000 | SPARIS | $4 N$ | 17E | 1 |  |  |
| 3507720580001 | STATE C URIT | 9 | 18E | 28 |  |  |
| 35077212870000 | MCCASLIN | 4 N | 17E | 2 |  |  |
| 35077212760000 | MCCASLIN | 4 N | 17E | 2 |  |  |
| 3507721280000 | SMLTH | \＄1 | 18E | 20 |  |  |
| 35072128000 | LATDEN | $4{ }^{4}$ | 17 E | 3 |  |  |
| 35077212160000 | PARKERALFORD | 31 | 17E | 27 |  |  |
| 3507721000000 | HENKLET | $\$$ | 17E | 25 |  |  |
| 3507720996000 | KITCHELL | 4 N | 17E | 14 |  |  |
| 35077209930000 | SIVIL | $\$$ | 17E | 22 |  |  |
| 35077209800000 | DAREY | 3 | 17E | 23 |  |  |
| 350770949000 | STATEC | 31 | 18E | 28 |  |  |
| 35077209350000 | WHITFEY | $\$$ | 17 E | 34 |  |  |
| 35077209210000 | BENHETT STATE | $\$$ | 18E | 19 |  |  |
| 35077208700000 | JESSEE BENHETT | $\$$ | 18E | 30 |  |  |
| 3507720850000 | AFDREXKKURIKKO | 51 | 17E | 35 |  |  |
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| 3507720800000 | CALDRRON | 3 | 17E | 26 |  |  |
| 3507720786000 | FABER0 | $\$$ | 17E | 24 |  |  |
| 35077207810000 | SMLTH | 31 | 18E | 20 |  |  |
| 35072002000 | LEELCLICE | $\underline{1}$ | 17E | 36 |  |  |
| 35072055000 | CAJDRON | 31 | 17E | 36 |  |  |
| 3507720565000 | DAREY | 3 | 17E | 23 |  |  |
| 3507720588000 | FABER0 | 81 | 17E | 24 |  |  |
| 35077205270000 | MABRY | 4N | 18E | 7 |  |  |
| 3507720525000 | BENKETT | 31 | 18E | 30 |  |  |
| 35072050000 | SMLTH | 31 | 18E | 20 |  |  |
| 35077205040000 | BENHETT STATE | 31 | 18E | 19 |  |  |
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| 3507720418000 | ALFEED PARKER | 3 | 17E | 27 |  |  |
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| 3507720402000 | FABER0 | 5 | 17 E | 24 |  |  |
| 3507720401000 | MCCASLIN | 4 N | 17E | 2 |  |  |
| 350720420000 | HUATER TUCKER | 31 | 18E | 31 |  |  |
| 3507720300000 | SPARFS | 4 N | 17E | 3 |  |  |
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| 3507720366000 | SMLTH | $\underline{1}$ | 18E | 20 |  |  |
| 350720313000 | AFDRENKUELKO | 31 | 17E | 35 |  |  |
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| 3507720189000 | KEFNT | $\underline{1}$ | 17E | 15 |  |  |
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| 3512121602000 | PATHELE BOWMAN | I | 17 E | 20 |  |  |
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| 3507720504000 | BENEETT STATE | 5 | 18E | 19 |  |  |
| 3507720105000 | KENFIEDY | 51 | 18E | 32 |  |  |
| 3507720481000 | BEFHETT STATE | 5 N | 18E | 19 |  |  |
| 3507720954000 | DOBES STATE | 51 | 18E | 29 |  |  |
| 3507720000000 | MCCASLIN | $4 N$ | 17 E | 2 |  |  |
| 3507721055000 | SIVIL | F1 | 17 E | 22 |  |  |
| 3507721006000 | BENHETT STATE | 5 | 18E | 19 |  |  |
| 3507720300000 | WHITHEY | 51 | 17 E | 34 |  |  |
| 35077204510000 | MABRY TRLET | 4 N | 17 E | 12 |  |  |
| 3507720079000 | PATITSOH | 4 N | 17E | 1 |  |  |
| 3507721070000 | CALDRON | 51 | 17 E | 2 |  |  |
| 3507760000000 | M C WATTS | 9 | 18E | 33 |  |  |
| 3507730147000 | MABRT | 4 N | 18E | 9 |  |  |
| 3507730011000 | JL HENLET | 31 | 17 E | 25 |  |  |


| UWT (AFFIM ${ }^{\text {m }}$ ) | Wellinue |  | Ringe | Sectian | Spro Thnus <br> SheetA <br> Tox |  SheetA Bot 供 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3507730040000 | MOSE C WATTS | \& | 18 E | 3 |  |  |
| 350773000000 | DARBYSUBDIVISION | \$ | 17E | 23 |  |  |
| 35077210410000 | DAEBY | \% | 17E | 23 |  |  |
| 350772105000 | CALDPRON | 9 | 17E | 26 |  |  |
| 35077210100000 | PARKER ALFED | $\stackrel{1}{1}$ | 17 E | 27 |  |  |
| 35077204180000 | ALFRED PARKER | S | 17E | 27 |  |  |
| 3507720413000 | DAEBYSUBDIVI | \$ | 17E | 23 |  |  |
| 35077204020000 | FABERO | $\stackrel{1}{1}$ | 17 E | 24 |  |  |
| 3507720401000 | MCCASLIN | 8 N | 17E | 2 |  |  |
| 3507720436000 | HUNTIER TUCKER | $\$$ | 18E | 31 |  |  |
| 3507720300000 | SPARKS | 4 N | 17E | 3 |  |  |
| 3507720352000 | SAMS | \$ | 17E | 22 |  |  |
| 35077203410000 | CALDRRON | $\stackrel{1}{1}$ | 17 E | 25 |  |  |
| 3507720336000 | SMITH | \% | 18E | 20 |  |  |
| 350770315000 | ARLREN KURLIKO | $\$$ | 17E | 35 |  |  |
| 3507720293000 | Maskry TRLET | 4 N | 18E | 5 |  |  |
| 3507720244000 | KRNHEDY | \$ | 18E | 32 |  |  |
| 35077202310000 | WHITFEY | $\stackrel{1}{1}$ | 17 E | 34 |  |  |
| 3507720219000 | PS 0 | 4 N | 17 E | 10 |  |  |
| 35077202540000 | KENT HEIRS | \$1 | 17E | 14 | 900 |  |
| 3507720240000 | SILVERBULIET | 4 | 17E | 11 |  |  |
| 3507720175000 | RJSPOTNIK | \$ | 17E | 10 |  |  |
| 35077201740000 | VAJJCTIN | $\underline{1}$ | 17E | 12 |  |  |
| 3507720189000 | KENNT | S | 17E | 15 | 821 |  |
| 35077201410000 | HINTTER TUCKRR | \$ | 18E | 31 |  |  |
| 350772006000 | ARDRENKURLIKO | $\$$ | 17 E | 35 |  |  |
| 35077200710000 | WHIITET | \$ | 17E | 34 |  |  |
| 3507720544000 | MABRY 9001 TV-P | 4 N | 18E | 11 |  |  |
| 3507720.590000 | WORKMMANTVP-9001 | 4 N | 18E | 22 |  |  |
| 3507721450000 | MAERYRANCH | \& | 18E | 10 |  |  |
| 350770574000 | HENEIL | 4 N | 18E | 2 |  |  |
| 3507730576000 | SFEAS | 4 | 18E | 21 |  |  |
| 35077204870000 | SHARP | \$ | 17 E | 2 |  |  |
| 35121216560000 | WALLACE | 4 N | 17E | 21 |  |  |
| 3512120820000 | MOSS | \$ | 16 E | 13 | 830 | 9186 |
| 35121214020000 | LEA | $\stackrel{1}{1}$ | 17 E | 28 |  |  |
| 3512121406000 | CHAELES CASTEAL | 9 | 17E | 32 |  |  |
| 3512121415000 | PDBOXMM | \$ | 17 E | 2 |  |  |
| 3512121444000 | WAYFE WALLACE | 4 N | 17E | 21 |  |  |
| 3512121614000 | BOXMMAN | \% | 17E | 21 |  |  |
| 35121216730000 | HARE | 9 | 17 E | 33 |  |  |
| 3512121602000 | PAJUNE BOTMKAN | $\$$ | 17E | 30 | 983 | 1006 |
| 3512121457000 | BELLESO | 4 | 17E | 6 |  |  |
| 35121214870000 | BOXMMAN | \$1 | 17E | 20 | 9490 | 978 |
| 35121216570000 | PDEOXMM | $\stackrel{1}{1}$ | 17E | 29 |  |  |
| 3512121208000 | WRICTIT | 4 N | 17 E | 18 |  |  |
| 3512121278000 | FDITHRICH4EDS | 91 | 17E | 30 | 9931 | 10149 |
| 351212105000 | POIICHy | 9 | 17E | 3 |  |  |
| 3512121523000 | HARTSHOERE | 4 N | 17E | 6 |  |  |
| 35121218070000 | USA | \$ | 17E | 28 |  |  |
| 3512121352000 | ALEXAKDER | 4 N | 17E | 9 |  |  |


| UW7 (AFFR M M | Wellicume | Townsix | Range | Section |  | spro Thnut MeetA Bot |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3512121344000 | ROCKISLAND IMPROVE | 4 N | 17 E | 8 |  |  |
| 3512121338000 | PETTIT | \% | 17E | 31 |  |  |
| 3512121331000 | WEPBEER | S | 17E | 18 | 9469 |  |
| 351212131000 | ROCK LSLAND | 8 N | 17E | 5 |  |  |
| 3512121319000 | POTICHEET | S | 17E | 3 |  |  |
| 3512121312000 | WOODS PROSPECT | S | 10 E | 36 |  |  |
| 3512120111000 | POTICHNY | S | 17E | 33 |  |  |
| 3512120133000 | STINE | 4 N | 17 E | 4 |  |  |
| 35121218870001 | CASTEFI CHARLES 'A' | 9 N | 17 E | 32 |  |  |
| 3512121851000 | PDEOXMM | 3 | 17 E | 2 |  |  |
| 3512121850000 | USA | 3 | 17E | 28 |  |  |
| 3512121842000 | BOXMMAN | \% | 17E | 21 |  |  |
| 35121218350000 | EDITHRICHAEDS | S | 17E | 30 |  |  |
| 3512121909000 | ANDEFSONK | \% | 17E | 19 | 9140 |  |
| 351212557000 | SWWET | 4 | 17 E | 9 |  |  |
| 3512120319000 | BOXMMAN | S | 17E | 17 |  |  |
| 3512120.950000 | DIRAN | \% | 17E | 18 |  |  |
| 3512120600000 | BERKAAEDI TONES | \% | 16 E | 10 |  |  |
| 3512120800000 | COOK | S | 10 E | 14 |  |  |
| 3512121334000 | LEWIS | 4 N | 10E | 12 |  |  |
| 3512121349000 | FEFPDHM | $4{ }^{4}$ | 10 E | 11 |  |  |
| 3512120700000 | SMALLXNOOD | 4 N | 10E | 3 |  |  |
| 3512120495000 | MCEEE | \$ | 10E | 2 | 899 |  |
| 3512121788000 | PEDEN | S | 16 E | 24 | 899 | 9183 |
| 3512121482000 | AIMMERTTO | 3 | 16 E | 34 |  |  |
| 351212127000 | SMEALLNOOD | $4{ }^{4}$ | 10 E | 10 |  |  |
| 3512121192000 | CPORCE PEDEN | S | 16E | 24 | 9082 | 9294 |
| 3512121280000 | HäleYvILIE TOWRSITE | 3 | 10 E | 35 |  |  |
| 3512121200000 | TEX | 4 N | 10 E | 14 |  |  |
| 3512121380000 | MIILIER | S | 16E | 26 | 9507 |  |
| 351212167000 | WOOLS PROSPECT | 9 | 16 E | 3 |  |  |
| 351212002000 | CPDETEPEDEN | F | 10E | 24 | 9240 |  |
| 3512121844000 | MLSS TinlT | \$ | 16E | 25 | 10464 | 10656 |
| 3512128811000 | SRMMALS LOS | 4 N | 10 E | 12 |  |  |
| 3512120206000 | MARCANGELI | S | 16 E | 34 |  |  |
| 3512120180000 | USA | 9 | 16 E | 27 | 9612 |  |
| 351212106000 | W WMLLACE | 4 | 17E | 17 |  |  |
| 35121206250000 | US GOVERMMMENT | S | 16 E | 27 | 9410 | 9615 |
| 3512120177000 | USA | S | 10 E | 35 |  |  |
| 3512120198000 | HEPDHAM | 8 N | 16E | 11 |  |  |
| 3512120270000 | MadDen | 4 N | 16E | 2 |  |  |
| 351212022000 | FRANIZ FEPDHAM | 4 | 16E | 14 |  |  |
| 351212020000 | LEVNIS | 4 | 10E | 12 |  |  |
| 3512120219000 | SLAJTGHTER | 4 N | 16 E | 1 |  |  |
| 3512120145000 | R EKITNG | S | 16E | 26 | 9330 |  |
| 3512120155000 | HARTSHOENE | 4 N | 17E | 6 |  |  |
| 35121200310000 |  | 31 | 17 E | 20 | 9264 |  |
| 3512122106000 | Kilva | 3 | 10 E | 3 | 9278 |  |
| 351212213000 | MCEEE | 3 | 10 E | 2 | 9568 | 979 |
| 3512121330000 | ANDESSON | \% | 17 E | 19 | 9550 |  |
| 3512121423000 | WC CAMP | 4 N | 16 E |  |  |  |


