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

By

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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 3-D 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 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:

- 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).
- 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.
- 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.

- Paper copies of certain wells were obtained from the Oklahoma City Geological Society Log Library. These were used to identify certain stratigraphic units.
- "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 (Φ) the following variables are needed (Boak, 1992). (1) The inclination angle in degrees from vertical (α), (2) compass bearing in degrees from north (β) 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 Φ by applying the following equation

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

The assumed kickoff angle in our study was 20°, while the angle when approaching the end of the well was closer to 40°. When these angles are obtained we can find Φ by using the equation S= r Φ 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° and 40° 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 3-D 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).



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);

- 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):

- 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. 18-B) (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 (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:

- 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° 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 - 9500ft. 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 W2-W2' (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°.

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 -13000ft and continues to rise to about -9000ft 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 561ft when compared to the average amounts of Spiro thickness of about 250ft-300ft.

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 -10,500ft. 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° and as the fault moves deeper within the basin the dip angle becomes shallower. The dip angle is almost horizontal at depths of about -8500ft 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
- The minor backthrusts that are located within the duplex structure to calculate the impact these backthrusts had on the overall compression within the duplex.
- 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 (L_f). 2) The original length of Spiro sandstone unit before deformation (L_o). This can be achieved by measuring the Spiro units individually. By subtracting the final length of the deformed Spiro (L_f) from the original

length of the Spiro before deformation (L_o) the result will be the shortening distance. The percent of shortening was calculated using the following equation

$$\frac{Lf - Lo}{Lo} X 100$$
 (Table 1).

Shortening applied to the overall duplex structure

	L _f (ft)	$L_{o}(ft)$	$L_{f}(ft)-L_{o}(ft)$	L_{f} (ft)- L_{o} (ft)/ L_{o} (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.



















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°. 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

					Normally	Normally
					Faulted	Faulted
					SpiroTaps	SpiroBat
UWI (AFIIhum)	Well Name	Township	Range	Section	(7)	<u> (7)</u>
35077205720000	BLUEMOUNTAIN	41	17E	22		
35077206090000	WALLACE	41-1	17E	ឋ		
35077203220000	W P LERBLANCE		17E	- 36		
35077203380000	JESSIE BENNETT	ম	18E	30		
35077204690000	HUNTER TUCKER	ম	18E	31		
35077205450000	DELLAHOLT	ম	17E	35		
35077205430000	STATE	ম	18E	28		
35077205310000	DOBBS STATE UNIT MA	ম	18E	29		
35077214630000	MABRY 12	41	17E	12		
35077214470000	SPARKS	41	17E	1		
35077205080001	STATE C UNIT	ম	18E	28		
35077212870000	MCCASLIN	41	17E	2		
35077212760000	MCCASLIN	41	17E	2		
35077212580000	SMTH	ম	18E	20		
35077212380000	LAYDEN	41	17E	3		
35077212160000	PARKER ALFORD	ম	17E	27		
35077210000000	HENLEY	ম	17E	25		
35077209960000	KITCHELL	41-1	17E	14		
35077209930000	SIVIL	ম	17E	22		
35077209800000	DARBY	ম	17E	23		
35077209490000	STATEC	ম	18E	28		
35077209350000	WHIINEY	ম	17E	34		
35077209210000	BENNETT STATE	ম	18E	19		
35077208700000	JESSIE BENNETT	ম	18E	30		
35077208580000	ANDREWKURILKO	ম	17E	35		
35077208090000	HENLEY	ম	17E	25		
35077208070000	CAUDRON	ম	17E	26		
3507720800000	CAUDRON	ম	17E	26		
35077207860000	FABERO	ম	17E	24		
35077207810000	SMITH	ম	18E	20		
35077206920000	LEBLANCE	ন্দ্র	17E	36		
35077205850000	CAUDRON	ম	17E	26		
35077205650000	DARBY	ম	17E	23		
3507720.5280000	FABBRO	ম	17E	24		
35077205270000	MABRY	41	18E	7		
3507720.5250000	BENNETT	ম	18E	30		
35077205050000	SMTTH	1 को	18E	20		
3507720.5040000	BENNETT STATE	ম	18E	19		
35077201050000	KENNEDY	ম	18E	32		
35077204810000	BENNETT STATE	গ	18E	19		
35077209540000	DOBES STATE	<u></u>	18E	20		
3507720080000	MCCASLIN	41	17E	2		
3507721053000	SIVIL.	म	17E	22		
35077210960000	BENNETT STATE	31	185	10		
3507720309000	WHINEY	ন	17E	34		
3507720451000	MARRY TRIET	401	175	12		
35077200700000	DATTSON	401	175	1		
350772100000	CAUDRON	- 31	1712	23		
3507760030000	M C WATTS		181	22		
35077301470000	MARRY	401	185			
35077300110000	IL HENTEV	91	175	25		
33077330110000		1 41	1725	تم ا		1

					Normally Emilted	Normally Tended
					Fairtea Svino Toort	Fairea Seirea Brat
IWI (AFI)humi	Well Jimme	Танинскій	Rance	Section	Spro Lops M	Baro Bac Ba
35077300040000	MOSE C WATTS	40	18E	3	09	09
3507730000000	DARBY SUBDUISION	ন্দ	17E	23		
35077210410000	DARBY	ন	17E	23		
3507721026000	CAUDRON	য	17E	26		
35077210100000	PARKER ALFRED	ম	17E	27		
35077204180000	ALFRED PARKER	ম	17E	27		
35077204130000	DARBY SUBDIVI	ম	17E	23		
35077204020000	FABERO	ম	17E	24		
35077204010000	MCCASLIN	41	17E	2		
35077204260000	HUNTER TUCKER	ন্য	18E	31		
35077203900000	SPARKS	411	17E	3		
35077203520000	SAMS	ম	17E	22		
35077203410000	CAUDRON	ম	17E	26		
35077203360000	SMITH	ম	18E	20		
35077203130000	ANDREW KURILKO	ন্য	17E	33		
35077202930000	MABRY TRUST	41	18E	5		
35077202840000	KENNEDY	ম	18E	32		
35077202810000	WHITNEY	ম	17E	34		
35077202190000	PSO	411	17E	10		
35077202540000	KENT HEIRS	ম	17E	14		
35077202460000	SILVERBULLET	411	17E	11		
35077201750000	RASPOTNIK	ম	17E	10	12174	
35077201740000	VAUGHN	ম	17E	12	12349	12497
3507720190000	KENT	ম	17E	15		
35077201410000	HUNTER TUCKER	ম	18E	31		
35077200960000	ANDREW KURLKO	স	17E	33		
35077200710000	WHITNEY	ম	17E	34		
35077205440000	MABRY 9001 JV-P	41	18E	11		
3507720.5890000	WORKMANJ VP-9001	41	18E	22		
35077214300000	MABRYRANCH	41	18E	10		
35077205740000	NEWELL	41	18E	23		
35077205760000	SPEARS	41	18E	21		
35077204870000	SHARP	ম	17E	2	11511	11736
35121216560000	WALLACE	41	17E	21		
35121208200000	MOSS	ম	16E	В		
35121214020000	USA	ম	17E	28		
35121214060000	CHARLES CASTEEL	ম	17E	32		
35121214150000	PDBOWMAN	ম	17E	29		
35121214440000	WAYNE WALLACE	421	17E	21		
35121216140000	BOWIMAN	ম	17E	21		
35121216730000	HARE	ম	17E	33		
35121216620000	PAULINE BOWIMAN	ম	17E	20		
35121214570000	BELUSKO	41	17E	6		
35121214870000	BOWMAN	R	17E	20		
35121216570000	PD BOWMAN	ЪN –	17E	29		
35121212080000	WRIGHT	4 N	17E	18		
35121212780000	EDITHRICHARDS	ম	17E	- 30		
35121210930000	POTICHNY	ম	17E	33		
35121213230000	HARTSHORNE	4 N	17E	6		
35121218070000	USA	ম	17E	28		
35121213520000	ALEXANDER	41	17E	9		