| UFT (AFFRM ${ }^{\text {a }}$ ) | Wellinawe | Townsix | Range | Section |  SheetA Toxs | spur Thnus SheetA Bot 伿 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3512121012000 | MLSS | 3 | 16 E | 25 | 9734 |  |
| 351212316000 | KEFWDFICK | 4 N | 10E | 13 |  |  |
| 3512123230000 | FIINK | \$ | 16E | 36 |  |  |
| 3512123054000 | AIMERTITO | $\$$ | 16 E | 27 |  |  |
| 3512122922000 | LEMIS TAMES | \& | 16E | 12 |  |  |
| 3512122851000 | CAMP | \$ | 16E | 34 |  |  |
| 3512123087000 | K17\% | 9 | 16 E | 26 | 9966 | 10197 |
| 3512122003000 | WOODS | $\stackrel{1}{1}$ | 16E | 36 |  |  |
| 35121217880000 | ANDERSON | \$ | 17 E | 19 |  |  |
| 3512121980000 | USA | 3 | 10 E | 35 |  |  |
| 3512121982000 | NEFDHAM | $4{ }^{\text {N }}$ | 16 E | 11 |  |  |


| UWT (AFFT, | Wellinme | T재쎠T | Range | Section | spro Thnut SheetB <br> Tops | spaw <br> SheetS <br> $B o t$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3507720572000 | ELUEMOUNTA ${ }^{\text {a }}$ | 8 N | 17E | 22 |  |  |
| 3507720009000 | WALLACE | 4 N | 17E | 15 |  |  |
| 3507720322000 | WPLERELAKNCE | \% | 17E | 36 |  |  |
| 350770388000 | JESSIE BENINETT | 9 | 18E | 5 |  |  |
| 35077204690000 | HINTTER TUCKER | $\stackrel{1}{1}$ | 18 E | 31 |  |  |
| 35077205450000 | DEILA HOLT | 9 | 17E | 35 |  |  |
| 35077205430000 | STATE | \% | 1SE | 28 |  |  |
| 3507720.510000 | DOBBS STATETINIT MA | 9 | 1SE | 2 |  |  |
| 35077214030000 | MABRY 12 | 4 N | 17 E | 12 |  |  |
| 3507721447000 | SPARIS | 4 N | 17E | 1 |  |  |
| 3507720.5080001 | STATE C UNIT | 9 | 18E | 28 |  |  |
| 35077212870000 | MCCASLIN | 4 N | 17E | 2 |  |  |
| 35077212760000 | MCCASLIN | 4 N | 17 E | 2 |  |  |
| 35077212580000 | SMITH | S | 18E | 20 |  |  |
| 350772128000 | LSMDEN | 4 N | 17E | 3 |  |  |
| 35077212160000 | PARKERALLFORD | 9 | 17E | 27 |  |  |
| 3507721000000 | HENLEY | \$ | 17E | 25 |  |  |
| 3507720996000 | KITCFELL | 4 N | 17E | 14 |  |  |
| 3507720993000 | SIVIL | 9 | 17E | 22 |  |  |
| 35077209800000 | DAEBY | 9 | 17E | 23 |  |  |
| 350773949000 | STATEC | 9 | 18E | 2 |  |  |
| 35077209350000 | WHIITEY | \% | 17E | 34 |  |  |
| 35077209210000 | EEFNETT STATE | \% | 18 E | 19 |  |  |
| 3507720870000 | JESSE BENNETT | 3 | 18E | 30 |  |  |
| 35077208580000 | AFDREN KURLIKO | 9 | 17E | 35 |  |  |
| 350770809000 | HEFLLEY | 9 | 17E | 25 |  |  |
| 35077208070000 | CALDRRON | \$ | 17E | 25 |  |  |
| 35077208000000 | CALDRRON | $\stackrel{1}{1}$ | 17 E | 26 |  |  |
| 35077207860000 | FABERO | 9 | 17E | 24 |  |  |
| 35077207810000 | SMITH | S | 18E | 20 |  |  |
| 350770032000 | LEELLSNCE | 3 | 17E | 3 |  |  |
| 350770585000 | CATDRON | 3 | 17 E | 26 |  |  |
| 35077205650000 | DAREY | \% | 17 E | 23 | 9478 | 9766 |
| 3507720588000 | FABERO | 3 | 17E | 24 | 11568 | 11812 |
| 35077205270000 | MABEY | $4{ }^{\text {N }}$ | 1SE | 7 |  |  |
| 35077205250000 | EEFHETT | S | 18 E | 30 |  |  |
| 3507700505000 | SMLTH | 3 | ISE | 20 |  |  |
| 3507720.5040000 | EERNETT STATE | \% | 18E | 19 | 1182 | 11515 |
| 35077201050000 | KFH2EDY | 3 | 18E | 32 |  |  |
| 35077204810000 | EEFNETT STATE | S | 18E | 19 | 10727 | 1090 |
| 35077209540000 | DOBES STATE | 9 | 18 E | 29 |  |  |
| 350773000000 | MCCASLIN | 8 | 17 E | 2 |  |  |
| 3507721050000 | SIVIL | 9 | 17E | 22 |  |  |
| 35077210060000 | EERFETT STATE | 3 | 18E | 19 |  |  |
| 3507720300000 | WHHTWEY | S | 17E | 34 |  |  |
| 35077204510000 | MABEV TRLET | 8 N | 17E | 12 |  |  |
| 3507720079000 | PATTTSON | 4 N | 17E | 1 |  |  |
| 35072100000 | CALDRON | 3 | 17E | 2 | 9751 | 9885 |
| 35077600000000 | M C WATTS | 3 | 18E | 3 |  |  |
| 35077301470000 | MABEY | 8 N | 18E | 9 |  |  |
| 35077300110000 | TL HENLEY | 3 N | 17E | 25 |  |  |


| UWT (AFFThum) | Wellinue | T재쎠T | Range | Section | spro Thnut SheetB <br> Tops | spaw <br> SheetS <br> $B o t$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 350773004000 | MOSE C WATTS | 8 N | 18E | 3 |  |  |
| 3507730000000 | DAREYYSUBDIVISION | \$ | 17E | 23 | 9950 |  |
| 35077210410000 | DAEEY | \% | 17E | 23 | 9782 | 1008 |
| 350772105000 | CAIDREON | 9 | 17E | 26 |  |  |
| 35077210100000 | PAFKER ALFED | \$ | 17E | 27 |  |  |
| 35077204180000 | ALFRED PARKER | 9 | 17E | 27 | 10216 | 10442 |
| 35077204130000 | DAEBYSUBDIVI | \% | 17E | 23 | 9047 | 9301 |
| 35077204020000 | FABERO | $\stackrel{1}{1}$ | 17 E | 24 | 9399 |  |
| 35077204010000 | MCCASLIN | 4 N | 17 E | 2 |  |  |
| 3507720485000 | HINATER TUCKER | 9 | ISE | 31 |  |  |
| 3507720300000 | SPARKS | 4 N | 17E | 3 |  |  |
| 35077203520000 | SAMS | S | 17E | 22 |  |  |
| 35077203410000 | CAJDRON | $\stackrel{1}{1}$ | 17 E | 25 |  |  |
| 35077203360000 | SMITH | S | 18E | 20 |  |  |
| 350770315000 | ARLRENKUELIKO | 9 | 17E | 35 |  |  |
| 3507720233000 | Maskry TRLET | 4 N | 18E | 5 |  |  |
| 35077202340000 | KRNAEDY | \$ | 1SE | 32 |  |  |
| 35077202810000 | WHITFEY | $\stackrel{1}{1}$ | 17 E | 34 |  |  |
| 3507720219000 | PS 0 | 4 N | 17E | 10 |  |  |
| 35077202540000 | KENT HEIRS | 9 N | 17E | 14 |  |  |
| 3507720246000 | SILVERBULLET | 4 N | 17E | 11 |  |  |
| 35077201750000 | RASPOTNIK | \% | 17E | 10 |  |  |
| 35077201740000 | VAJJTHN | \% | 17 E | 12 |  |  |
| 3507720129000 | KEFNT | 3 | 17E | 15 |  |  |
| 35077201410000 | HINTTER TUCKER | 3 N | 18E | 31 |  |  |
| 350772006000 | ARLDRENKUEILKO | 3 | 17E | 35 |  |  |
| 35077200710000 | WHITHEY | S | 17E | 34 |  |  |
| 3507720544000 | MABRY 9001 TV -P | 4N | 1SE | 11 |  |  |
| 3507720.890000 | WORKMM ${ }^{\text {a }}$ NTVP-9001 | 4 N | 18E | 22 |  |  |
| 35077214500000 | MAERYRANCH | 4 N | 18E | 10 |  |  |
| 3507705974000 | FENELI | $4{ }^{4}$ | ISE | $\underline{3}$ |  |  |
| 350772576000 | SPEASS | 4 | 18E | 21 |  |  |
| 35077204870000 | SHARP | 9 | 17 E | 2 |  |  |
| 35121216560000 | WALLACE | 4 N | 17E | 21 |  |  |
| 3512120820000 | M0ss | S | 16 E | 13 |  |  |
| 35121214020000 | LSA | \% | 17 E | 28 |  |  |
| 3512121406000 | CHAELES CASTERL | 3 | 17E | 32 |  |  |
| 3512121415000 | PDBOXMM | S | 17E | 2 | 10723 | 11003 |
| 3512121444000 | WAYFE WALLACE | 4 N | 17E | 21 |  |  |
| 35121216140000 | BOXMMAN | S | 17E | 21 | 9409 | 9661 |
| 3512121673000 | HARE | \% | 17 E | 33 |  |  |
| 3512121602000 | PRJHEE BOWMKN | 3 | 17E | 20 |  |  |
| 3512121457000 | EELLESK | 4 | 17E | 6 | 12127 |  |
| 35121214870000 | BOXMM ${ }^{\text {a }}$ | 9 | 17E | 20 | 9069 | 9282 |
| 35121216570000 | PD BOXMM | S | 17E | 2 | 9004 |  |
| 3512121208000 | WRICTIT | 8 N | 17 E | 18 |  |  |
| 3512121278000 | FDITHRICH4EDS | 9 N | 17E | 30 | 9564 | 9777 |
| 351212105000 | POTICHy | 3 | 17E | 3 |  |  |
| 3512121322000 | HARTSHOERE | 4 N | 17 E | 6 |  |  |
| 35121218070000 | USA | S | 17E | 28 | 10001 | 10442 |
| 3512121352000 | ALEXARDER | 8 N | 17E | 9 |  |  |


|  | Well 7 保me | Townsim | Range | Section | Spro <br> Thruy <br> Sheet $B$ <br> Tors 伆 | S2W <br> Thum <br> Sheet $B$ <br> Bat 嗄 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3512121344000 | ROCKISLAKD IMIPROVE | 4 N | 1／E | 8 |  |  |
| 3512121388000 | PEITIT | 5 N | 17E | 31 | 11702 | 11921 |
| 3512121331000 | WEBEER | 51 | 17E | 18 |  |  |
| 3512121321000 | ROCK ISLARD | $4{ }^{4}$ | 17E | 5 |  |  |
| 3512121319000 | POTICHNEY | 31 | 17E | 33 |  |  |
| 3512121312000 | WOODS PROSPECT | 5 | 16 E | 36 |  |  |
| 3512120111000 | POTICHNY | 5 N | 17E | 33 |  |  |
| 3512120183000 | STIFE | 4 N | 17 E | 4 |  |  |
| 35121218870001 | CASTEEL CHARLES＇A＇ | $\$ 1$ | 17E | 32 |  |  |
| 3512121851000 | PDBOWIMAN | 31 | 17 E | $\boldsymbol{\sim}$ | 10143 | 10401 |
| 3512121850000 | USA | 31 | 17 E | 28 | 10077 | 10008 |
| 3512121842000 | BOWMMAN | 5 | 17E | 21 | 10882 | 11118 |
| 3512121835000 | EDITHRICHARDS | 81 | 17E | 30 | 9779 | 10021 |
| 3512121900000 | ARDEFSONK | 31 | 17E | 19 |  |  |
| 351212057000 | SWVEET | $4 N$ | 17 E | 9 |  |  |
| 3512120319000 | BOWMMAN | 51 | 17E | 17 |  |  |
| 3512120.950000 | DURAN | 5 | 17E | 18 |  |  |
| 3512120600000 | BERKARLI JONES | 31 | 16 E | 10 |  |  |
| 3512120800000 | COOK | 31 | 10E | 14 |  |  |
| 3512121334000 | LEWIS | 4 N | 16 E | 12 |  |  |
| 3512121349000 | FEWDHM | $4{ }^{4}$ | 16E | 11 |  |  |
| 3512120700000 | SMEALLWOOD | 4 N | 16 E | 3 |  |  |
| 35121204950000 | MCEEE | 51 | 10E | 23 |  |  |
| 3512121763000 | PEDEN | $\$ 1$ | 10 E | 24 |  |  |
| 3512121482000 | AIMERIT0 | 51 | 16 E | 34 | 10399 |  |
| 3512121207000 | SKSILDNOUD | $4{ }^{4}$ | 16E | 10 |  |  |
| 3512121192000 | CWORCE PEDEN | 5 | 16 E | 24 |  |  |
| 3512121288000 | HALIETVILIE TOWHSITE | 51 | 16 E | 35 | 11040 |  |
| 3512121200000 | TEX | 4 N | 10 E | 14 |  |  |
| 3512121380000 | MIILIER | 5 | 16 E | 26 |  |  |
| 3512120157000 | WOUDS PROSPECT | IT | 16 E | 36 | 1240 |  |
| 3512120092000 | CDORTE PDEA | 3 | 16 E | 24 |  |  |
| 3512121844000 | MLSSS URIT | 31 | 16 E | 25 | 10166 | 10350 |
| 3512122811000 | SIRMARS LOE | 4 N | 16 E | 12 |  |  |
| 3512120206000 | MARCANCWII | 31 | 16 E | 34 | 10664 |  |
| 3512120188000 | US A | 51 | 16 E | 27 |  |  |
| 3512120108000 | W WALLMCE | $4{ }^{4}$ | 17 E | 17 |  |  |
| 3512120625000 | US GOWERKIMENT | 51 | 16 E | 27 |  |  |
| 3512120177000 | USA | $\$ 1$ | 16 E | 35 | 10332 | 10088 |
| 3512120198000 | FEWDHAM | 4 N | 16 E | 11 |  |  |
| 35121202670000 | MCADDEN | 4 N | 16 E | 2 |  |  |
| 351212020000 | FRAKIZ FEWDHAM | $4 N$ | 10 E | 14 |  |  |
| 3512120200000 | LEWIS | $4 N$ | 16 E | 12 |  |  |
| 3512120219000 | SLALJGHIER | 4 N | 16 E | 1 |  |  |
| 3512120145000 | R EKTING | 31 | 16 E | 26 |  |  |
| 3512120155000 | HARTSHORNE | 4 N | 17E | 6 |  |  |
| 3512120031000 | PALILTE B OMNMAK | 51 | 17E | 20 |  |  |
| 3512122106000 | KINE | 31 | 16 E | 25 |  |  |
| 3512122123000 | MCBEE | $\$ 1$ | 16 E | 23 |  |  |
| 351212133000 | AFDESSON | $\$$ | 17E | 19 |  |  |
| 3512121423000 | WC CAMP | 4 N | 10 E | 4 |  |  |


| UW7 (AFFMhum) | Well ${ }_{\text {Nome }}$ | Townsix | Range | Section |  SheetS Tox | $\stackrel{\text { Spw }}{\text { Thnu }}$ Sheet $B$ Bot 伿 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3512121012000 | MASS | \% | 16E | 25 |  |  |
| 3512123216000 | KEFIDEICK | \& | 16E | 13 |  |  |
| 351212323000 | FINK | \% | 10 E | 36 | 10307 | 10800 |
| 3512123054000 | SIMMERITO | 3 | 16 E | 27 | 10445 | 10000 |
| 3512122922000 | LEMIS TAMES | 8 N | 16 E | 12 |  |  |
| 3512122851000 | CAMP | \% | 16 E | 34 | 1053 | 10754 |
| 3512120070000 | K1H5 | \% | 16 E | 26 |  |  |
| 3512122003000 | WOODS | \% | 16 E | 36 | 11007 | 11830 |
| 3512121780000 | ANDESSON | \% | 17 E | 19 | 980 |  |
| 3512121950000 | USA | 3 | IGE | 35 | 10939 | 11149 |
| 3512121982000 | NEWDHAM | 8 N | 16 E | 11 |  |  |


| U/FT ( 4 FFSM | Well 7 号we | TOFHM\% | Range | Section | Sxivo <br> Thruy <br> SheetC <br> TOR 例 | Spiro <br> Thru포 <br> Sheerc <br> $B C \pi$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3507720572000 | BLUEMOUNTARN | 4 N | 17E | 22 |  |  |
| 3507720600000 | WALLACE | 4 N | 17E | 15 |  |  |
| 3507720320000 | W PLERBLAKNCE | 9 | 17E | 36 |  |  |
| 3507203 8000 | TESSIEBENIET'T | 3 | 18E | 30 |  |  |
| 3507720469000 | HINTER TUCKER | 9 | 18E | 31 |  |  |
| 3507720545000 | DETIA HOLT | 5 | 17E | 35 |  |  |
| 3507720543000 | STATE | 9 | 18 E | 28 |  |  |
| 3507720.51000 | DOBBS STATEURIT MA | 9 | 18E | 29 |  |  |
| 3507721463000 | MABRY 12 | 4 N | 17E | 12 |  |  |
| 3507721447000 | SPARFS | 4 N | 17 E | 1 |  |  |
| 35077205080001 | STATE C URIT | $\$$ | 18E | 28 |  |  |
| 35077212870000 | MCCASLIN | 4 N | 17E | 2 |  |  |
| 3507721276000 | MCCASLIN | 4 N | 17E | 2 |  |  |
| 3507721288000 | SMLTH | \$1 | 18E | 20 |  |  |
| 350772128000 | LATDEN | 4 | 17 E | 3 |  |  |
| 35077212160000 | PARKERALFORD | 9 | 17E | 27 |  |  |
| 3507721000000 | HENHLEY | \$1 | 17E | 25 |  |  |
| 3507720996000 | KITCHELL | 4 N | 17E | 14 |  |  |
| 3507720993000 | SIVIL | 9 | 17E | 22 |  |  |
| 3507720980000 | DAREY | \$1 | 17E | 23 |  |  |
| 350772949000 | STATEC | $\$$ | 18E | 28 |  |  |
| 35077209350000 | WHITFEY | 5 | 17E | 34 |  |  |
| 3507720921000 | BEFRETET STATE | 5 | 18E | 19 |  |  |
| 3507720870000 | JESSIE BENNETT | 9 | 18E | 30 |  |  |
| 3507720858000 | AKDREXKURIKKO | \$1 | 17E | 35 |  |  |
| 35077280000 | HEFNLET | $\underline{1}$ | 17 E | 25 |  |  |
| 3507720807000 | CALIDRON | 5 | 17E | 25 |  |  |
| 3507720800000 | CALIDRON | 9 | 17E | 26 |  |  |
| 3507720786000 | FABERO | 9 | 17E | 24 |  |  |
| 3507720781000 | SMLTH | F1 | 18E | 20 |  |  |
| 35077008000 | LFELLAFCE | 91 | 17 E | 36 |  |  |
| 350772055000 | CAJDREN | $\underline{1}$ | 17E | 25 |  |  |
| 3507720565000 | DARBY | \$1 | 17E | 23 |  |  |
| 3507720588000 | FABER0 | \$1 | 17E | 24 |  |  |
| 35077205270000 | MABRT | 4 N | 18E | 7 |  |  |
| 3507720525000 | BEFINETT | 9 | 18E | 30 |  |  |
| 350770505000 | SMITH | 9 | 18E | 31 |  |  |
| 3507720504000 | BERFETTT STATE | \$1 | 18E | 19 |  |  |
| 35077201050000 | KENHEDY | 9 | 18E | 32 |  |  |
| 35077204810000 | BERFLETT STATE | \$1 | 18E | 19 |  |  |
| 35077209540000 | DOBES STATE | \$1 | 18E | 20 |  |  |
| 350772000000 | MCCHSLIV | $4{ }^{4}$ | 17 E | 2 |  |  |
| 3507721050000 | SIVIL | I | 17E | 22 |  |  |
| 3507721006000 | EERFLETT STATE | 9 | 18E | 19 |  |  |
| 3507720300000 | WHITHEY | 9 | 17 E | 34 |  |  |
| 3507720451000 | MABRY TRLET | 4 N | 17E | 12 |  |  |
| 3507720079000 | PATITS ON | 4 N | 17E | 1 |  |  |
| 3507721050000 | CALIDRON | \$1 | 17 E | 23 |  |  |
| 3507700000000 | MC WATTS | 9 | 18E | 33 |  |  |
| 35077301470000 | MABRY | 4 N | 18E | 9 |  |  |
| 3507730011000 | JL HENLET | 9 | 17E | 25 |  |  |


|  | Well ${ }_{\text {dimwe }}$ | TOTHS安 | Ronge | Section | SFPO <br> TRhy <br> SheezC <br> TO石潮 | sparo <br> Thrug <br> Sheet C <br> $B O \pi$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3507730004000 | MOSE C WATTS | 4 N | 18E | 3 |  |  |
| 3507730000000 | DARBYSUBDIVISION | $\$ 1$ | 17E | 23 |  |  |
| 3507721041000 | DAREY | 5 | 17E | 23 |  |  |
| 3507721050000 | CAJDRON | 31 | 17E | 25 |  |  |
| 3507721010000 | PARKER ALFEED | 31 | 17E | 27 |  |  |
| 3507720418000 | ALFRED PARKER | $\$ 1$ | 17E | 27 |  |  |
| 3507720413000 | DARBYSUBDIVI | 3 N | 17E | 23 |  |  |
| 3507720402000 | FABER0 | 9 | 17E | 24 |  |  |
| 3507720401000 | MCCASLIN | 4 N | 17E | 2 |  |  |
| 3507720425000 | HJINTER TUCKER | \＄1 | 18E | 31 |  |  |
| 3507720300000 | SPARES | 4 N | 17E | 3 |  |  |
| 3507720352000 | SAMS | \＄ | 17E | 22 |  |  |
| 3507720341000 | CALIDRON | 5 | 17E | 26 |  |  |
| 3507720366000 | SMLTH | 31 | 18E | 20 |  |  |
| 350720313000 | AFDRENKURIKKO | 31 | 17E | 35 |  |  |
| 3507720293000 | MABRY TRLET | 4 N | 18E | 5 |  |  |
| 3507720244000 | KENHEDY | 5 | 18E | 32 |  |  |
| 35077202810000 | WHITHEY | 31 | 17E | 34 |  |  |
| 3507720219000 | PS 0 | 4 N | 17E | 10 |  |  |
| 3507720254000 | KENT HEIRS | 5 | 17E | 14 |  |  |
| 3507720246000 | SLTVERBULIET | 4 | 17E | 11 |  |  |
| 35077201750000 | RASPOTVIK | $\$$ | 17E | 10 |  |  |
| 3507720174000 | VAJTCHN | 5 | 17E | 12 |  |  |
| 3507720189000 | KEFNT | 9 | 17E | 15 |  |  |
| 35077201410000 | HJITER TUCKER | \＄1 | 18E | 31 |  |  |
| 3507720060000 | AHDRENKURHKO | IN | 17E | 35 |  |  |
| 3507720071000 | WHITHEY | 9 | 17E | 34 |  |  |
| 3507720544000 | MABRY 90015\％－P | 4 N | 18E | 11 |  |  |
| 3507720，99000 | WORKMMASTVP－901 | 4 N | 18E | 22 |  |  |
| 3507721430000 | MABRYRANCH | 4 N | 18E | 10 |  |  |
| 3507720574000 | FEWEIL | 4 | 18E | 2 |  |  |
| 350772056000 | SPEAFS | 4 N | 18E | 21 |  |  |
| 3507720487000 | SHARP | 5 | 17E | 2 |  |  |
| 3512121656000 | WALLACE | 4 N | 17E | 21 |  |  |
| 3512120820000 | MOSS | \＄1 | 16 E | 13 |  |  |
| 3512121402000 | LSA | \＄1 | 17E | 28 |  |  |
| 3512121406000 | CHARLES CASTERL | 3 | 17E | 32 | 1095 |  |
| 3512121415000 | PD BOWM | 9 | 17E | 2 |  |  |
| 3512121444000 | WA YFE WALLACE | 4 N | 17E | 21 |  |  |
| 3512121614000 | BOWMMAN | \＄1 | 17E | 21 |  |  |
| 3512121673000 | HARE | \＄1 | 17 E | 33 |  |  |
| 3512121602000 | PAJLIFEBOWMM | IN | 17E | 20 |  |  |
| 3512121457000 | BELTEKO | 4 | 17E | 6 | 10717 | 10952 |
| 35121214870000 | BOWMMAN | $\$$ | 17E | 20 |  |  |
| 3512121657000 | PD B OXMMAN | 5 | 17E | 29 |  |  |
| 3512121208000 | WRIGTT | 4 N | 17E | 18 | 12569 |  |
| 3512121278000 | EDITHRICHARDS | $\$$ | 17E | 30 |  |  |
| 3512121053000 | POICHVY | $\underline{1}$ | 17E | 3 | 1080 | 1088 |
| 3512121523000 | HARTSHORLE | 4 N | 17E | 6 | 10542 | 10782 |
| 3512121807000 | USA | \＄1 | 17E | 28 |  |  |
| 3512121352000 | ALEXAHDER | 4 N | 17E | 9 |  |  |