					Normally	Normally
					Faulted	Faulted
		_			Spiro Taps	Spiro Bat
UWI (APIIhum)	Well Dame	Township	Range	Section	(7)	(P)
35121213440000	ROCKISLAND IMPROVE	41	17E	8		
35121213380000	PEITIT	ন্য	17E	31		
35121213310000	WEBBER	ন্য	17E	18		
35121213210000	ROCK ISLAND	481	17E	5		
35121213190000	POTICHNEY	_ ম্ব	17E	33		
35121213120000	WOODS PROSPECT	_ মূ	16E	36		
35121201110000	POTICHNY	ন্য	17E	33		
35121201330000	STINE	411	17E	4		
35121218870001	CASTEEL CHARLES 'A'	ন্য	17E	32		
35121218510000	PDBOWMAN	214	17E	29		
35121218500000	USA	<u>191</u>	17E	28		
35121218420000	BOWMAN	74	17E	21		
35121218350000	EDITHRICHARDS	ন্য	17E	30		
35121219090000	ANDERSONK	ন্য	17E	19		
35121205370000	SWEET	421	17E	9		
35121203190000	BOWMAN	24	17E	17	12330	12549
35121205950000	DURAN	74	17E	18	11960	
35121206800000	BERNARDI JONES	_ ম্ব	16E	10	11100	
35121208900000	COOK	ন্য	16E	14	11759	11957
35121213340000	LEWIS	41	16E	12		
35121213490000	NEEDHAM	421	16E	11		
35121207300000	SMALLWOOD	421	16E	3		
35121204950000	MCBEE	_ ম	16E	23		
35121217630000	PEDEN	_ ম্ব	16E	24		
35121214820000	AIMERITO	<u> 191</u>	16E	34		
351212120/000	SMALLWOOD	411	TOF.	10		
3512121192000	GEORGE: PEDEN	14	TOF	24		
35121212980000	HAILEY VILLE TO WASITE	14	TOF	<u> </u>		
35121212200000	TEX	421	16E	14		
35121213080000	MILLER	<u> 191</u>	16E	26		
351212013/0000	WOODS PROSPECT	14	TOF.	<u> </u>		
3512120092000	GEORGE: PEDEN	14	TOF	24		
3512121844000	MASS UNIT	14	TOF	25		
35121228110000	SIRMANS LUB	411	TOF	12		
3512120206000	MARCANGEL	14	TOF	54		
35121201280000		14	10E	2/		
30121201080000	W WALLACE	414	1/12	1/		
3012120020000	US GOVERNMENT	10	10E	21		
35121201//0000	USA	14	10E	30		
35121201980000	NEEDHAIN	421	10E	<u> </u>		
35121202370000	MADDEN VDA MYZ MIEDDAAM	411 AT	1015	4		
25121202290000	FRANIZ NEEDHAM	484	1012	14		
251212020000	CI ATIGUTED	411	165	1		
2512120219000	DEADOULTER	- শ্বণ কা	1012	1		
25 121 20 1930000	LADTCLODATE	10	10E	40		
2512120120000	DALE DE DOUBLAN	- 414	175	2		
3512120031000	PAOLINE BOWINAN	11	1/12	<u>20</u> 26		
3512122100000	MCDEE	10	165	20		
2512121220000	ANDERS ON	-11 91	175	10		
2512121209000		10.	1/12	19		
0000041616101	ALC CATTLE	1 121	1000	1 4		

					Normally Faulted StingToos	Normally Faulted Seize Bot
UWI (AFIIdum)	Well Diame	Township	Range	Section	n A	6 M
35121210120000	MASS	ম	16E	25		
35121232160000	KENDRICK	4ম	16E	в		
35121232330000	FINK	ম	16E	- 36		
35121230540000	AIMERITO	ম	16E	- 27		
35121229220000	LEANS LAMES	4 N	16E	12		
35121228510000	CAMP	ম	16E	- 34		
35121230870000	KING	ম	16E	26		
35121220030000	WOODS	ম	16E	- 36		
35121217880000	ANDERSON	ম	17E	19		
35121219200000	USA	ম	16E	- 35		
35121219820000	NEEDHAM	4 N	16E	11		

					Spro	Spro
					Threat	Thread
			_		Sheet A	Sheet A
UWI (AFIIdum)	Well Name	Τσψημάρ	Range	Section	Tops (ft)	Bot (ft)
35077205720000	BLUEMOUNTAIN	42ন্য	17E	22		
35077206090000	WALLACE	- 41	17E	ឋ		
35077203220000	W PLEEBLANCE	ম	17E	36		
35077203380000	JESSIE BENNEIT	<u> </u>	18E	30		
35077204690000	HUNTER TUCKER		<u> 18E</u>	31		
35077205450000	DELLAHOLT	ন্য	17E	35		
35077205430000	STATE	ম	18E	28		
35077205310000	DOBBS STATEUNIT MA	ন্য	18E	29		
35077214630000	MABRY 12	<u>4</u> N	17E	12		
35077214470000	SPARKS	494	17E	1		
35077205080001	STATE CUNIT		<u>18E</u>	28		
35077212870000	MCCASLIN	4থ	17E	2		
35077212760000	MCCASLIN	- 4 ম	17E	2		
3507721280000	SMITH	<u> </u>	18E	20		
35077212380000	LAYDEN	41-1	17E	3		
35077212160000	PARKER ALFORD	ন্য	17E	27		
35077210000000	HENLEY	<u>N</u>	17E	25		
35077209960000	KITCHELL	4ম	17E	14		
35077209930000	SIVIL	ম	17E	22	9266	9547
35077209800000	DARBY	N	17E	23		
35077209490000	STATEC		<u>18E</u>	28		
35077209350000	WHINEY	ন্য	17E	34		
35077209210000	BENNETT STATE	<u>N</u>	18E	19		
35077208700000	JESSIE BENNETT	ন্য	18E	30		
35077208580000	ANDREWKURILKO	ন্দ্র	17E	35		
35077208090000	HENLEY		17E	25		
35077208070000	CAUDRON		17E	26		
3507720800000	CAUDRON		17E	26		
35077207860000	FABERO	<u> </u>	17E	24		
35077207810000	SMITH	<u> </u>	<u> 18E</u>	20		
3507720692000	LEBLANCE	21/	17E	30		
35077205850000	CAUDRON	ন্দ্র	17E	26		
35077205650000	DARBY	<u> 9</u> V	<u>17E</u>	23		
35077205280000	FABERO	<u> 9</u> V	17E	24		
35077205270000	MABRY	<u>4</u>	<u> 18E</u>	7		
5507/205250000	BENNETT	<u> 14</u>	<u>18E</u>	30		
5007/20505000	SMITH					
35077205040000	BENNETT STATE	774	<u> 18E</u>	<u>u</u>		ļ
55077201050000	KENNEDY	<u> </u>	<u> 18E</u>	13		
55077204810000	BENNETT STATE	<u> </u>	<u> 18E</u>	민		
35077209540000	DOBES STATE	<u> 9</u> N	18E	29		
3507720080000	MUUASLIN	411	17E	2		
5007/21053000		<u> </u>				
5507/21060000	BENNETT STATE	<u> 10</u>		<u>u</u>		
55077203090000	WHIINEY	<u> </u>	17E	<u>54</u>		
55077/20451000	MABRY TRUST	<u>4N</u>				
5507720079000	PATTIS UN	41	17E			
3507721070000		<u>111</u>	17世	<u>45</u>		
3007/00030000	IN U WALLS		18 <u>E</u>	33		
30077301470000	IMABRY	411	188	<u> </u>		
	I L HENLEY	<u>7</u> 4		که		

					Spro	Spro
					Thrust	Thus
					Sheet A	Skeet A
UWI (AFIItum)	Well Name	Τσινκελίφ	Range	Section	Tops (ft)	Bot (ft)
35077300040000	MOSE C WATTS	- 41	18E	3		
3507730000000	DARBYSUBDIVISION	ম	17E	23		
35077210410000	DARBY	<u> </u>	17E	<u> 23</u>		
35077210260000	CAUDRON	শ	17E	26		
35077210100000	PARKER ALFRED	শ	17E	27		
35077204180000	ALFRED PARKER	শ	17E	27		
35077204130000	DARBYSUBDIVI		17E	23		
35077204020000	FABBRO	শ	17E	24		
35077204010000	MCCASLIN	<u>4</u> 1	17E	2		
35077204260000	HUNTER TUCKER	শ	18E	31		
35077203900000	SPARKS	41	17E	3		
35077203520000	SAMS	ম	17E	22		
35077203410000	CAUDRON	ম	17E	26		
35077203360000	SMITH	<u> </u>	<u>18E</u>	20		
35077203130000	ANDREWKURILKO		17E	35		
35077202930000	MABRY TRUST	41	18E	5		
35077202840000	KENNEDY	শ	18E	32		
35077202810000	WHIINEY		17E	34		
35077202190000	PSO	ধ্য	17E	10		
35077202540000	KENT HEIRS	<u> </u>	17E	14	9000	
35077202460000	SILVERBULLET	41	17E	11		
35077201750000	RASPOTNIK		17E	10		
35077201740000	VAUGHN	শ	17E	12		
35077201590000	KENT		17E	ឋ	8921	
35077201410000	HUNTER TUCKER	াম	18E	31		
35077200960000	ANDREWKURLKO		17E	35		
35077200710000	WHIINEY	ম	17E	34		
35077205440000	MABRY 9001 JV-P	41	18E	11		
35077205890000	WORKMANJ VP-9001	<u>4</u> N	18E	22		
35077214300000	MABRYRANCH	<u>4</u> N	18E	10		
35077205740000	NEWELL	41	18E	23		
35077205760000	SPEARS	41	18E	21		
35077204870000	SHARP	শ	17E	2		
35121216560000	WALLACE	41	17E	21		
3512120820000	MOSS		<u>16E</u>	B	8930	9136
35121214020000	USA	_ ম	17E			
55121214060000	CHARLES CASTEEL	<u> </u>		<u> </u>		
55121214150000	PDBOWMAN	<u> म</u>				
5121214440000	WAYNE WALLACE	41				
35121216140000	BOWIMAN	ि म	<u>17E</u>	$\frac{21}{-}$		
5.12121673000	HARE	<u> ₩</u>	<u>17E</u>			1 100.00
3512121662000	PAULINE BUWMAN	<u> 1</u>	17E	20	9833	10056
351212145/000	BELUSKU	41/				L
55121214870000	BOWIMAN	<u> 171</u>			9490	9753
<u>- 351212165/000</u>	PDBOWMAN	<u> 77</u>	17E	<u>2</u>		
51212128000	WKIGHI	41/				
	EDIT H RICHARDS	<u> 14</u>	17E	<u>भ</u>	99931	10149
				<u> 55</u>		
5512121325000	HARTSHURNE	414	17E			
<u>- 351212180/000</u>		<u>1 77</u>				
<u>5512121352000</u>	ALEXANDER	41-1	17E	9		

					Spro	Spro
					Thnist	Thnist
			_		Sheet A	Sheet A
UWI (AFIIdum)	Well Diame	Τσπαλίφ	Range	Section	Tops (ft)	Bot (ft)
35121213440000	ROCKISLAND IMPROVE	- 421	17E	8		
35121213380000	PEITIT	্ৰম	17E	31		
35121213310000	WEBBER	<u> </u>	17E	18	9469	
35 121 21 32 10000	ROCK ISLAND	<u>4</u> N	17E	5		
35121213190000	POTICHNEY	<u> </u>	17E	33		
35 121 21 3 12 0000	WOODS PROSPECT	্রম	16E	36		
35121201110000	POTICHNY	<u> </u>	17E	33		
35121201330000	STINE	ধ্য	17E	4		
35121218870001	CASTEEL CHARLES 'A'	<u> </u>	17E	32		
35121218510000	PDBOWMAN	ন্য	17E	29		
3512121850000	USA		17E	28		
35121218420000	BOWIMAN	্রম	17E	21		
35121218350000	EDITHRICHARDS	্রম	17E	30		
35121219090000	ANDERS ON K	ম	17E	19	9140	
33121205370000	SWEET	421	17E	9		
35121203190000	BOWIMAN	<u> </u>	17E	17		
3512120.9950000	DURAN	্রম	17E	18		
35121206800000	BERNARDI JONES	<u> </u>	16E	10		
35121208900000	COOK	ম	16E	14		
35121213340000	LEWIS	4 N	16E	12		
35121213490000	NEEDHAM	<u>4</u> N	16E	11		
35121207300000	COOWLLLWOOD	- 4ম	16E	3		
35121204950000	MCBEE	ম	16E	23	8999	
35121217630000	PEDEN	ম	16E	24	8999	9183
35121214820000	AIMERITO	ম	16E	34		
35121212070000	SMALLWOOD	<u>4</u> N	16E	10		
35 121 21 1920000	CEORCE PEDEN	্রম	16E	24	9082	9284
35121212980000	HAILEYVILLE TOWNSITE	্রম	16E	35		
35121212200000	TEX	- 4 শ	16E	14		
35121213080000	MILLER	ম	16E	26	9507	
35121201370000	WOODS PROSPECT	ম	16E	30		
35121200920000	GEORGE PEDEN	শ	16E	24	9240	
35121218440000	MASS UNIT		<u>16E</u>	25	10464	10656
35121228110000	SIRMANS LOE	<u>4</u> N	16E	12		
35121202060000	MARCANGELI	<u> </u>	<u>16E</u>	34		
3512120180000	USA	<u> </u>	16E	27	9612	
5121201680000	W WALLACE	<u>41</u>	<u> 17E</u>	17		
55121206250000	US GOVERNMENT	া হয	<u>16E</u>	27	9410	21399
5121201770000	USA	<u> 74</u>	LOE	55		
35121201980000	NEEDHAM	41	<u>16E</u>	11		
35121202370000	MADDEN	41	16E	2		
3512120229000	FRANTZ NEEDHAM	414	IOE	14		
5121202200000		41	<u> IdE</u>			
5121202190000	SLAUGHTER	484				ļ
55121201450000	R EKING	<u> </u>		<u></u> 20	9330	
5121201550000	HARTSHUKNE	46/		0		ļ
<u>- 35 121 20 031 0000</u>	PAULINE BOWMAN	<u> 74</u>	<u> 17E</u>		9264	
	MINJ Restaur				92/8	0.000
3512122123000		<u> </u>		<u> </u>	9368	9759
5012121339000	ANDERSUN	<u> </u>		<u> </u>	16566	
<u>5.121214230000</u>	W U CAMP	4N	LIQE	4		

					Spec	Spiro
					Thnist	Thrust
					Sheet A	Sheet A
UWI (AFIIdum)	Well Mame	Township	Range	Section	Tops (ft)	Bot 例
35121210120000	MASS	ম	16E	25	9734	
35121232160000	KENDRICK	<u>4</u> N	16E	B		
3512128230000	FINK	ম	16E	36		
35121230540000	AIIMERITO	ম	16E	27		
3512122922000	LEANS JAMES	- 4ম	16E	12		
35121228510000	CAMP	ম	l6E	34		
35121230870000	KING	ম	16E	26	9966	10197
35121220030000	WOODS	ম	16E	36		
35121217880000	ANDERS ON	ম	17E	19		
3512121920000	USA	<u> </u>	16E	35		
35121219820000	NEEDHAM	। 4स	16E	11		