| UWT (AFPR M m | Wellihme | Townstip | Ratge | Sectias | spro Thrúㅗ SheetC Tops | Sparo Thnu포 SheetC Bot 供 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3512121344000 | ROCKISLAKD IMPROWE | 4 N | 17E | 8 |  |  |
| 3512121338000 | PEITIT | \% | 17E | 31 | 10309 | 10006 |
| 3512121331000 | WIPBEER | \% | 17 E | 18 |  |  |
| 351212131000 | KOCK ESLEN | 4 N | 17E | 5 | 1183 |  |
| 3512121319000 | POTICHNEY | \% | 17E | 33 | 11610 | 11002 |
| 3512121312000 | WOODS PROSPECT | \% | 16 E | 36 | 10474 | 1099 |
| 3512120111000 | POTICHNY | \% | 17 E | 33 |  |  |
| 3512120133000 | STINE | 4 N | 17E | 4 |  |  |
| 35121218870001 | CASTEEL CHARLES 'A ${ }^{\text {a }}$ | \% | 17E | 32 |  |  |
| 3512121851000 | PDEOWMM | 9 | 17E | 2 |  |  |
| 3512121850000 | USA | 9 | 17E | 28 |  |  |
| 3512121942000 | BOXMMAN | \% | 17E | 21 |  |  |
| 3512121835000 | EDITHRICHAEDS | \% | 17E | 30 |  |  |
| 3512121909000 | ANDERSONK | \% | 17E | 19 |  |  |
| 35121257000 | SWMET | $4{ }^{4}$ | 17 E | 9 |  |  |
| 3512120319000 | BOXMMAN | \% | 17 E | 17 |  |  |
| 3512120.95000 | DURAN | \% | 17E | 18 |  |  |
| 3512120060000 | BERKAAFDI TONES | 3 | 16 E | 10 |  |  |
| 351212080000 | COOK | \% | 10 E | 14 |  |  |
| 3512121334000 | LEVXIS | 4 N | 16 E | 12 | 11188 | 159 |
| 3512121349000 | NEFDHMM | 4 N | 10 E | 11 | 10640 | 1088 |
| 3512120700000 | SMMLLDKOOD | 4 N | 16 E | 3 | 11451 |  |
| 35121204950000 | MCEEE | \% | 10 E | 23 |  |  |
| 3512121768000 | PFDEN | 3 | 16 E | 24 |  |  |
| 3512121482000 | AMMERTTO | \% | $16 E$ | 34 |  |  |
| 351212127000 | SMMSLINOTD | 4 N | 10 E | 10 | 1077 | 1102 |
| 3512121192000 | CPORCE PEDEN | S | 16 E | 24 |  |  |
| 3512121280000 | HALIEYYILIE TOXNSITE | \% | 16 E | 35 |  |  |
| 3512121200000 | TEX | 4 N | 10 E | 14 | 11888 | 12121 |
| 3512121308000 | MILIER | \% | 16 E | 26 |  |  |
| 351212157000 | WOOLS PROSPECT | \$ | 16 E | 36 |  |  |
| 351212002000 | CPDETEPEDEN | 9 | 10 E | 24 |  |  |
| 3512121844000 | MLSS URIT | \$ | 10 E | 25 |  |  |
| 3512122811000 | STRMLARS LOS | 4 N | 16 E | 12 | 1169 | 11888 |
| 3512120206000 | MARCANGELI | \$ | 16 E | 34 |  |  |
| 3512120180000 | USA | S | 10 E | 27 |  |  |
| 3512120180000 | W WALLACE | 4 N | 17E | 17 |  |  |
| 3512120625000 | US GOWERKMMENT | S | 16 E | 27 |  |  |
| 3512120177000 | USA | S | 10 E | 35 |  |  |
| 3512120188000 | NEFDHAM | 4 N | 16 E | 11 | 11109 |  |
| 351212027000 | MadDen | 4 N | $16 E$ | 2 | 10440 |  |
| 35121202000 | FRAFIZ NEWDHBM | 4 N | 10 E | 14 | 1106 |  |
| 351212020000 | LEVNIS | 4 N | $16 E$ | 12 | 1573 |  |
| 3512120219000 | SLAJTGHIER | 4 N | 16 E | 1 | 10641 |  |
| 3512120145000 | R EKINTG | 9 | 10 E | 26 |  |  |
| 3512120155000 | HARTSHOENE | 4 N | 17E | 6 | 10\$80 |  |
| 3512120031000 | PAJLINE BOMMM | \% | 17E | 20 |  |  |
| 3512122106000 | KIINJ | 9 | 16 E | 26 |  |  |
| 3512122130000 | MCEEE | \% | 16 E | 23 |  |  |
| 3512121390000 | ANDESSON | \% | 17E | 19 |  |  |
| 3512121423000 | WC CAMP | 4 N | 16 E | 4 | 11092 | 11001 |


| UW7 (AFPR ${ }^{\text {a m }}$ ) | Welliswe | Townsty | Runge | Section |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3512121012000 | MASS | \% | 10 E | 25 |  |  |
| 3512123216000 | KEFIDEICK | 4 N | 16E | 13 | 1198 |  |
| 351212323000 | FITEK | \% | 10E | 36 |  |  |
| 3512120054000 | ALMERITO | 3 | 16 E | 27 |  |  |
| 3512122922000 | LEMIS TAMES | 4 N | 16 E | 12 | 11341 | 11896 |
| 3512122851000 | CAMP | \% | 16 E | 34 |  |  |
| 3512128070000 | K17\% | 9 | 16 E | 26 |  |  |
| 351212203000 | WOODS | 3 | 16 E | 36 |  |  |
| 3512121788000 | ANDESSON | \% | 17E | 19 |  |  |
| 3512121950000 | USA | 3 | 16 E | 35 |  |  |
| 3512121982000 | NEFDHAMM | 8 N | 16 E | 11 | 10774 | 11035 |


| UFF（ 4 FFRMus） | Well ${ }_{\text {atwe }}$ | TOHMS㐫 | Range | Section | Sxizo <br> Thny <br> SheetD <br> Tors 陱 | Spiro <br> Thn포 <br> SheetD <br> Bot 侮 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3507720572000 | ELUEMOUNTAEN | 4 N | 17E | 22 |  |  |
| 3507720609000 | WALLACE | 4 N | 17E | 15 |  |  |
| 3507720320000 | W P LERELLANCE | $\$$ | 17E | 36 | 11054 | 1120 |
| 35072038000 | JESSIE BENLETT | 31 | 18E | 30 | 9779 | 1003 |
| 3507720469000 | HINHTER TUCKER | 51 | 18E | 31 | 10007 |  |
| 35077205450000 | DEITAHOLT | 31 | 17E | 35 | 10752 | 11021 |
| 35077205430000 | STATE | 51 | 18E | 28 |  |  |
| 350772051000 | DOBBS STATEUNIT MA | $\$ 1$ | 18E | 2 | 9770 | 10000 |
| 3507721460000 | MABRY 12 | 4 N | 17E | 12 |  |  |
| 350721447000 | SPARFS | $4 N$ | 17 E | 1 |  |  |
| 35077205080001 | STATE C URIT | 51 | 18E | 28 |  |  |
| 3507721287000 | MCCASLIN | 4 N | 17E | 2 |  |  |
| 3507721276000 | MCCASLIN | 4 N | 1／E | 2 |  |  |
| 3507721258000 | SMLTH | \＄1 | 18E | 20 | 9141 | 936 |
| 35072128000 | LSMDEN | $4 N$ | 17E | 3 | 12057 |  |
| 3507721216000 | PARKERALFORD | $\underline{\$ 1}$ | 17E | 27 | 10270 |  |
| 3507721000000 | HEFLIEY | 31 | 17E | 25 | 1024 | 10555 |
| 3507720996000 | KITCHELL | 4 N | 17E | 14 |  |  |
| 3507720993000 | SIVIL | $\$ 1$ | 17E | 22 |  |  |
| 3507720900000 | DAREY | 5 | 1／E | 23 | 9278 |  |
| 350730949000 | STATEC | $\$ 1$ | 18E | 28 |  |  |
| 35077209350000 | WHITHEY | 31 | 17E | 34 | 11101 | 11372 |
| 3507720921000 | BERFLETT STATE | 31 | 18E | 19 | 8727 | 9175 |
| 3507720870000 | JESSIE BENLETT | 51 | 18E | 30 | 9996 | 10095 |
| 35077208580000 | AFDREXKURIIKO | 31 | 17E | 35 | 10494 | 10762 |
| 350720809000 | HENTET | $\$$ | 17 E | 25 | 10004 |  |
| 3507720807000 | CALIDRON | $\$ 1$ | 17E | 25 | 8988 | 9202 |
| 3507720800000 | CALIDRON | 5 | 1／E | 25 | 10035 |  |
| 35077207860000 | FABERO | 51 | 17 E | 24 | 8988 |  |
| 35077207810000 | SMLTH | 31 | 18E | 20 | 10471 | 10658 |
| 350720092000 | LFELLENCE | 31 | 17E | 36 |  |  |
| 35072055000 | CAIDREN | 5 | 17E | 36 | 950 | 9541 |
| 35077205650000 | DAREY | 31 | 17 E | 23 | 9066 | 9390 |
| 3507720528000 | FABER0 | 31 | 17E | 24 | 9714 | 9952 |
| 3507720527000 | MABRT | 4 N | 18E | 7 |  |  |
| 3507720.5250000 | BENHETT | 51 | 18E | 30 | 1188 | 11651 |
| 350720505000 | SMLIH | 5 | 18E | 20 | 10579 | 1077 |
| 3507720504000 | BEFRIETT STATE | 31 | 18E | 19 | 9260 | 9551 |
| 35077201050000 | KENHEDY | 31 | 18E | 32 |  |  |
| 35077204810000 | BEFRNETT STATE | 5 N | 18E | 19 | 8481 | 8734 |
| 3507720954000 | DOBES STATE | 9 | 18E | 2 |  |  |
| 35072000000 | MCCHSLIN | $4 N$ | 17E | 2 |  |  |
| 35072105s000 | SIVIL | $\pm 1$ | 17E | 22 | 9887 | 10102 |
| 3507721096000 | BEFRNETT STATE | 5 N | 18E | 19 | 9441 | 9674 |
| 3507720309000 | WHITHEY | 31 | 17 E | 34 | 10700 | 10060 |
| 3507720451000 | MABRY TRLET | 4 N | 17E | 12 |  |  |
| 3507720079000 | PATITS ${ }^{\text {d }}$ | 4 N | 17E | 1 |  |  |
| 350721070000 | CALDREN | 31 | 17 E | 3 | 908 | 9245 |
| 35077600000000 | M C WATTS | 51 | 18E | 3 |  |  |
| 3507730147000 | MABRT | 4 N | 18E | 9 |  |  |
| 3507730011000 | JL HENLET | 51 | 17E | 25 | 10011 |  |


| UW7 (AFFRM ${ }^{\text {a }}$ ) | Wellinwe | TOWHMS | Range | Section | Sxivo Thum主 SheetD Tops | Syivo Thy SRy SheetD Bot 例 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3507730040000 | MOSE C WATTS | 4 N | 18E | 3 |  |  |
| 3507730000000 | DAREYYSUBDIVISION | S | 17E | 23 |  |  |
| 35077210410000 | DAEBY | \$ | 17E | 23 | 9131 | 9460 |
| 350772108000 | CALDREON | 9 | 17E | 26 | 1025 | 10341 |
| 35077210100000 | PAFKER ALFRED | 9 | 17E | 27 | 897 |  |
| 35077204180000 | ALFRED PARKER | \$ | 17E | 27 | 9202 | 9442 |
| 3507720418000 | DAFBYSUBDIVI | $\stackrel{1}{1}$ | 17 E | 23 |  |  |
| 3507720402000 | FABER0 | 9 | 17E | 24 |  |  |
| 35077204010000 | MCCASLIN | 4 N | 17 E | 2 | 11287 |  |
| 350773480000 | HINTIER TUCKER | F | 18E | 31 |  |  |
| 3507720300000 | SPARES | 4 N | 17 E | 3 | 11616 |  |
| 3507720352000 | SAMS | 9 | 17E | 22 | 9520 | 9744 |
| 35077203410000 | CAJDR ON | 9 | 17E | 26 | 9189 | 9443 |
| 35077203360000 | SMITH | S | 18E | 20 |  |  |
| 350770312000 | ARDRENKURILKO | 9 | 17E | 35 | 1098 | 11202 |
| 3507720235000 | MABREY TRLET | 4 N | 18E | 5 |  |  |
| 35077202340000 | KRNTEDY | S | 18E | 32 |  |  |
| 3507720231000 | WHITNEY | \% | 17E | 34 | 1145 | 1106 |
| 3507720219000 | PS 0 | 4 N | 17E | 10 |  |  |
| 35077202540000 | KPNT HEIRS | \$ | 17 E | 14 |  |  |
| 3507720246000 | SILVERBULIET | 4 N | 17E | 11 |  |  |
| 35077201750000 | RUSPOTNIK | S | 17E | 10 |  |  |
| 3507720174000 | VAJJCFIN | \% | 17E | 12 |  |  |
| 3507720129000 | KENT | 9 | 17E | 15 |  |  |
| 3507720141000 | HINTER TUCKER | \$ | 18E | 31 |  |  |
| 350773006000 | ARDRENKURILKO | 9 | 17E | 35 | 11052 |  |
| 3507720071000 | WHHTHEY | 9 | 17E | 34 | 11157 |  |
| 3507720544000 | MLBRY 9001 TV - P | 4 N | 18E | 11 |  |  |
| 3507720.99000 | WORKMM ${ }^{\text {a }}$ NJVP-901 | $4{ }_{\text {N }}$ | 18E | 22 |  |  |
| 35077214500000 | MAEERYRANCH | 4 N | 18E | 10 |  |  |
| 3507730574000 | Fendeil | 4 N | ISE | $\underline{3}$ |  |  |
| 350770576000 | SPEAES | $4{ }^{4}$ | 18E | 21 |  |  |
| 35077204670000 | SHARP | 9 | 17E | 2 |  |  |
| 3512121656000 | WALLACE | 4 N | 17E | 21 |  |  |
| 3512120820000 | M0SS | 9 | 16 E | 13 |  |  |
| 3512121402000 | LSA | 9 | 17E | 28 | 10961 | 11219 |
| 3512121406000 | CHEELES CASTEAL | 9 | 17E | 32 |  |  |
| 3512121415000 | PDBOXMM | 9 | 17E | 2 |  |  |
| 3512121444000 | WA FNE WALLACE | 4 N | 17E | 21 |  |  |
| 3512121614000 | BOXMMAN | \% | 17E | 21 |  |  |
| 3512121673000 | HAEE | $\stackrel{1}{1}$ | 17 E | 33 | 10997 | 11055 |
| 351212160000 | PRJUITE EOWMKAN | 9 | 17E | 21 |  |  |
| 3512121457000 | EELTESO | 4 N | 17E | 6 |  |  |
| 3512121487000 | BOXMM ${ }^{\text {a }}$ N | \$ | 17E | 20 |  |  |
| 3512121657000 | PD BOXMMAN | 9 | 17E | 2 |  |  |
| 3512121288000 | WRICTIT | 4 N | 17E | 18 |  |  |
| 3512121278000 | EDITHRICHAEDS | 9 | 17E | 30 |  |  |
| 351212105000 | POITCHIY | 3 | 17E | 3 |  |  |
| 3512121523000 | HARTSHORNE | 4 N | 17E | 6 |  |  |
| 3512121807000 | USA | 3 | 17E | 28 | 9790 | 10105 |
| 3512121352000 | ALEXAKDER | 4 N | 17E | 9 |  |  |