INT (AFTMAN) Well Name Township Range Sector Type (b) Event 3307730572000 BLUEMOUNT AIN 4N 17E 22 5 3307730572000 WALLACE 4N 17E 35 5 3307730322000 WALLACE 4N 17E 36 5 3307730459000 HEREBLANCE 3N 136 30 3307730450000 DELIA HOLT 3N 138E 31 3307730450000 DELIA HOLT 3N 138E 31 3307730450000 DESIE BERNETT 3N 138E 32 3307720450000 DOBES STATEUNT MA 3N 138E 22 3307721470000 STATE CURIT 3N 138E 20 3307721280000 MCC ASLIN 4N 17E 2 3307721280000 LACYDEN 4N 17E 2 3307721280000 LAYDEN 4N 17E 2 3307721280000 LAYDEN 4N 17E 2<						Spro	Spro
DWT (AFT/hum) Well Name Rowship Rayse Sockat Royse (P) Bort (P) 35077.20.57.2000 BLUE MOUNT AIN 4N 17E 22 22 35077.20.57.2000 WY LEKELANCE 4N 17E 15 33 35077.20.57.2000 WY LEKELANCE 3N 17E 30 30 35077.20.57.2000 DELIA HOLT 3N 17E 25 30 35077.20.57.2000 DELIA HOLT 3N 17E 25 30 35077.20.57.2000 DEST AT EUNT MA 3N 18E 23 30 35077.20.57.2000 DEST AT EUNT MA 3N 18E 28 30 35077.20.57.2000 MCC ASLIN 4N 17E 1 30 30772.21.25000 MCC ASLIN 4N 17E 2 30772.21.25000 SMTH 3N 17E 27 30772.21.25000 MCC ASLIN 4N 17E 2 30772.21.25000 MCC ASLIN 4N 17E 2 30772.20.25000 MEE 307						Thrust	Thus
Lift (Jellann) Weil Name Townsky Karge Sector Tops (3) E.C. (9) 3307720600000 WIALLACE 4N 17E 15 1 3307720600000 WIALLACE 4N 17E 15 1 3307720600000 WISELEBANNET 2N 18E 30 1 330772060000 HUSELEBANNET 2N 18E 30 1 33077204690000 HUMTER TUCKER 3N 18E 31 1 3307720530000 DELLAHOLT 3N 18E 28 1 1 3307720530000 DELLAHOLT 3N 18E 28 1 1 33077214470000 SPARES 4N 17E 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						Skeet B	Sheet B
307720572000 ELEEMOUNTAIN 4N ITE 12 30772050000 WALLACE 4N ITE 36 307720520000 WILLANCE 4N ITE 36 307720530000 HESELEBINNET 4N IZE 36 307720450000 HUNTER TUCKER 3N IZE 28 307720450000 DELLAHOLT 3N IZE 28 307721463000 DEES STATEURITMA 3N IZE 28 307721463000 MARRY 12 4N IZE 1 307721463000 MCCASLIN 4N IZE 2 307721463000 MCCASLIN 4N IZE 2 30772126000 MCCASLIN 4N IZE 2 30772126000 MCCASLIN 4N IZE 2 30772120000 MCCASLIN 4N IZE 2 30772120000 MCCASLIN 4N IZE 2 30772120000 SATHEC 3N IZE 2	UWI (AFIIvium)	Well Diame	<i>โ</i> сพทริญัญ	Range	Section	Tops (fi)	Bat (ft)
3077232000 WALLACE 44 17E 15 30772323000 WEDERELANCE PA 17E 36 30772333000 HENRER DENNETT PA 18E 31 30772335000 HUNTER TUCKER PA 18E 31 30772354000 DELLANDLT PA 18E 31 30772354000 DELLANDLT PA 18E 28 30772145000 MAERY 12 44 17E 1 30772145000 MAERY 12 44 17E 1 307721236000 MCCASLN 44 17E 2 307721236000 MCCASLN 44 17E 2 307721236000 MCCASLN 44 17E 2 307721236000 JAKER ALPORD 24 17E 2 307721230000 JAKER ALPORD 24 17E 2 307721230000 JAKER ALPORD 24 17E 2 307720930000 SWELEY 94 17E 2	35077205720000	BLUEMOUNTAIN	41	17E	22		
3507723520000 WP LEREBLANCE N ITE 36 3507723530000 HENTER TUCKER N ISE 31 35077204590000 DELLAHOLT N IZE 32 35077205450000 DELLAHOLT N IZE 32 3507720530000 DOBES STATEUNTIMA SN IZE 32 3507720530000 DOBES STATEUNTIMA SN IZE 32 3507721470000 STATE C UNIT SN IZE 32 3507721250000 INC CASLIN SN IZE 32 3507721250000 INC CASLIN SN ITE 2 3507721250000 INC CASLIN SN ITE 3 3507721250000 IAVDEN SN ITE 3 3507721260000 FAREE ALFORD SN ITE 3 3507721260000 SNTH SN ITE 3 3 3507721260000 FAREEY SN ITE 3 3 3507720930000 FAREEY </td <td>35077206090000</td> <td>WALLACE</td> <td>41</td> <td>17E</td> <td>15</td> <td></td> <td></td>	35077206090000	WALLACE	41	17E	15		
2507720380000 125528 PENRET 24 30 2307720490000 DETLABOLT 24 31 2307720490000 DETLABOLT 24 17E 2307720490000 DETLABOLT 24 17E 230772049000 DEBS STATEURT MA. 24 18E 28 2307721463000 MARRY 12 44 17E 1 13 2307721497000 SPARES 44 17E 1 13 2307721287000 MCC4SLIN 44 17E 2 13 307721287000 MCC4SLIN 44 17E 2 13 307721287000 MCC4SLIN 44 17E 2 13 30772128000 LAVDEN 44 17E 3 17E 27 307721280000 LAVDEN 44 17E 2 13 177 13 17E 22 13 13 13 13 13 1377 17E 34 17E 24 14 13	3507720322000	W P LERBLANCE	<u> </u>	17E	36		
23077/20469000 HINTER TOCKER YM IRE 31 230772053000 DELLANDLT YM IRE 23 230772053000 DOBES STATE UNIT MA YM IRE 23 230772053000 DOBES STATE UNIT MA YM IRE 23 230772147000 MARRY V12 447 ITE 1 230772147000 MCCASLIN 447 ITE 2 230772127000 MCCASLIN 447 ITE 2 230772128000 MCCASLIN 447 ITE 2 230772128000 SINTH 447 ITE 2 230772128000 LAYDEN 447 ITE 3 230772128000 LAYDEN 447 ITE 3 2307721280000 KITCHELL 447 ITE 3 2307721280000 KITCHELL 447 ITE 3 2307720990000 STATE C 347 17E 3 2307720990000 STATE C 347 17E	35077203380000) ESSIE BENNEIT	<u> </u>	18E	য		
S107720393000 DELACHOLT N 17E 23 330772033000 DOBES STATEUNT MA SN 18E 28 330772143000 DOBES STATEUNT MA SN 18E 29 330772143000 MAERY 12 4N 17E 1 330772147000 SPARES 4N 17E 1 330772147000 STATE CUNT SN 18E 28 330772128000 MCCASLIN 4N 17E 2 330772128000 SMUTH SN 18E 20 330772128000 LAVDEN 4N 17E 2 330772128000 LAVDEN 4N 17E 2 3307721090000 HENLEY SN 17E 24 3307720990000 STUL 4N 17E 24 3307720990000 STATE C SN 17E 24 3307720990000 STATE C SN 17E 34 3307720990000 JENET STATE N 18E 19 <td>35077204690000</td> <td>HUNTER TUCKER</td> <td><u> </u></td> <td>18E</td> <td>31</td> <td></td> <td></td>	35077204690000	HUNTER TUCKER	<u> </u>	18E	31		
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30773053000 DUBES STATE OVALUAR PA BR 29 30773147000 SPARKS 4N 17E 1 30773147000 SPARKS 4N 17E 1 30773120380001 STATE CURIT 3N 18E 28 307731270000 MCCASLIN 4N 17E 2 307731280000 MCCASLIN 4N 17E 2 307731280000 LAVDEN 4N 17E 2 307731280000 LAVDEN 4N 17E 2 307731280000 LAVDEN 4N 17E 2 307731290000 KITCHELL 4N 17E 2 307730930000 DAREY 3N 17E 23 307730930000 DAREY 3N 17E 24 307730930000 DARENT STATE 3N 18E 30 307730930000 DARENT STATE 3N 17E 34 307730830000 ANDREWKURTEO 3N 17E 34	35077205430000	STALL DODDA CELEBRER MAL		188	<u></u>		
3507/21493000 NEWRY 12 4% 1/E 1/E 1 3507721/37000 STATE C UNIT 9N 18E 28 3507721/37000 MC CASLIN 4N 1/E 2 3507721/37000 MC CASLIN 4N 1/E 2 3507721/37000 MC CASLIN 4N 1/E 2 3507721/37000 SMITH 9N 18E 20 3507721/37000 LAMDEN 4N 1/E 2 3507721/37000 PARKER ALFORD 9N 1/E 2 350772099000 RENEY 9N 1/E 2 350772099000 STATE C 9N 1/E 28 350772099000 RENET STATE C 9N 1/E 34 3507720930000 HENET STATE C 9N 1/E	330/7203310000	DUBBS SI ALE UNIT INA		188	29 10		
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200712280000 INTER ALFORD IN IN <thin< th=""> IN <thin< th=""> IN<td>25077212070000</td><td>MCCASTIN</td><td>- 12.1 - AB.T</td><td>175</td><td>1 1</td><td></td><td></td></thin<></thin<>	25077212070000	MCCASTIN	- 12.1 - AB.T	175	1 1		
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3007212160000 PARKER ALFORD 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 <th1< th=""> 1<td>350772128000</td><td>LAVDEN</td><td>41</td><td>10E</td><td></td><td></td><td></td></th1<>	350772128000	LAVDEN	41	10E			
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SUPPOSITION LILE 4N 17E 14 300720990000 STVL 9N 17E 14 3007720990000 DARBY 9N 17E 12 3007720990000 DARBY 9N 17E 23 3007720990000 STATEC 9N 18E 28 300720920000 WHINEY 9N 17E 34 300720920000 BENNETT STATE 9N 18E 19 3007720820000 ANDREWKURLKO 9N 17E 25 3007720820000 ANDREWKURLKO 9N 17E 26 3007720800000 CAUDRON 9N 17E 26 300720720800000 CAUDRON 9N 17E 26 300720720800000 CAUDRON 9N 17E 26 30072072080000 CAUDRON 9N 17E 26 30072072080000 DARBY 9N 17E 26 30072072080000 DARBY 9N 17E 26	350772100000	HENLEY		17E	25		
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35077207860000 FABERO N 17E 24 35077207810000 SMITH 9N 18E 20 35077207810000 LEELANCE 9N 17E 36 35077207810000 CAUDRON 9N 17E 36 35077205850000 CAUDRON 9N 17E 23 9478 9766 35077205850000 DAREY 9N 17E 24 11568 11812 3507720520000 FABERO 9N 17E 24 11568 11812 35077205250000 BENNETT 9N 18E 30 3507720505000 SMITH 9N 18E 32 350772050500	3507720800000	CAUDRON	্রম	17E	26		
35077207810000 SMITH 9N 18E 20 3507720720000 LEELANCE 9N 17E 36 35077203850000 CAUDRON 9N 17E 26 35077203850000 DARBY 9N 17E 26 35077203520000 DARBY 9N 17E 23 9478 9766 35077205280000 FABERO 9N 17E 24 1158 11812 35077205270000 MABRY 4N 18E 7 13507720525000 BENNETT 9N 18E 30 1350720525000 13507720525000 BENNETT 9N 18E 30 13507720502000 13507720502000 13507720502000 13507720502000 13507720502000 13507720502000 13507720502000 13507720502000 13507720502000 13507720502000 13507720502000 13507720502000 13507720502000 13507720502000 13507720502000 13507720502000 13507720502000 13507720502000 13507720502000 13507720502000 13507720502000 135077205020000 13507720502000	35077207860000	FABBRO	<u> </u>	17E	24		
35077206920000 LEELANCE M 17E 36 35077203850000 CAUDRON M 17E 36 35077203850000 DAREY M 17E 36 3507720380000 DAREY M 17E 23 9478 9766 3507720380000 RABERO M 17E 24 11568 11812 3507720320000 MAERY 4N 18E 7 185 100 3507720350000 BENNETT M 18E 30 11515 350772050000 BENNETT STATE M 18E 19 11322 11515 350772050000 KENNEDY M 18E 19 10727 10980 35077204810000 BENNETT STATE M 18E 19 10727 10980 3507720480000 DOBES STATE M 18E 29 13507721050000 10727 10980 3507720050000 MCCASLIN 4N 17E 2 13507721050000 10727<	35077207810000	SMITH	_ ম	18E	20		
35077205850000 CAUDRON 9N 17E 26 35077205650000 DARBY 9N 17E 23 9478 9766 35077205520000 FABERO 9N 17E 24 11568 11812 35077205220000 MABERY 4N 18E 7 1 1358 11812 35077205250000 BENNETT 9N 18E 30 1 1350 350772050000 BENNETT 9N 18E 30 1 1352 350772050000 BENNETT STATE 9N 18E 19 11322 11515 350772050000 BENNETT STATE 9N 18E 19 10727 10980 35077204810000 BENNETT STATE 9N 18E 19 10727 10980 35077209540000 DOBES STATE 9N 18E 19 10727 10980 35077200800000 MCCASLIN 4N 17E 2 1350772105000 10727 10980 35077200	35077206920000	LEBLANCE	<u> </u>	17E	36		
3507720565000 DARBY 1N 17E 23 9478 9766 3507720528000 FABERO 1N 17E 24 11568 11812 35077205270000 MABRY 4N 18E 7 1 35077205270000 BENNETT 1N 18E 30 1 3507720520000 BENNETT 1N 18E 30 1 350772050000 BENNETT STATE 1N 18E 20 1 350772050000 BENNETT STATE 1N 18E 19 11322 11515 35077201050000 BENNETT STATE 1N 18E 19 10727 10980 35077204810000 BENNETT STATE 1N 18E 19 10727 10980 35077200500000 MCCASLIN 4N 17E 2 13507720080000 100727 10980 35077200500000 MCCASLIN 4N 17E 2 1450 1450 35077200500000 BENNETT STATE 1N	3507720.5850000	CAUDRON		17E	26		
35077205280000 FABERO SN 17E 24 11568 11812 35077205270000 MAEKY 4N 18E 7 185 30 35077205250000 BENNETT SN 18E 30 185 30 35077205050000 SMITH SN 18E 30 11515 35077205040000 BENNETT STATE SN 18E 19 11322 11515 35077201050000 KENNETY STATE SN 18E 19 10727 10980 35077204810000 BENNETT STATE SN 18E 19 10727 10980 35077209540000 DOBES STATE SN 18E 29 109 10727 10980 35077200800000 MCCASLIN 4N 17E 2 109 10727 10980 35077200800000 MCCASLIN 4N 17E 2 109 10727 10980 35077203090000 MCCASLIN 4N 17E 2 109 109 109 109 109 109 109 109 100 109<	35077205650000	DARBY	<u> </u>	17E	23	9478	9766
3507720525000 MABRY 4N 18E 7 3507720525000 BENNETT 9N 18E 30 3507720505000 SMITH 9N 18E 30 3507720505000 BENNETT STATE 9N 18E 20 3507720504000 BENNETT STATE 9N 18E 19 11322 11515 3507720105000 KENNEDY 9N 18E 32 10727 10980 3507720481000 BENNETT STATE 9N 18E 19 10727 10980 3507720481000 DOBES STATE 9N 18E 29 10727 10980 3507720680000 MCCASLIN 4N 17E 2 3507720080000 10727 10980 35077210300000 STVIL 9N 17E 22 3507720309000 10727 10980 35077203090000 BENNETT STATE 9N 17E 24 3507720309000 17E 1 35077204510000 MABRY TRUST 4N 17E 1 1 35077200790000 PATTISON 4N 17E	35077205280000	FABERO	- জা	17E	24	11568	11812
3507720525000 BENNETT N ISE 30 3507720505000 SMITH N ISE 20 35077205050000 BENNETT STATE N ISE 20 35077205050000 BENNETT STATE N ISE 19 11322 11515 35077201050000 KENNEDY N ISE 32 10980 3507720481000 BENNETT STATE N ISE 19 10727 10980 3507720481000 DOBES STATE N ISE 29 10980 10727 10980 3507720080000 MCCASLIN 4N I7E 2 10980 10980 10980 10980 10980 10980 10980 10980 10980 10980 10980 10980 10980 10980 10980 10980 10980 10980 10980 10980 10980 10980 10980 10980 10980 10980 10980 10980 10980 10980 10980 10980 10980	35077205270000	MABRY	411	ISE	γ 		
35007/20300000 SMITH IN 18E 20 35007/205040000 BENNETT STATE 9N 18E 19 11322 11515 35007/201050000 KENNETY STATE 9N 18E 32 10020 35007/201050000 BENNETT STATE 9N 18E 19 10727 10980 35007/20080000 DOBES STATE 9N 18E 29 100000 35007/20080000 MCCASLIN 4N 17E 2 10080 35007/20080000 MCCASLIN 4N 17E 2 10080 35007/20080000 MCCASLIN 4N 17E 2 10080 35007/20080000 STVIL 9N 17E 2 10000 35007/20080000 BENNETT STATE 9N 17E 2 10080 35007/2009000 WHITNEY 9N 17E 34 100000 35007/200790000 RATTISON 4N 17E 1 1000000000000000 35007/200790000 MABRY <td>35077205250000</td> <td>BENNETT</td> <td><u> </u></td> <td>18E</td> <td>30</td> <td></td> <td></td>	35077205250000	BENNETT	<u> </u>	18E	30		
35007/203040000 BENNETT STATE IN 18E 19 11522 1155 35077201050000 KENNEDV 9N 18E 32	300/72000000			185	<u>40</u> 10	11200	11616
S3077204810000 RENNELTY IN 18E 32 35077204810000 BENNETT STATE IN 18E 19 10727 10980 35077209540000 DOBES STATE IN 18E 29 10727 10980 35077209540000 DOBES STATE IN 18E 29 10727 10980 35077200800000 MCCASLIN 4N 17E 2 1080 35077210530000 STVIL IN 17E 22 10000 35077203090000 BENNETT STATE IN 18E 19 10900 35077203090000 WHITNEY IN 17E 24 10000 35077203090000 WHITNEY IN 17E 12 100000 35077200790000 PATTISON 4N 17E 1 10000000000 35077200790000 CAUDRON IN 17E 23 9751 9885 35077301470000 MABRY 4N 18E 9 17E 17E 1985	33077203040000	BENNEIT STATE	111 at	185	<u>4</u>		
S30772094810000 BENNETT STATE IN ISE IP I0727 I0880 35077209540000 DOBES STATE 9N 18E 29 10727 10880 35077209540000 MCCASLIN 4N 17E 2 10727 10880 35077200800000 MCCASLIN 4N 17E 2 10727 10880 35077210530000 STVIL 9N 17E 22 10727 10880 35077210960000 BENNETT STATE 9N 17E 22 10727 10880 35077203090000 WHTNEY 9N 17E 34 10727 10720 35077204510000 MABRY TRUST 4N 17E 1 10727 10720 35077200790000 PATTISON 4N 17E 1 10727 10720 35077200790000 CAUDRON 9N 17E 23 9751 9885 35077600300000 MC WATTS 9N 18E 33 35077301470000 MABRY 4N </td <td>300/720100000</td> <td>NENNELLY DESERTER OF ATTR</td> <td></td> <td>18E</td> <td>کد ۱۵</td> <td>10202</td> <td>10000</td>	300/720100000	NENNELLY DESERTER OF ATTR		18E	کد ۱۵	10202	10000
S3077200800000 DOBES STATE IN INE 20 35077200800000 MCCASLIN 4N 17E 2 2 35077210530000 STVIL 9N 17E 22 2 35077210960000 BENNETT STATE 9N 17E 22 2 35077203090000 BENNETT STATE 9N 18E 19 2 35077203090000 WHITNEY 9N 17E 34 2 35077204510000 MABRY TRUST 4N 17E 1 2 35077200790000 PATTISON 4N 17E 1 2 35077200790000 RATTISON 4N 17E 1 2 35077200790000 RATTISON 4N 17E 2 9751 9853 35077600300000 MC WATTS 9N 18E 33 3 35077301470000 MABRY 4N 18E 9 3 35077300110000 JL HENLEY 9N 17E 25 5	26027200640000	DERUNEII SIMIE	119 at	10E	<u>4</u> 20	10/2/	10000
3507720000000 Interfedent 41 17E 2 35077210530000 STVIL 9N 17E 22 35077210960000 BENNETT STATE 9N 18E 19 35077203090000 WHITNEY 9N 17E 34 35077204510000 MABRY TRUST 4N 17E 1 35077200790000 PATTISON 4N 17E 1 35077200790000 CAUDRON 9N 17E 23 9751 35077200790000 M C WATTS 9N 18E 33 35077600300000 MC WATTS 9N 18E 33 35077301470000 MABRY 4N 18E 9 35077300110000 J'L HENLEY 9N 17E 25	25077209040000	MCCASIDA	111 111	18 <u>E.</u> 1757	<u>-</u>		
3507721000000 BENNETT STATE N 18E 19 350772003090000 WHITNEY N 17E 34 35077203090000 WHITNEY N 17E 34 35077204510000 MABRY TRUST 4N 17E 12 35077200790000 PATTISON 4N 17E 1 35077210700000 CAUDRON 2N 17E 23 9751 9985 35077600300000 M C WATTS 2N 18E 33 35 35 35077301470000 MABRY 4N 18E 9 35 35 35077300110000 J1 HENLEY 2N 17E 25 1	250772000000	eron	<u>-</u>	1715	$\frac{1}{2}$		
35077203090000 WHITNEY 11 10E 15 35077203090000 WHITNEY 9N 17E 34 35077204510000 MABRY TRUST 4N 17E 12 35077200790000 PATTIS ON 4N 17E 1 35077210700000 CAUDRON 9N 17E 23 9751 9985 35077600300000 M C WATTS 9N 18E 33 35 35077301470000 MABRY 4N 18E 9 35 35077300110000 JL HENLEY 9N 17E 25 5	35077210060000	BENNETT STOTE	9J	17 <u>E</u> 18F	کم 10		
35077204510000 MABRY TRUST 4N 17E 24 350772004510000 MABRY TRUST 4N 17E 12 35077200790000 PATTISON 4N 17E 1 35077210700000 CAUDRON 2N 17E 23 9751 9985 35077600300000 M C WATTS 2N 18E 33 35 35077301470000 MABRY 4N 18E 9 35 35077300110000 JL HENLEY 2N 17E 25 5	2507720200000		91 91	175	- - 2 74		
35077200790000 PATTISON 4N 17E 1 35077210700000 CAUDRON 2N 17E 23 9751 9985 350773007600300000 MC WATTS 2N 18E 33 35077301470000 MABRY 4N 18E 9 35077300110000 J'L HENLEY 2N 17E 25 5	2507720451000	MARRY TRIET	 	17E	1 <u>-7</u> 10		
33077210700000 CAUDRON N 17E 23 9751 9985 35077600300000 M C WATTS N 18E 33 33 35077301470000 MABRY 4N 18E 9 35077300110000 J'L HENLEY 2N 17E 25	2507720070000		 	17E	فد 1		
35077600300000 M C WATTS 91 18E 33 35077301470000 MABRY 4N 18E 9 35077300110000 J L HENLEY 9N 17E 25	350772107000	CAUDRON	<u>ম</u> ম	17E		<u> </u>	0085
35077301470000 MABRY 4N 18E 9 35077300110000 JL HENLEY 2N 17E 25	35077600000	M C WATTS	ন	18F	73		
35077300110000 JL HENLEY 91 17E 25	3507730147000	MABRY	4N	18E			1
	35077300110000	JL HENLEY	- ম	17E	25		