| UF/ (AFETM思) | Fell 7 dume | TOWHS | Rrage | Sectian | Sxivo <br> Thpur <br> SheetD <br> Tox 你 | Syivo <br> Thum <br> SheetD <br> $B a \pi$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3512121344000 | ROCKISLAKD IMPROVE | 4 N | 17 E | 8 |  |  |
| 3512121380000 | PEITIT | 31 | 17 E | 31 |  |  |
| 3512121331000 | WEBEER | 5 N | 17E | 18 |  |  |
| 3512121521000 | ROCK ELEAND | $4{ }^{4}$ | 17 E | 5 |  |  |
| 3512121310000 | POTTCHET | 5 | 17E | 33 | 10603 | 10920 |
| 3512121312000 | WOODS PROSPECT | 31 | 16 E | 36 |  |  |
| 3512120111000 | POTICHNY | 51 | 17 E | 3 | 11045 |  |
| 3512120133000 | STINE | 4 N | 17E | 4 | 10992 |  |
| 35121218870001 | CASTEEL CHARLES 'A | 51 | 17E | 32 | 11000 |  |
| 3512121851000 | PDEOWM | IN | 17 E | 2 |  |  |
| 3512121850000 | USA | 5 | 17E | 28 |  |  |
| 3512121842000 | BOWMMAN | 51 | 17E | 21 |  |  |
| 3512121835000 | EDITHRICHARDS | $\$ 1$ | 17 E | 30 |  |  |
| 3512121900000 | AFDEFSONK | 5 | 17E | 19 |  |  |
| 351212057000 | SWNET | 4 | 17 E | 9 |  |  |
| 3512120310000 | BOWMMN | \$1 | 17E | 17 |  |  |
| 3512120.950000 | DURAN | $\$ 1$ | 17 E | 18 |  |  |
| 3512120690000 | BERKLARDI JOFES | 31 | 16 E | 10 |  |  |
| 3512120800000 | COOK | 51 | 16 E | 14 |  |  |
| 3512121334000 | LEWIS | 4 N | 16 E | 12 |  |  |
| 3512121390000 | FEWDHMM | $4{ }^{4}$ | 16E | 11 |  |  |
| 3512120700000 | SMCALLWOOD | 4 N | 16 E | 3 |  |  |
| 35121204950000 | MCEEE | $\$$ | 16 E | 23 |  |  |
| 3512121763000 | PEDEN | 9 | 16 E | 24 |  |  |
| 3512121482000 | AIMERIT0 | 51 | 16 E | 34 |  |  |
| 3512121207000 | SKMLIMNOD | $4{ }^{1}$ | 10 E | 10 |  |  |
| 3512121192000 | CWORCE PDDEN | \$1 | 16 E | 24 |  |  |
| 351212128000 | HAILEYYILIE TOWNEITE | \$1 | 16 E | 35 |  |  |
| 3512121200000 | TEX | 4 N | 16 E | 14 |  |  |
| 3512121380000 | MUILER | 51 | 16 E | 26 |  |  |
| 3512120157000 | WOUDS PROSPECT | I | 16 E | 56 |  |  |
| 3512120052000 | CoDRTE PDDEN | $\$$ | 10 E | 24 |  |  |
| 3512121844000 | MLASS URIT | 31 | 16 E | 25 |  |  |
| 3512120811000 | SIRMARS LOE | 4 N | 16 E | 12 |  |  |
| 3512120206000 | MARCANCEDI | 9 | 16 E | 34 |  |  |
| 3512120188000 | USA | 5 | 16 E | 27 |  |  |
| 3512120168000 | W WALLMCE | $4 N$ | 17 E | 17 |  |  |
| 3512120625000 | US GOVERHIMENT | 5 | 16 E | 27 |  |  |
| 35121201770000 | USA | \$1 | 16 E | 35 |  |  |
| 3512120198000 | FEVCDHAM | 4 N | 16 E | 11 |  |  |
| 3512120257000 | MCADDEN | 4 N | 16 E | 2 |  |  |
| 351212020000 | FRAFIZ HEWDHAM | 4 | 10 E | 14 |  |  |
| 3512120200000 | LENVIS | $4{ }^{4}$ | 10 E | 12 |  |  |
| 3512120219000 | SLAJTGHIER | 4 N | 16 E | 1 |  |  |
| 3512120145000 | R EKINT | 5 | 16 E | 25 |  |  |
| 3512120155000 | HARTSHORFE | 4 N | 17E | 6 |  |  |
| 35121200310000 | PALILTEE B OWMMAN | 51 | 17E | 20 |  |  |
| 3512122106000 | Kille ${ }^{\text {d }}$ | 9 | 16 E | 35 |  |  |
| 3512122123000 | MCEEE | 9 | 16 E | 23 |  |  |
| 3512121330000 | ANDESSON | 5 | 17E | 19 |  |  |
| 3512121423000 | WC CAMP | 4 N | 16 E | 4 |  |  |


|  | Wellinme | Townsix | Range | Sectia | Sẏ̇o <br> Thnuㅁ <br> SheetD <br> Tops | Spiro <br> Thnu포 <br> SheetD <br> Bot 伤 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3512121012000 | MASS | \% | 16 E | 25 |  |  |
| 35121232160000 | KEFDEICK | 4 N | 16E | 13 |  |  |
| 3512123230000 | FINK | \% | 16 E | 36 |  |  |
| 3512123054000 | ALMERITO | 3 | 16 E | 27 |  |  |
| 3512122922000 | LEMIS TAMES | 4 N | 16 E | 12 |  |  |
| 3512122851000 | CAMP | \% | 16 E | 34 |  |  |
| 3512123070000 | K17NF | \% | 16 E | 26 |  |  |
| 3512122003000 | WOODS | \% | 16 E | 36 |  |  |
| 3512121780000 | ANDEASON | \% | 17E | 19 |  |  |
| 3512121980000 | USA | 3 | 16 E | 35 |  |  |
| 3512121982000 | NEFDHAM | 4 N | 16 E | 11 |  |  |


| UW7 (AFFThum) | Wellinume | Townsix | Rnuge | Sectias |  Sheet E <br> TOXS | $\stackrel{\text { Spw }}{\text { Thnu }}$ Sheet E Bot |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3507720572000 | ELTEMOUNT A AN | 4 N | 17E | 22 |  |  |
| 3507720600000 | WALLACE | 4 N | 17E | 15 |  |  |
| 350772032000 | W PLERELLANCE | \% | 17 E | 36 | 10276 | 10567 |
| 35077038000 | JESSE BEMNETT | 3 | 18E | 51 |  |  |
| 3507720469000 | HINTER TUCKER | \% | 18E | 31 | 9812 | 10000 |
| 3507720545000 | DEILA.HOLT | \% | 17E | 35 |  |  |
| 3507720543000 | STATE | \% | 18E | 28 | 10357 | 10616 |
| 350772051000 | DOBES STATETINTTMA | \% | 18E | 2 | 8774 | 9067 |
| 3507721463000 | MABRY 12 | 8 N | 17E | 12 |  |  |
| 3507721447000 | SPARES | 4 | 17E | 1 |  |  |
| 35077205080001 | STATE C UnIT | \% | 18E | 28 | 9794 | 10074 |
| 350721270000 | MCCASLIN | 8 N | 17E | 2 |  |  |
| 35077212760000 | MCCASLIN | 4 N | 17 E | 2 |  |  |
| 3507221280000 | SMITH | 3 | 18E | 20 | 808 | 8317 |
| $3507 / 2128000$ | LSTDEN | 4 N | 17E | 3 |  |  |
| 35077212160000 | PARKERALFORD | 3 | 17E | 27 |  |  |
| 3507221000000 | HENTLET | 3 | 17 E | 25 |  |  |
| 3507720996000 | KITCHELL | 8 N | 17E | 14 |  |  |
| 3507720993000 | SIVIL | \% | 17E | 22 |  |  |
| 35077209800000 | DAREY | \% | 17 E | 23 |  |  |
| 350772949000 | STATEC | 3 | ISE | 28 | 988 | 9342 |
| 35077209350000 | WHITNET | \% | 17E | 34 |  |  |
| 3507720921000 | EENHETT STATE | \$ | 18E | 19 |  |  |
| 3507720870000 | JESSEP BENNETT | $\underline{1}$ | 18E | 30 | 9139 | 9392 |
| 3507720880000 | AFDREXKUELIKO | \% | 17 E | 35 |  |  |
| 350773809000 | HeNTLET | $\stackrel{1}{1}$ | 17E | 25 | 996 | 10075 |
| 3507720007000 | CALDDRON | S | 17 E | 26 |  |  |
| 3507720800000 | CALIDRON | 3 | 17 E | 26 |  |  |
| 3507720786000 | FABERO | S | 17E | 24 |  |  |
| 35077207810000 | SMITH | 3 | 18E | 20 | 8794 | 9044 |
| 35077002000 | LEELLSNCE | 31 | 17 E | 3 | 11201 | 1149 |
| 35077085000 | CAJDRON | 3 | 17E | 3 |  |  |
| 3507720565000 | DAEBY | \% | 17 E | 23 |  |  |
| 3507720580000 | FABERO | 3 | 17E | 24 |  |  |
| 3507720527000 | Masky | 8 N | 18E | 7 |  |  |
| 3507720525000 | EERNETTT | S | 18E | 30 | 9898 | 1015 |
| 350770505000 | SMITH | 3 | 18E | 21 | 9101 | 9343 |
| 3507720.040000 | EENHETT STATE | \% | 18E | 19 |  |  |
| 35077201050000 | KPNREDY | S | 18E | 32 |  |  |
| 35077204810000 | EENHETT STATE | S | 18E | 19 |  |  |
| 3507720954000 | DOBES STATE | \% | 18E | 2 | 9925 | 9159 |
| 35077205000 | MCCASLIT | 4 N | 17E | 2 |  |  |
| 350772105800 | SIVIL | 3 | IJE | 2 |  |  |
| 35077210060000 | EENHETT STATE | \% | 18E | 19 |  |  |
| 3507720300000 | WHITNEY | \% | 17 E | 34 |  |  |
| 35077204510000 | Maskr TRLET | 4 N | 17E | 12 |  |  |
| 3507720079000 | PATTIS ON | $4{ }^{\text {N }}$ | 17E | 1 |  |  |
| 350721000000 | CAJDERON | 3 | 17E | 2 |  |  |
| 3507760030000 | M C WATTS | 3 | 18E | 3 |  |  |
| 3507730147000 | Masky | 8 N | 18E | 9 |  |  |
| 3507730011000 | JL HENLEY | S | 17 E | 25 |  |  |


| UFT (AFFThum) | Well ${ }_{\text {dume }}$ | TOTM | Runge | Sectica | Spzo <br> Thny <br> Sheete <br> Tors | Sp\% <br> Thpy <br> Sheet E <br> Bot 信 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 350773004000 | MCSE C WATTS | $4{ }^{4}$ | 18E | 3 |  |  |
| 3507730000000 | DARBYSUBDIVISION | 5 | 17E | 23 |  |  |
| 35077210410000 | DARBY | 9 | 17E | 23 |  |  |
| 350772105000 | CALDREN | 3 | 17E | 35 |  |  |
| 35077210100000 | PARKER ALFFRD | 9 | 17E | 27 |  |  |
| 3507720418000 | ALFRED PARKER | 9 | 17E | 27 |  |  |
| 3507720413000 | DARBYSUBDIVI | 5 | 17E | 23 |  |  |
| 35077204020000 | FABERO | 9 | 17E | 24 |  |  |
| 35077204010000 | MCCASLIN | 4 N | 17E | 2 |  |  |
| 350720420000 | HIMTER TUCKER | \$ | 18E | 31 | 10191 | 10440 |
| 3507720300000 | SPARKS | 4 N | 17E | 3 |  |  |
| 3507720352000 | SAMS | F1 | 17 E | 22 |  |  |
| 3507720341000 | CAJIDRON | 5 | 17 E | 25 |  |  |
| 3507720366000 | SMLTH | 9 | 18E | 20 | 9076 | 9318 |
| 350720315000 | AFDRENKURHKO | $\$$ | 17E | 35 |  |  |
| 3507720293000 | MABRFY TRLET | 4 N | 18E | 5 |  |  |
| 3507720284000 | KENLEDY | 5 | 18E | 32 |  |  |
| 35077202810000 | WHITHEY | \$1 | 17E | 34 |  |  |
| 3507720219000 | PS 0 | 4 N | 17E | 10 |  |  |
| 3507720254000 | KENT HEIRS | 9 | 17E | 14 |  |  |
| 3507720246000 | SILVERBUILET | $4{ }^{4}$ | 17E | 11 |  |  |
| 3507720175000 | RASPOTHIK | 9 | 17E | 10 |  |  |
| 3507720174000 | VAJTCHN | 5 | 17E | 12 |  |  |
| 3507720159000 | KERTT | 5 | 17E | 15 |  |  |
| 35077201410000 | HITHTER TUCKER | 5 | 18E | 31 | 10085 |  |
| 350720006000 | AFDREXKURHKO | $\$$ | 17 E | 35 |  |  |
| 3507720071000 | WHITHEY | $\$$ | 17 E | 34 |  |  |
| 3507720544000 | MABRF 9001 JV-P | 4 N | 18E | 11 |  |  |
| 3507720.99000 | WOREIMCANJ WP-9001 | 4 N | 18E | 22 |  |  |
| 3507721430000 | MAERYRANCH | 4 N | 18E | 10 |  |  |
| 350772574000 | FEXVIL | $4{ }^{4}$ | 18E | 2 |  |  |
| 350720576000 | SPEAES | $4{ }^{4}$ | 18E | 21 |  |  |
| 3507720487000 | SHARP | \$1 | 17E | 2 |  |  |
| 3512121656000 | WALLACE | 4 N | 17 E | 21 |  |  |
| 3512120820000 | MOOS | $\$$ | 16 E | 13 |  |  |
| 3512121402000 | LEA | 5 | 17E | 28 |  |  |
| 3512121406000 | CHARLES CASTERL | $\$$ | 17 E | 31 |  |  |
| 35121214150000 | PDBOWMMAN | 5 | 17E | 29 |  |  |
| 35121214440000 | WAYHE WALLACE | 4 N | 17E | 21 |  |  |
| 35121216140000 | BOWMMAN | 9 | 17E | 21 |  |  |
| 3512121673000 | HARE | 9 | 17E | 33 |  |  |
| 3512121602000 | PATIEIE BOWMAN | 31 | 17E | 20 |  |  |
| 3512121457000 | BELTESO | $4{ }^{4}$ | 17E | 6 |  |  |
| 3512121487000 | BOWMM | \$1 | 17E | 20 |  |  |
| 3512121657000 | PD B OXMMAN | 5 | 17 E | 29 |  |  |
| 3512121208000 | WRICTI | 4 N | 17E | 18 |  |  |
| 35121212780000 | EDITHRICHARDS | 5 | 17E | 30 |  |  |
| 3512121053000 | POICHVY | $\$$ | 17 E | 3 |  |  |
| 3512121530000 | HARTSHORFE | 4 N | 17E | 6 |  |  |
| 3512121807000 | USA | \$1 | 17E | 28 |  |  |
| 3512121352000 | ALEXANDER | 4 N | 17 E | 9 |  |  |