					Spro	Spro
					Thread	Three
					Sheet B	Sheet B
UWI (AFIIdum)	Well Diame	Township	Range	Section	Tops (ft)	Bat (ft)
35077300040000	MOSE C WATTS	41-1	18E	3		
3507730000000	DARBYSUBDIVISION	_ স	17E	23	9930	
35077210410000	DARBY	<u> </u>	17E	- 23	9782	10088
35077210260000	CAUDRON		17E	26		
35077210100000	PARKER ALFRED	ম	17E	27		
35077204180000	ALFRED PARKER	<u> </u>	17E	2/	01201	10442
35077204130000	DARBYSUBDIVI	<u> </u>	17E	23	9047	1069
3507720402000	FABERU	<u> </u>	17E	24	9399	
35077204010000		411	17E	2		
30077204200000	HUNTER TUCKER	11 8.1	188	31		
30077203900000	SPARIS CAME	9£4	17E 17E) 200		
26022002410000	CATEDON	14 	1/E 1777	44 76		
350/7203410000	CAODKON	104 at	1/E	<u></u>		
2507710212000		14 	10E	<u>20</u> 75		
2507720305000	MADDIT TOLET		1/12	5		
25077202930000			1015	2		
2507720281000		1 	1005	- 24 - 74		
2507720210000		1 1	175	10		
25077202540000	2001 Patali Thay	<u>म</u> ा कुर्ग	175	10		
3507720246000	SILVER BULLET	41	17E	11		
3507720175000	RASPOTNIK	- গ্য	17E	10		
3507720174000	VAINTIN		17E	12		
3507720159000	KENT		171	15		
3507720141000	HINTER THERE	<u></u> ! भ	18E	31		
35077200960000	ANDREWKURLKO	না	17E	35		
35077200710000	WHIINEY	ম	17E	34		
3507720.5440000	MABRY 9001 JV-P	4থ	18E	11		
3507720.5890000	WORKMANJ VP-9001	41	18E	22		
35077214300000	MAERYRANCH	4 N	18E	10		
35077205740000	NEWELL	4 N	18E	23		
35077205760000	SPEARS	41	18E	21		
35077204870000	SHARP	<u>N</u>	17E	2		
35121216560000	WALLACE	4 N	17E	21		
3512120820000	MOSS		16E	В		
35121214020000	USA	শ	17E	28		
35121214060000	CHARLES CASTEEL	শ	17E	32		
35121214150000	PDBOWMAN	_ ম	17E	29	10723	11023
35121214440000	WAYNE WALLACE	41	17E	21		
35121216140000	BOWIMAN	ম	17E	21	9409	9661
3512121673000	HARE	_ হ্য	17E	33		
3512121662000	PAULINE BUWMAN	214	17E	20	1.0100	
55121214570000	BELUSKU	41				
50121214870000	BUWMAN	<u> 11</u>		<u> </u>	9069	9482
5012121657000	PDBUWMAN			<u>2</u>	9804	
<u>351212128000</u>	WRIGHT	414			0000	
5121212/8000	PDITH RICHARDS		17E	<u> </u>	9564	9777
26101012020000	POILENY TIADTEIDORE		17E 17E	<u> </u>		
		9£4 ат	17E 17E		10601	10040
261010120000	USA AT 1011 A 300-000	11 7.5	1/12	<u> </u>		10092
	ALEXANDER	1 11	니다뜨	9		

					Spro	Spiro
					Thrust	Thrust
	W (1)31		_		SheetB	Sheet B
CWI (APIINIM)	Well Diame	Тонняцр	Range	Section	Tops (fi)	Bot (ff)
35121213440000	ROCKISLAND IMPROVE	411	17E	8		L
35121213380000	PEITIT	34	17E	31	11702	11921
3512121331000	WEBBER	71	17E	18		
3512121321000	RUCKISLAND	411	17E	2		
3512121319000	POTICHNEY	11	17E	<u> </u>		
3512121312000	WOODS PROSPECT	11	10E	30		
35121201110000	POLICHNY	14	17E	35		
35121201330000	SILNE	461	1/E	4		
351212188/0001	DD DOUMAN	<u>11</u>	17E	52	10142	10401
2512121801000	PDBOWNAN	11	17E		10145	10401
251212100000	POURAN	11	17E	20	10077	11110
3012121042000	B OWNEAN EXTLUDICUADDC	11	17E	21	10662	10001
35121218550000	ANDERCONK	11	17E	30	9/19	10021
2512121909000	CULTET	121	1712	4 19		<u> </u>
2512120210000	D OUTMAN	9.7	175	17		<u> </u>
35121203150000	DIRAN	91	175	17		<u> </u>
3512120690000	BEDNARDI IONES	91	161	10		<u> </u>
2512120200000	COOK	91	1612	10		<u> </u>
2512120000000	T FILING	401	1612	17		<u> </u>
35121213490000	NEDHAM	41	16E	<u> π</u>		<u> </u>
3512120730000	SMALLWIOOD	401	16E			
35121204950000	MCBEE	- মা	161	2		
3512121763000	NACAN	শ	161	24		
35121214820000	AINERITO	শ	161	74	1/7390	
3512121207000	SMALLWOOD	41	16E	10	10000	
35121211920000	GEORGE PEDEN	- 31	16E	24		
35121212980000	HAILEY VILLE TOWNSITE	<u></u>	16E	35	11040	
35121212200000	TEX	41	16E	14		
35121213080000	MILLER	ম	16E	26		
35121201370000	WOODS PROSPECT	ন্য	16E	36	11240	
35121200920000	GEORGE PEDEN	গ	16E	24		
35121218440000	MASS UNIT	ম	16E	25	10136	10330
35121228110000	SIRMANS LOE	421	16E	12		
35121202060000	MARCANGELI	ম	16E	34	10664	
35121201580000	USA	ম	16E	27		
35121201680000	W WALLACE	41	17E	17		
35121206250000	US GOVERNMENT	ম	16E	27		
35121201770000	USA	ম	16E	35	10332	10638
35121201980000	NEEDHAM	421	16E	11		
35121202370000	MADDEN	41	16E	2		
35121202290000	FRANTZ NEEDHAM	41	16E	14		
35121202200000	LEWIS	41	16E	12		
35121202190000	SLAUGHTER	41-1	16E	1		
35121201450000	R EKING	N	16E	26		
35121201550000	HARTSHORNE	421	17E	6		
35121200310000	PAULINE BOWIMAN	ম	17E	20		
35121221060000	KING	ম	16E	26		
35121221230000	MCBEE	ম	16E	23		
35121213390000	ANDERSON	N	17E	19		
35121214230000	W C CAMP	41	16E	4		