| U/WT (AFFRMM) | Well ${ }^{\text {anume }}$ | TOWHE安 | Range | Section | Sxivo <br> Thnus <br> SheetE <br> Tops | Spiro <br> Thruy <br> Shetez <br> $B o \pi$ 伿 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3512121344000 | ROCKISLAND IMPROVE | 4 N | 17E | 8 |  |  |
| 3512121383000 | PEITIT | 5 | 17E | 31 |  |  |
| 3512121331000 | WEBEER | ST | 17E | 18 |  |  |
| 3512121321000 | ROCK ISLARED | 4 | 17E | 5 |  |  |
| 3512121310000 | POTICHFEY | \$1 | 17E | 3 |  |  |
| 3512121312000 | WOODS PROSPECT | 5 | 16 E | 36 |  |  |
| 3512120111000 | POTICHNY | 9 | 17E | 3 |  |  |
| 3512120183000 | STINE | 4 N | 17E | 4 |  |  |
| 3512121887001 | CASTEEL CHARLES 'A' | 5 | 17 E | 32 |  |  |
| 3512121851000 | PDEOWMKA | 3 | 17 E | 2 |  |  |
| 3512121850000 | USA | 9 | 17E | 28 |  |  |
| 3512121842000 | BOWMMAN | FI | 17E | 21 |  |  |
| 3512121835000 | EITTHRICHARDS | 9 | 17E | 30 |  |  |
| 3512121900000 | ARDEFSONK | S | 17E | 19 |  |  |
| 351212057000 | SWVET | $4{ }^{4}$ | 17E | 9 |  |  |
| 3512120319000 | BOWMMN | \$1 | 17E | 17 |  |  |
| 3512120.950000 | DURAK | F | 17E | 18 |  |  |
| 3512120600000 | BERKARDI JOFES | 9 | 16 E | 10 |  |  |
| 3512120900000 | COOK | 5 | 16 E | 14 |  |  |
| 3512121334000 | LEWIS | 4 N | 16 E | 12 |  |  |
| 3512121349000 | FEWDHMM | $4{ }^{4}$ | 16 E | 11 |  |  |
| 3512120700000 | SMASLLNOOD | 4 N | 16 E | 3 |  |  |
| 35121204950000 | MCBEE | \$1 | 16 E | 23 |  |  |
| 3512121763000 | PEDEN | \$1 | 16 E | 24 |  |  |
| 3512121482000 | AIMERITO | \$1 | 10 E | 34 |  |  |
| 3512121207000 | SKALIMOOD | 4 | 16 E | 10 |  |  |
| 3512121192000 | GEORCE PEDEN | 5 | 16 E | 24 |  |  |
| 3512121280000 | HALIEYYILIE TOWRSITE | \$1 | 16 E | 35 |  |  |
| 3512121200000 | TEX | 4N | 16 E | 14 |  |  |
| 3512121380000 | MIIL.LER | \$1 | 16 E | 26 |  |  |
| 3512120157000 | WOUDS PROSPECT | \$ | 16 E | 5 |  |  |
| 3512120092000 | GODRLE PDDEN | 9 | 16 E | 24 |  |  |
| 3512121844000 | MMSS URIT | S | 16 E | 25 |  |  |
| 3512122811000 | SIRMARS LOS | 4 N | 16 E | 12 |  |  |
| 3512120206000 | MARCANCWDII | F | 16 E | 34 |  |  |
| 3512120158000 | USA | S | 16 E | 27 |  |  |
| 3512120168000 | W WALLMCE | $4 N$ | 17E | 17 |  |  |
| 3512120625000 | US GOVERHMMENT | 5 | 16 E | 27 |  |  |
| 3512120177000 | USA | \$1 | 16 E | 35 |  |  |
| 3512120188000 | HEFDHAM | 4 N | 16 E | 11 |  |  |
| 3512120267000 | MADDEN | 4 N | 16 E | 2 |  |  |
| 351212020000 | FRAEI' HEPD HPM | $4 N$ | 16 E | 14 |  |  |
| 3512120200000 | LEWIS | 4 | 16 E | 12 |  |  |
| 3512120219000 | SLAJTGHIER | 4 N | 16 E | 1 |  |  |
| 3512120145000 | R EKTNT | F | 16 E | 25 |  |  |
| 3512120155000 | HARTSHORNE | 4 N | 17E | 6 |  |  |
| 3512120031000 | PALILINE B OMMMAN | 5 | 17E | 20 |  |  |
| 3512122106000 | KIIFJ | 3 | 16 E | 25 |  |  |
| 3512120123000 | MCEEE | 5 | 16 E | 23 |  |  |
| 3512121330000 | ANDESSON | \$1 | 17E | 19 |  |  |
| 3512121423000 | WC CAMP | 4 N | 10 E | 4 |  |  |


| U／FT（AFFRMM） | Well 7 ume | TOTHMS年 | Range | Section | Sxivo <br> Thruy <br> SheetE <br> Tors 伤 | Skivo <br> Thruy <br> Shete E <br> $B 0 \pi$ 侕 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3512121012000 | MASS | ST | 16 E | 25 |  |  |
| 3512123216000 | KEFWDRICK | 4 N | 16 E | 13 |  |  |
| 3512123230000 | FIIEK | \＄1 | 16 E | 36 |  |  |
| 351212054000 | SIMERITO | I | 10E | 27 |  |  |
| 3512122922000 | LENXS TAMES | 4 N | 16 E | 12 |  |  |
| 3512120851000 | CAMP | 5 | 16 E | 34 |  |  |
| 3512123087000 | KTrNE | 9 | 16 E | 25 |  |  |
| 351212000000 | WOODS | 5 | 16 E | 36 |  |  |
| 3512121788000 | ANDESSON | 9 | 17E | 19 |  |  |
| 3512121900000 | USA | $\$$ | 10 E | 35 |  |  |
| 3512121982000 | HEFDHAM | 4 N | 16 E | 11 |  |  |


|  | Well 7 品we | TOFMS | Range | Section | Syivo <br> Thruㅍ <br> Sheet $F$ <br> Tors | $\begin{gathered} \text { Spin } \\ \text { Thrug } \\ \text { Shet F } \\ \text { Bot 偷 } \end{gathered}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3507720572000 | ELUEMOUNTAIN | 4 N | 17 E | 22 | 13640 | 1390 |
| 3507720609000 | WALLACE | 4 N | 17E | 15 | 1399 | 14387 |
| 3507720322000 | W P LERELAKNC | 5 | 17E | 36 |  |  |
| 35072038000 | JESSIE BENENET'T | 31 | 18E | 30 |  |  |
| 3507720469000 | HJITER TUCKER | $\$ 1$ | 18E | 31 |  |  |
| 3507720545000 | DETIA HOLT | 5 | 17E | 35 |  |  |
| 3507720543000 | STATE | 9 | 18E | 28 | 12569 | 12790 |
| 3507720.510000 | DOBBS STATEUNIT MA | $\$ 1$ | 18E | 2 | 11430 | 11000 |
| 3507721463000 | MABRY 12 | 4 N | 17E | 12 | 12055 | 12300 |
| 350721447000 | SPARIS | $4 N$ | 17E | 1 | 11000 |  |
| 35077205080001 | STATE C UNIT | 5 | 18E | 28 |  |  |
| 3507721287000 | MCCASLIN | 4 N | 17E | 2 | 1185 | 12160 |
| 3507721276000 | MCCASLIN | 4N | 17E | 2 | 11575 |  |
| 3507721288000 | SMLTH | 5 | 18E | 20 |  |  |
| 35072128000 | LStDEN | $4 N$ | 17E | 3 | 11812 | 1285 |
| 350721216000 | PARKERALFORD | 5 | 17E | 27 |  |  |
| 3507721000000 | HENTLET | $\$ 1$ | 17E | 25 |  |  |
| 3507720996000 | KITCHELL | 4 N | 17E | 14 | 13210 |  |
| 3507720993000 | SIVIL | $\$$ | 17 E | 22 |  |  |
| 3507720900000 | DAEBY | \$1 | 17E | 23 |  |  |
| 350720949000 | STATEC | 3 | 18E | 28 | 11547 | 11761 |
| 3507720935000 | WHITHEY | \$1 | 17 E | 34 |  |  |
| 3507720921000 | BENHETT STATE | 5 | 18E | 19 |  |  |
| 3507720870000 | JESSEE BENEETT | \$1 | 18E | 30 |  |  |
| 35077208580000 | AFDREXKURILKO | 51 | 17 E | 35 |  |  |
| 350720809000 | HEFHLET | 3 | 17 E | 25 |  |  |
| 3507720807000 | CALIDRON | 5 | 17E | 25 |  |  |
| 3507720800000 | CALIDRON | $\$ 1$ | 17E | 25 |  |  |
| 3507720766000 | FABER0 | $\$ 1$ | 17E | 24 |  |  |
| 35077207810000 | SMLTH | 9 | 18E | 20 |  |  |
| 350720092000 | LFELLENCE | 31 | 17 E | 36 |  |  |
| 35072055000 | CAIDREN | 31 | 17E | 36 |  |  |
| 3507720565000 | DAREY | 9 | 17E | 23 |  |  |
| 3507720528000 | FABER0 | 9 | 17E | 24 |  |  |
| 3507720527000 | MABRY | 4 N | 18E | 7 |  |  |
| 3507720525000 | BENFETTT | \$1 | 18E | 30 |  |  |
| 350772505000 | SMIIH | I | 18E | 20 |  |  |
| 3507720504000 | BEFHETT STATE | F1 | 18E | 19 |  |  |
| 35077201050000 | KENHEDY | \$1 | 18E | 32 | 10892 |  |
| 35077204810000 | BENHETT STATE | \$1 | 18E | 19 |  |  |
| 3507720954000 | DOBES STATE | 5 | 18E | 29 | 1158 | 11749 |
| 350720000000 | MCCHSLIN | 4 N | 17 E | 2 | 1150 |  |
| 350721055000 | SIVIL | \$1 | 17 E | 22 |  |  |
| 3507721096000 | BEFINETT STATE | 5 | 18E | 19 |  |  |
| 3507720309000 | WHITHEY | \$1 | 17E | 34 |  |  |
| 35077204510000 | MABRF TRLET | 4N | 17E | 12 |  |  |
| 3507720079000 | PATISON | 4 N | 17 E | 1 | 11572 |  |
| 35072100000 | CAIDRON | \$ | 17 E | 2 |  |  |
| 3507760000000 | M C WATTS | 9 | 18E | 3 |  |  |
| 3507730147000 | MABRY | 4 N | 18E | 9 |  |  |
| 3507730011000 | JL HENLEY | \$1 | 17 E | 25 |  |  |