					Spero	Spro
					Thrust	Thnist
					Sheet B	Sheet B
UWI (AFIIhum)	Well Name	Township	Range	Section	Tops (ft)	Bot (ft)
35121210120000	MASS	ম	16E	25		
35121232160000	KENDRICK	4 N	16E	в		
35121232330000	FINK	ম	16E	- 36	10367	10590
35121230540000	AIMERITO	ম	16E	- 27	10445	10660
35121229220000	LEANS JAMES	41	16E	12		
35121228510000	CAMP	ম	16E	34	10526	10754
35121230870000	KING	ম	16E	26		
35121220030000	WOODS	ম	16E	- 36	11607	11830
35121217880000	ANDERSON	ম	17E	19	9830	
35121219200000	USA	ম	16E	- 35	10939	11149
35121219820000	NEEDHAM	41	16E	11		

					Spiro Throat	Spino Throat
					SheetC	SheetC
UWI (AFIIhim)	Well Diame	Township	Range	Section	Tops (ft)	Bot (ft)
35077205720000	BLUE MOUNT AIN	41-1	17E	22		
35077206090000	WALLACE	41	17E	15		
35077203220000	W P LERBLANCE	ম	17E	36		
35077203380000	JESSIE BENNETT	ম	18E	30		
35077204690000	HUNTER TUCKER	ম	18E	31		
35077205450000	DELLAHOLT	ম	17E	35		
35077205430000	STATE	ম	18E	28		
35077205310000	DOBBS STATE UNIT MA	ম	18E	29		
35077214630000	MABRY 12	41	17E	12		
35077214470000	SPARKS	41	17E	1		
35077205080001	STATE C UNIT	ম	18E	28		
35077212870000	MCCASLIN	41-1	17E	2		
35077212760000	MCCASLIN	41-1	17E	2		
35077212580000	SMITH	ম	18E	20		
35077212380000	LAYDEN	41	17E	3		
35077212160000	PARKER ALFORD	ন্য	17E	27		
35077210000000	HENLEY	ন্য	17E	25		
35077209960000	KITCHELL	41-1	17E	14		
35077209930000	STVIL	ন্য	17E	22		
35077209800000	DARBY	ন্দ্র	17E	23		
35077209490000	STATEC	ম	18E	28		
35077209350000	WHINEY	ম	17E	34		
35077209210000	BENNETT STATE	ম	18E	19		
35077208700000	JESSIE BENNETT	ম	18E	30		
35077208580000	ANDREWKURLKO	ন্য	17E	35		
35077208090000	HENLEY	ম	17E	25		
35077208070000	CAUDRON	ম	17E	26		
3507720800000	CAUDRON	_ স্থ	17E	26		
35077207860000	FABERO	ম	17E	24		
35077207810000	SMITH	_ হয	18E	20		
3507720692000	LEBLANCE	121	17E	- 20		
35077205850000	CAUDRUN	74	17E	20		
35077205650000	DARBY	14	17E	23		
35077205280000	KABBRU	14	17E	24		
35077205270000	MABRY	411	18E	$\frac{\gamma}{\infty}$		
3507720525000	BENNETT	<u>114</u>	18E	90		
2507720-504000	DENDETT OTATE	PL 10	10E	10		
25077203040000	VENDETSZ	P1L T-0	10E	20		
25077204010000	DEMILITY OF ATE		1012	10		
2507720054000	DEPUTEIT STATE	PL TO	1012	29		
25077209940000	MCCASIN	10	10E	- 47		
3507721052000	CTON CONTRACTOR OF CONTRACTOR	41	175	<u><u></u><u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u></u></u>		
35077210050000	RENNETT CTATE	-11 9J	195	مم 10		
3507720200000	INTERVIEW	-11 9J	175	24		
35077204510000	MARRY TRIET	10	175	12		
35077204010000	DATTICON	-111 	175	1		
350772100000	CAUDRON	41	1712	2		
3507760030000	M C WATTS	- ম	185	2		
35077301470000	MARRY	401	181			
3507730011000	IL HENLEY	ন্থ	17E	25		
		· -·				