| UW7 (AFFIM ${ }^{\text {a }}$ ) | Wellicure |  | Range | Section | spro Thma Mat Sheet $F$ TOFS | spavo <br> Sheet $F$ <br> Bot |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3507730040000 | MCSE C WATTS | 4 N | 18E | 3 |  |  |
| 3507730000000 | DAREYSUEDIVISION | \% | 17E | 2 |  |  |
| 35077210410000 | DAEBY | \% | 17E | 23 |  |  |
| 350721085000 | CALDDRON | 3 | 17E | 26 |  |  |
| 3507721010000 | PAFKER ALFRED | 3 | 17E | 27 |  |  |
| 35077204180000 | ALFRED PARKER | \% | 17E | 27 |  |  |
| 3507720413000 | DAFBYSUBDIM | \% | 17E | 23 |  |  |
| 3507720402000 | FABER0 | 9 | 17E | 24 |  |  |
| 35077204010000 | MCCASLIN | 4 N | 17 E | 2 |  |  |
| 3507731430000 | HDINTER TUCKER | 3 | 18E | 31 |  |  |
| 3507720300000 | SPARES | 4 N | 17E | 3 |  |  |
| 3507720352000 | SAMS | s | 17E | 22 |  |  |
| 35077203410000 | CALDDRON | N | 17 E | 26 |  |  |
| 3507720360000 | SMITH | 3 | 18E | 20 |  |  |
| 350770315000 | AFLREN KUELKO | 3 | 17E | 35 |  |  |
| 3507720233000 | Maskry TRLET | 4 N | 18E | 5 |  |  |
| 3507720240000 | K-NTEDY | \% | 18E | 32 | 10917 |  |
| 3507720281000 | WHHTHEY | 3 | 17E | 34 |  |  |
| 35077202190000 | PS 0 | 8 N | 17E | 10 | 12140 |  |
| 3507720254000 | KENT HEIRS | \% | 17E | 14 |  |  |
| 350772046000 | SILVERBUILET | 4 N | 17E | 11 | 125 | 12610 |
| 35077201750000 | RASPOTHIK | s | 17E | 10 |  |  |
| 3507720174000 | VAJJCTIN | \% | 17E | 12 |  |  |
| 3507720190000 | KERNT | S | 17E | 15 |  |  |
| 3507720141000 | HINTER TUCKER | \% | 18E | 31 |  |  |
| 350772006000 | AFDREN KUELIKO | 3 | 17E | 35 |  |  |
| 35077200710000 | WHIITEY | \% | 17E | 34 |  |  |
| 3507720544000 | MABRY 9001 CV - P | 4 N | 18E | 11 |  |  |
| 3507720590000 | WORKMMANJTP-9001 | 4 N | 18E | 22 |  |  |
| 3507721430000 | MAERYRANCH | 8 N | 18E | 10 |  |  |
| 350772094000 | FDNEIL | 4 N | 18E | $\underline{2}$ |  |  |
| 350770576000 | SFEASS | $4{ }^{4}$ | 18E | 21 |  |  |
| 35077204870000 | SHARP | 9 | 17E | 2 |  |  |
| 3512121656000 | WALLACE | 4 N | 17E | 21 | 1339 | 15722 |
| 3512120820000 | MOSS | 3 | 16 E | 13 |  |  |
| 3512121402000 | LEA | S | 17E | 28 |  |  |
| 3512121406000 | CHARLES CASTEEL | 3 | 17E | 32 |  |  |
| 3512121415000 | PDBOXMMAN | 3 | 17E | 2 |  |  |
| 3512121444000 | WAYFE WALLACE | 4 N | 17E | 21 | 13248 | 13578 |
| 3512121614000 | BOXMM ${ }^{\text {a }}$ N | S | 17E | 21 |  |  |
| 3512121673000 | HAEE | 3 | 17E | 33 |  |  |
| 3512121602000 | PATHINE BOTMKM | 9 | 17 E | 21 |  |  |
| 3512121457000 | BELLESO | 4 N | 17E | 6 |  |  |
| 3512121487000 | BOXMM ${ }^{\text {a }}$ N | \$ | 17E | 20 |  |  |
| 3512121657000 | PD BOXMM ${ }^{\text {a }}$ | S | 17E | 2 |  |  |
| 3512121280000 | WRICFIT | 4 N | 17 E | 18 |  |  |
| 3512121278000 | EDITHRICH4EDS | 9 | 17E | 30 |  |  |
| 3512121035000 | POITCHIY | 3 | 17 E | 3 |  |  |
| 3512121323000 | HARTSHOENE | 8 N | 17E | 6 |  |  |
| 3512121807000 | USA | 9 | 17E | 28 |  |  |
| 3512121352000 | ALEXANDER | 8 N | 17E | 9 | 12006 |  |


| UFT (AFFRMM) | Well ${ }_{\text {ckwe }}$ | Tornasit | Ronge | Section | Sxivo <br> Thrut <br> Sheet $F$ <br> Tors 做 | Spivo <br> Thy포 <br> Sheet $F$ <br> Bot 觔 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3512121344000 | ROCKISLAKD IMPROVEE | 4 N | 17E | 8 | 12025 |  |
| 3512121388000 | PEITIT | 5 | 17E | 31 |  |  |
| 3512121331000 | WEBEER | 5 | 17E | 18 |  |  |
| 3512121321000 | ROCK ISLAED | $4 N$ | 17E | 5 |  |  |
| 3512121310000 | POTICHEEY | 9 | 17E | 3 |  |  |
| 3512121312000 | WOODS PROSPECT | 5 | 16 E | 36 |  |  |
| 3512120111000 | POTTCHVY | 9 | 17E | 33 |  |  |
| 3512120133000 | STIFE | 4 N | 17E | 4 |  |  |
| 35121218670001 | CASTEEL CHARLES 'A' | 5 | 17E | 32 |  |  |
| 3512121851000 | PDEOWMAN | $\$$ | 17 E | 2 |  |  |
| 3512121850000 | USA | 5 | 17E | 28 |  |  |
| 3512121842000 | BOWMMAN | 9 | 17E | 21 |  |  |
| 3512121835000 | EDITHRICHARDS | $\$ 1$ | 17E | 30 |  |  |
| 3512121909000 | ALDEFSONK | 9 | 17E | 19 |  |  |
| 351212057000 | SWVET | $4{ }^{4}$ | 17E | 9 | 12495 |  |
| 3512120310000 | BOWMMAN | \$ | 17E | 17 |  |  |
| 3512120.950000 | DURAN | 9 | 17E | 18 |  |  |
| 3512120680000 | BERKAREDI JOKES | 9 | 16 E | 10 |  |  |
| 3512120900000 | COOK | 5 | 16 E | 14 |  |  |
| 3512121334000 | LEWS | 4 N | 16 E | 12 |  |  |
| 3512121349000 | FEFDHMM | $4{ }^{4}$ | 10 E | 11 |  |  |
| 3512120730000 | SMEALLWOOD | 4 N | 16 E | 3 |  |  |
| 3512120495000 | MCBEE | \$1 | 16E | 23 |  |  |
| 3512121760000 | PEDEN | 9 | 16 E | 24 |  |  |
| 3512121482000 | AIMERITO | 9 | 16 E | 34 |  |  |
| 3512121207000 | SKMALINOOD | $4{ }^{4}$ | 10 E | 10 |  |  |
| 3512121192000 | CWDRCE PEDEN | 9 | 16 E | 24 |  |  |
| 3512121280000 | HAILEYVILIE TOWFSITE | $\$$ | 16 E | 35 |  |  |
| 3512121200000 | TEX | 4 N | 16 E | 14 |  |  |
| 3512121380000 | MIILER | 9 | 16 E | 26 |  |  |
| 3512120157000 | WOOLS PROSPECT | $\pm 1$ | 16 E | 56 |  |  |
| 3512120092000 | EDORTEPDDEN | $\underline{1}$ | 16 E | 24 |  |  |
| 3512121844000 | MLSSS URIT | $\$$ | 16 E | 25 |  |  |
| 3512122811000 | SIRMAAS LOE | 4 N | 16 E | 12 |  |  |
| 3512120206000 | MARCANCEDI | $\$ 1$ | 16 E | 34 |  |  |
| 3512120180000 | USA | 91 | 16 E | 27 |  |  |
| 3512120168000 | W WALLACE | $4 N$ | 17 E | 17 | 12750 | 13042 |
| 3512120625000 | US COUERKIMENT | $\$$ | 16 E | 27 |  |  |
| 3512120177000 | USA | 5 | 16 E | 35 |  |  |
| 3512120198000 | FEWDHAM | 4 N | 16 E | 11 |  |  |
| 3512120257000 | MLADDEN | 4 N | 10 E | 2 |  |  |
| 351212020000 | FRAKIZ FEFCDHAM | $4 N$ | 16 E | 14 |  |  |
| 351212020000 | LEWIS | 4 | 16E | 12 |  |  |
| 3512120219000 | SLAJTGHIER | 4 N | 16 E | 1 |  |  |
| 3512120145000 | R EKTING | $\$ 1$ | 16 E | 26 |  |  |
| 3512120155000 | HARTSHORFE | 4 N | 17E | 6 |  |  |
| 3512120031000 | PALILINE BOWMMAN | F1 | 17E | 20 |  |  |
| 3512122106000 | Killes | $\$$ | 10 E | 25 |  |  |
| 3512122123000 | MCEEE | 9 | 16 E | 23 |  |  |
| 3512121339000 | ANDEFSON | 91 | 17E | 19 |  |  |
| 3512121423000 | WC CAMP | 4 N | 16 E | 4 |  |  |


| UW7 (AFFTM ${ }^{\text {m }}$ ) | Well Mrwe | Towncix | Runge | Section |  | Spiro Thur <br> Shect $F$ <br> Bot 侯 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3512121012000 | MASS | \% | 16 E | 25 |  |  |
| 3512123216000 | KEFMDEICK | ¢ ${ }_{\text {N }}$ | 16 E | 13 |  |  |
| 3512123230000 | FITK | $\stackrel{1}{1}$ | 16 E | 36 |  |  |
| 3512123054000 | AIMERETTO | \$ | 16 E | 27 |  |  |
| 3512122920000 | LEMIS TMMES | 8 N | 16 E | 12 |  |  |
| 3512122851000 | CAMP | \$ | 16 E | 34 |  |  |
| 3512123077000 | K17F | \% | 16 E | 26 |  |  |
| 3512122003000 | WOODS | \% | 16 E | 36 |  |  |
| 3512121788000 | ANDEASON | \$ | 17E | 19 |  |  |
| 3512121930000 | USA | 9 | 10 E | 35 |  |  |
| 3512121982000 | FEFDHAM | 4 | 16 E | 11 |  |  |


|  | Fell ${ }_{\text {chwe }}$ | TOHMS安 | Runge | Section | Sxivo <br> Thpur <br> SheetG <br> TOR 例 | Syivo <br> Thru포 <br> SheetG <br> $B a x$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3507720572000 | BLTEMOUNTARN | 4 N | 17 E | 22 |  |  |
| 3507720009000 | WALLACE | 4 N | 17 E | 15 |  |  |
| 3507720322000 | W PLERBLAKNCE | 31 | 17 E | 36 |  |  |
| $350720 \leq 8000$ | JESSEEEENET'T | F | 18E | 30 |  |  |
| 3507720469000 | HJFTER TUCKER | F | 18E | 31 |  |  |
| 3507720545000 | DETIA HOLT | F | 17 E | 35 |  |  |
| 3507720543000 | STATE | 9 | 18E | 28 |  |  |
| 3507720.510000 | DOBBS STATEURIT MA | F | 18E | 29 |  |  |
| 3507721465000 | MABRY 12 | 4 N | 17E | 12 |  |  |
| 3507721477000 | SPARES | 4 | 17E | 1 |  |  |
| 35077205080001 | STATE C URIT | \$ | 18E | 28 |  |  |
| 3507721267000 | MCCASLIN | 4 N | 17 E | 2 |  |  |
| 35077212760000 | MCCASLIN | 4 | 17 E | 2 |  |  |
| 3507721258000 | SMLTH | 5 | 18E | 20 |  |  |
| 35072128000 | LAMDEN | $4{ }^{4}$ | 17E | 3 |  |  |
| 3507721216000 | PARKERALFORD | \$ | 17 E | 27 |  |  |
| 3507721000000 | HEFLET | 9 | 17E | 25 |  |  |
| 3507720996000 | KITCHELL | 4 N | 17 E | 14 |  |  |
| 3507720993000 | SIVIL | \$1 | 17 E | 22 |  |  |
| 3507720900000 | DAREY | \$1 | 17 E | 23 |  |  |
| 350772949000 | STATEC | 31 | 18E | 28 |  |  |
| 3507720935000 | WHHITEY | S | 17E | 34 |  |  |
| 3507720921000 | BERHETT STATE | 9 | 18E | 19 |  |  |
| 3507720870000 | JESSIE BENLETT | 9 | 18E | 30 |  |  |
| 3507720858000 | ARDREXKURIKKO | F1 | 17 E | 35 |  |  |
| 350720800000 | HENTET | 31 | 17E | 25 |  |  |
| 35077208070000 | CATIDRON | \$1 | 17 E | 26 |  |  |
| 3507720800000 | CALIDRON | \$1 | 17E | 26 |  |  |
| 3507720786000 | FABER0 | $\underline{\$ 1}$ | 17E | 24 |  |  |
| 35077207810000 | SMLTH | 9 | 18E | 20 |  |  |
| 35072009000 | LFELSLNCE | 91 | 17E | 36 |  |  |
| 350720565000 | CATIDRON | 31 | 17E | 25 |  |  |
| 35077205650000 | DARBY | \$1 | 17E | 23 |  |  |
| 3507720.58000 | FABER0 | 5 | 17 E | 24 |  |  |
| 3507720.527000 | MABRY | 4 N | 18E | 7 | 13490 | 13755 |
| 3507720.5250000 | BENHETT | 5 | 18E | 30 |  |  |
| 350720505000 | SMLTH | 31 | 18E | 20 |  |  |
| 3507720504000 | BEFRIETT STATE | 9 | 18E | 19 |  |  |
| 35077201050000 | KENHEDY | \$1 | 18E | 32 |  |  |
| 3507720481000 | BERFETTT STATE | \$1 | 18E | 19 |  |  |
| 3507720954000 | DOBES STATE | 5 | 18E | 20 |  |  |
| 350770000000 | MCCHSLIN | $4{ }^{4}$ | 17E | 2 |  |  |
| 35072105s000 | SIVIL | 31 | 17E | 22 |  |  |
| 3507721006000 | BEFRIETT STATE | F | 18E | 19 |  |  |
| 3507720300000 | WHHITEY | 9 | 17 E | 34 |  |  |
| 3507720451000 | MABRY TRLST | 4 N | 17 E | 12 | 12405 | 12775 |
| 3507720079000 | PATITS ON | 4 N | 17E | 1 |  |  |
| 350721070000 | CALDREN | 9 | 17E | 2 |  |  |
| 3507760000000 | MC WATTS | 5 | 18E | 33 | 11363 |  |
| 35077301470000 | MABRY | 4 N | 18E | 9 | 13100 |  |
| 3507730011000 | IL HENLEX | 5 | 17 E | 25 |  |  |


| UW7 (AFFRM ${ }^{\text {m }}$ ) | Wellicme | Townssiy | Range | Sectiat | $\begin{gathered} \text { Spivo } \\ \text { Thury } \\ \text { SheetG } \\ \text { Tops in } \\ \hline \end{gathered}$ | $\begin{array}{\|c\|} \hline \text { Syivo } \\ \text { Thus } \\ \text { SheetG } \\ \text { Bat } \\ \hline \end{array}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3507730040000 | MCSE C WATTS | 8 N | 18 E | 3 | 1152 | 11482 |
| 3507730000000 | DAREYSUBDINSION | 8 | 17 E | 23 |  |  |
| 3507721041000 | DAEBY | 8 | 17 E | 23 |  |  |
| 350772108000 | CAJDEON | 9 | 17E | 26 |  |  |
| 35077210100000 | PAFKKRR ALFRED | \% | 17E | 27 |  |  |
| 3507720418000 | ALFRED PARKER | 3 | 17 E | 27 |  |  |
| 3507720413000 | DAFEYSUBDIVI | 8 | 17 E | 23 |  |  |
| 3507720402000 | FABERO | 8 | 17 E | 24 |  |  |
| 3507720401000 | MCCASLIN | 8 N | 17 E | 2 |  |  |
| 3507730480000 | HINTER TUCKR | 9 | 18E | 31 |  |  |
| 3507720300000 | SPARKS | 4 N | 17 E | 3 |  |  |
| 3507720352000 | SAMS | S | 17 E | 22 |  |  |
| 35077203410000 | CAJDRON | \% | 17 E | 26 |  |  |
| 3507720336000 | SMLTH | 9 | 18E | 20 |  |  |
| 350770312000 |  | 9 | 17E | 35 |  |  |
| 3507720233000 | MABREY TRLET | 4 N | 18E | 5 | 1285 |  |
| 3507720234000 | KBNREDY | 9 | 18E | 32 |  |  |
| 35077202310000 | WHHITNEY | 9 | 17 E | 34 |  |  |
| 3507720219000 | PS 0 | 4 N | 17E | 10 |  |  |
| 35077202540000 | KPNT HEIRS | 9 | 17E | 14 |  |  |
| 3507720246000 | SLIVERBUILET | 4 N | 17E | 11 |  |  |
| 3507720175000 | RUSPOTHIK | 3 | 17 E | 10 |  |  |
| 3507720174000 | VAJTCFIN | 3 | 17 E | 12 |  |  |
| 3507720129000 | KENNT | N | 17 E | 15 |  |  |
| 35077201410000 | HINTER TUCKRR | N | 18E | 31 |  |  |
| 350773006000 | AFLDREN KURILKO | 3 | 17 E | 35 |  |  |
| 35077200710000 | WHITFEY | 9 | 17E | 34 |  |  |
| 3507720544000 | MaskY 9001 TV-P | 4 N | 18E | 11 | 13120 | 13341 |
| 3507720s90000 | WORKMMSNTVP-9001 | 4 N | 18E | 22 | 14200 | 14616 |
| 3507721450000 | MAERTVRANCH | 4 N | 18E | 10 | 15200 |  |
| 3507720574000 | FEDNELI | 4 N | ISE | $\underline{3}$ | 1483 |  |
| 350770576000 | SHEAS | 4 N | ISE | 21 | 13713 | 1406 |
| 35077204870000 | SHARP | 9 | 17 E | 2 |  |  |
| 3512121656000 | WALLACE | 4 N | 17 E | 21 |  |  |
| 3512120820000 | M0S | 3 | 16 E | 13 |  |  |
| 3512121402000 | LSA | 3 | 17 E | 28 |  |  |
| 3512121406000 | CHMELES CASTEBL | 3 | 17E | 3 |  |  |
| 3512121415000 | PDEOMMM | S | 17 E | 2 |  |  |
| 3512121444000 | WA YME WALLACE | 8 N | 17 E | 21 |  |  |
| 3512121614000 | BOXMMAN | \% | 17E | 21 |  |  |
| 3512121673000 | HARE | \% | 17E | 33 |  |  |
| 3512121602000 | PAJIIIEE BOWIMAN | 9 | 17E | 20 |  |  |
| 3512121457000 | BELISKO | 4 N | 17E | 6 |  |  |
| 3512121487000 | BOXMMAN | 3 | 17 E | 20 |  |  |
| 3512121657000 | PD BOXMM ${ }^{\text {a }}$ | \% | 17 E | 2 |  |  |
| 3512121208000 | WRICTIT | 4 N | 17E | 18 |  |  |
| 3512121278000 | EITHRICHAEDS | \% | 17 E | 30 |  |  |
| 3512121055000 | POIICHy | 9 | 17E | 3 |  |  |
| 3512121532000 | HARTSHORNE | 4 N | 17 E | 6 |  |  |
| 3512121807000 | USA | S | 17 E | 28 |  |  |
| 3512121352000 | ALEXARDER | 4 N | 17 E | 9 |  |  |


|  | Well ${ }^{\text {anume }}$ | TOWHS产 | Rrage | Section | Sxivo <br> Thnu <br> SkeetG <br> Tors | Syivo <br> Thruy <br> SheerG <br> $B a x$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3512121344000 | ROCKISLAKD IMPROVE | ¢ ${ }_{\text {N }}$ | 17E | 8 |  |  |
| 3512121380000 | PEITIT | 5 | 17E | 31 |  |  |
| 3512121331000 | WEBEER | 9 | 17 E | 18 |  |  |
| 3512121321000 | ROCK ELEAKD | $4{ }^{4}$ | 17E | 5 |  |  |
| 3512121310000 | POTICHETEY | 3 | 17 E | 33 |  |  |
| 3512121312000 | WOODS PROSPECT | 3 | 16 E | 36 |  |  |
| 3512120111000 | POTICHNY | 5 | 17 E | 33 |  |  |
| 3512120153000 | STINE | 4 N | 17 E | 4 |  |  |
| 35121218870001 | CASTEEL CHARLES 'A' | \$1 | 17 E | 32 |  |  |
| 3512121851000 | PDEOWMKA | $\$$ | 17E | 2 |  |  |
| 3512121850000 | USA | 9 | 17 E | 28 |  |  |
| 3512121842000 | BOWMMA | 5 | 17 E | 21 |  |  |
| 35121218350000 | EITHRICHARLS | 9 | 17 E | 30 |  |  |
| 3512121909000 | ANDEFSONK | 5 | 17E | 19 |  |  |
| 351212057000 | SWVET | $4{ }^{4}$ | 17E | 9 |  |  |
| 3512120310000 | BOWMM | \$1 | 17E | 17 |  |  |
| 3512120.950000 | DURAK | 5 | 17E | 18 |  |  |
| 3512120600000 | BERHLARDI JOFES | 9 | 16 E | 10 |  |  |
| 3512120800000 | COOK | 5 | 16 E | 14 |  |  |
| 35121213340000 | LEWIS | 4 N | 16 E | 12 |  |  |
| 3512121349000 | FEFPDHM | 4 | 16 E | 11 |  |  |
| 3512120700000 | SMEALLWNOOD | 4 N | 16E | 3 |  |  |
| 35121204950000 | MCEEE | 5 | 16 E | 23 |  |  |
| 3512121763000 | PEDEN | 3 | 16 E | 24 |  |  |
| 3512121482000 | AIMERITO | $\underline{\$ 1}$ | 16 E | 34 |  |  |
| 3512121207000 | SKLILINOOD | 4 | 10 E | 10 |  |  |
| 3512121192000 | CODRCE PEDEN | 9 | 16 E | 24 |  |  |
| 351212128000 | HAILETVILIE TOWHSITE | $\underline{\$ 1}$ | 16 E | 35 |  |  |
| 3512121200000 | TEX | 4 N | 16 E | 14 |  |  |
| 351212138000 | MIIL.LER | 31 | 16 E | 26 |  |  |
| 3512120157000 | WOODS PROSPECT | I | 16 E | 56 |  |  |
| 3512120092000 | GEDRKEPEDEN | 3 | 16E | 24 |  |  |
| 3512121844000 | MMSS URIT | 5 | 16 E | 25 |  |  |
| 3512122811000 | SIRMARS LOE | 4 N | 16 E | 12 |  |  |
| 3512120206000 | MARCANCWDII | \$1 | 16 E | 34 |  |  |
| 3512120158000 | USA | 9 | 16 E | 27 |  |  |
| 3512120168000 | W WALLMCE | $4{ }^{4}$ | 17E | 17 |  |  |
| 3512120025000 | US GOVERHMMENT | 5 | 16 E | 27 |  |  |
| 35121201770000 | USA | $\underline{1}$ | 16 E | 35 |  |  |
| 3512120198000 | FEWDHAM | 4 N | 16 E | 11 |  |  |
| 3512120257000 | MADDEN | 4 N | 16 E | 2 |  |  |
| 351212020000 | FRAEIZ FEFD HAM | $4 N$ | 16 E | 14 |  |  |
| 3512120200000 | LEWIS | $4{ }^{4}$ | 10 E | 12 |  |  |
| 3512120219000 | SLAJTGHIER | 4 N | 16 E | 1 |  |  |
| 3512120145000 | R EKTNG | 5 | 16 E | 26 |  |  |
| 3512120155000 | H4RTSHORFLE | 4 | 17E | 6 |  |  |
| 3512120031000 | PALILINE B OXMMAN | 5 | 17E | 20 |  |  |
| 3512122106000 | KIITS | 3 | 16 E | 25 |  |  |
| 3512122123000 | MCEEE | \$1 | 16 E | 23 |  |  |
| 3512121330000 | ANDESSON | S | 17E | 19 |  |  |
| 3512121423000 | WC CAMP | 4N | 16 E | 4 |  |  |


| UWF (AFFRMm) | Well ${ }_{\text {drame }}$ | TOHASM | Range | Section | Sxizo <br> Thnuㅁ <br> SheetG <br> Tops 例 | Sẏ̇o <br> Thn포 <br> SheetG <br> Bat 例 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3512121012000 | MASS | \$1 | 16 E | 25 |  |  |
| 3512123216000 | KEFWDRICK | 4 N | 16 E | 13 |  |  |
| 351212323000 | FINK | 5 | 16 E | 36 |  |  |
| 3512123054000 | AIMERITO | 3 | 16E | 27 |  |  |
| 3512122920000 | LENXS TAMES | 4 N | 16 E | 12 |  |  |
| 35121208510000 | CAMP | $\$$ | 16 E | 34 |  |  |
| 3512123087000 | Kint | \$1 | 16 E | 26 |  |  |
| 3512122003000 | WOODS | \% | 16 E | 36 |  |  |
| 3512121788000 | ANDESSON | S | 17E | 19 |  |  |
| 3512121920000 | USA | 3 | 16 E | 35 |  |  |
| 3512121982000 | FEWDHAM | 4 N | 16 E | 11 |  |  |











VITA

AbdulWahab Mohammed Sadeqi<br>Candidate for the Degree of<br>Master of Science

# Thesis: STRUCTURAL GEOMETRY OF THE LATE PALEOZOIC THRUSTING IN THE HARTSHORNE, HIGGINS, ADAMSON AND GOWEN QUADRANGLES, SOUTHEASTERN OKLAHOMA 

Major Field: Geology
Biographical:
Personal Data: Born in Royal Oak, Michigan on June $18^{\text {th }} 1979$, the son of Dr. Mohammed I. Sadeqi and Dr. Salwa H. Darwish

Education: Received a Bachelor of Arts in Geology from the University of Colorado at Boulder in December of 2003. Completed the requirements for a Masters of Science degree in Geology from Oklahoma State University at Stillwater in May of 2007.

Experience:

- Teaching Assistant: Boone Pickens School of Geology, Oklahoma State University.
- Geotechnician: Encana Oil Company, Denver, Colorado.
- Student Services Contract: United State Geological Survey, Boulder Colorado.
- Physical Science Technician: United State Geological Survey, Boulder Colorado.

Professional Memberships: American Association for Petroleum Geologist

Scope and Method of Study:
The purpose of this thesis is to delineate the subsurface structural geometry of the Wilburton Gas Field area, using well log data and 3D seismic data.
7 cross sections were constructed in the study area. Raster images of well logs were imported into PETRA software to assist in the mapping process.

Findings and Conclusions:
The presence of the Wilburton triangle zone is confirmed. The duplex structure in the footwall of Choctaw contains hinterland dipping break-forward thrusts which form horses in the duplex. These thrusts dip $\sim 25^{\circ}$ southward. The horses are apparently cut by foreland dipping backthrusts. Shortening calculation for the backthrusts within the duplex is $\sim 10 \%$. It is $\sim 21 \%$ for the duplex structure and $\sim 58 \%$ for the study area. Middle Atokan units were displaced by a splay from the Choctaw fault named the Middle Atokan Thrust (M.A.T.).