					Spro	Spiro
					Thrust	Thrust
			_		SheetC	SheetC
UWI (AFIItum)	Well Diame	Township	Range	Section	Tops (fi)	Bot (ff)
35077300040000	MOSE C WATTS	421	18E	3		
35077300000000	DARBYSUBDIVISION	ম	17E	23		
35077210410000	DARBY	<u> </u>	17E	23		
3507/210260000	CAUDRUN	<u> 10</u>	17E	20		
3507721010000	PARKER ALFRED	<u> 14</u>	17E	2/		
35077204180000	ALFRED PARKER	11	17E	2/		
35077204130000	DARBYSUBDIVI	<u>114</u>	17E	23		
35077204020000	FABBRO	14	17E	24		
35077204010000	MUCASLIN	411	17E	2		
300/7204200000	HUNTER TOLKER		18E	31		<u> </u>
30077203900000	SPARED	461	17E	<u></u>		<u> </u>
300/720302000	SAM	<u>111</u>	17E	44		<u> </u>
35077203410000	CAUDRON	<u>111</u>	17E	20		
350/720330000		<u>11</u>	18E	20		
25077203150000	MADIX TOLET		1/12	<u> </u>		<u> </u>
25077202950000	VENDETV	911	105	5		<u> </u>
2507720201000	INTERNES/	11	105	24		
250772020000	DS O		175	10		
2507720254000		- 121	175	10		<u> </u>
3507720246000	SILVER BUILTET	4	1715	11		<u> </u>
35077201750000	RASDOLINIK	্যা হয	175	10		
35077201740000	VAIIGHN	90 91	171	10		
35077201590000	KENT	শ	171	15		
35077201410000	HINTER TUCKER	91 91	18E	1 21		
35077200960000	ANDREWKURLKO	1 1	17E	35		
35077200710000	WHIINEY	ম	17E	34		
3507720.5440000	MABRY 9001 JV-P	41	18E	11		
3507720.5890000	WORKMANI VP-9001	401	18E	22		
35077214300000	MABRYRANCH	401	18E	10		
35077205740000	NEWELL	41	18E	23		
35077205760000	SPEARS	41	18E	21		
35077204870000	SHARP	ম	17E	2		
35121216560000	WALLACE	421	17E	21		
35121208200000	MOSS	ম	16E	в		
35121214020000	USA	ম	17E	28		
35121214060000	CHARLES CASTEEL	ম	17E	32	10996	
35121214150000	P D BOWMAN	N	17E	29		
35121214440000	WAYNE WALLACE	4 N	17E	21		
35121216140000	BOWIMAN	ম	17E	21		
35121216730000	HARE	ম	17E	33		
35121216620000	PAULINE BOWMAN	ম	17E	20		
35121214570000	BELUSKO	41	17E	6	10717	10952
35121214870000	BOWIMAN	ম	17E	20		
35121216570000	PD BOWIMAN	N	17E	29		
35121212080000	WRIGHT	4 N	17E	18	12569	
35121212780000	EDITHRICHARDS	N	17E	- 30		
35121210930000	POTICHNY	ম	17E	- 33	10590	10838
35121213230000	HARTSHORNE	41	17E	6	10542	10782
35121218070000	USA	ম	17E	28		
35121213520000	ALEXANDER	41-1	17E	9		

					Spro	Spro
					Thus	Threat
			_		SkeetC	SheetC
UWI (APIInum)	Well Diame	Township	Range	Section	Tops (fi)	Bot (ft)
35121213440000	ROCKISLAND IMPROVE	421	17E	8		L
35121213380000	PEITIT	ন্য	17E	31	10309	10606
35121213310000	WEBBER	1 हो	17E	18	110-	
3512121321000	RUCK ISLAND	411	17E	2	11263	
3512121319000	PUTICHNEY	111	17E	55	11010	11902
3512121312000	WOODS PROSPECT	111	TOF	- 30	10474	10/91
35121201110000	POTICHNY	<u> 10</u>	17E	55		
3512120133000	STINE	411	17E	4		
351212188/0001	CASTEEL CHARLES 'A'	<u>111</u>	17E	52		
2612121801000	PDBOWNAN		17E			<u> </u>
35121218500000	DOURAN		17E	0		<u> </u>
3012121842000	BOWINAN	11	17E	21		<u> </u>
35121218350000	ANDERCONK	11	17E	30		<u> </u>
2512121909000	ANDERSON K		17E	4		
251212020000	D CUIMAN	41	175	17		<u> </u>
25121203190000	DIRAN	<u>1</u>	175	1/		<u> </u>
2512120690000	DEDNADU IONES	 	1/12	10		<u> </u>
2512120000000	COOK	 9.T	1612	10		<u> </u>
2512120800000	סחנרים ד		1612	19	11120	11270
2512121240000	NICIONA	 	168	11	10640	10279
3512120720000	SMALLINDOD	401	1612	2	11451	100/0
25121207200000	MCPEE	9.1	1612	22	11451	<u> </u>
35121217620000	DEDEN	91	1612	24		<u> </u>
25121214920000	A TMER TO	91	1612	24		<u> </u>
3512121207000	SMALLWOOD	41	16E	10	10772	11020
3512121192000	(#DR(#: PEDEN	- 91	16E	24		
35121212980000	HAILEVUILLE TOWNSITE		16E	35		
3512121220000	TFX	41	16E	14	11828	12121
35121213080000	MILLER	- 91	16E	26	11040	
3512120137000	WOODS PROSPECT	मि	16E	36		
3512120092000	GOURGO PODION	ম	16E	24		<u> </u>
35121218440000	MASS UNIT	ম	16E	25		
35121228110000	SIRMANS LOE	41	16E	12	11629	11898
35121202060000	MARCANGELI	ম	16E	34		
35121201580000	USA	ম	16E	27		
35121201680000	W WALLACE	41	17E	17		
35121206250000	US GOVERNMENT	ম	16E	27		
35121201770000	USA	ম	16E	35		
35121201980000	NEEDHAM	41	16E	11	11109	
35121202370000	MADDEN	41-1	16E	2	10440	
35121202290000	FRANTZ NEEDHAM	41	16E	14	11686	
35121202200000	LEWIS	41	16E	12	11373	
35121202190000	SLAUGHTER	41	16E	1	10641	
35121201450000	REKING	স	16E	26		
35121201550000	HARTSHORNE	4 N	17E	6	10880	
35121200310000	PAULINE BOWIMAN	ম	17E	20		
35121221060000	KING	ম	16E	26		
35121221230000	MCBEE	ম	16E	23		
35121213390000	ANDERS ON	ম	17E	19		
35121214230000	W C CAMP	41	16E	4	11092	11301

					Spero Thrust	Spiro Thrust
					SheetC	SheetC
UWI (APIIhim)	Well Diame	Township	Range	Section	Tops (fi)	Bot (ft)
35121210120000	MASS	ম	16E	25		
35121232160000	KENDRICK	41	16E	в	11933	
35121232330000	FINK	ম	16E	- 36		
35121230540000	AIMERITO	ম	16E	- 27		
35121229220000	LEWIS JAMES	41	16E	12	11341	11596
35121228510000	CAMP	ম	16E	34		
35121230870000	KING	ম	16E	26		
35121220030000	WOODS	ম	16E	- 36		
35121217880000	ANDERSON	ম	17E	19		
35121219200000	USA	ন্য	16E	- 35		
35121219820000	NEEDHAM	41	16E	11	10774	11035

					Spiro	Spiro
					Thrust	Thrus
			_		SheetD	Sheet D
UWI (APIINIM)	Well Diame	TOWNSREP	Range	Section	Tops (ff)	Bot (ff)
35077205720000	BLUEMOUNTAIN	421	17E	22		
35077206090000	WALLACE	421	17E	<u> </u>		
35077203220000	W P LERBLANCE	<u> </u>	17E	36	11054	11300
35077203380000	JESSIE BENNEIT	71/	18E	90	9779	10033
35077204690000	HUNTER TUCKER	74	18E	31	10607	
35077205450000	DELLAHOLT	<u> 142</u>	17E	35	10752	11021
35077205430000	STATE	<u>191</u>	18E	28		
35077205310000	DOBBS STATE UNIT MA	_ 14	18E	29	9770	10020
35077214630000	MABRY 12	41	17E	12		
35077214470000	SPARKS	411	17E			
35077205080001	STATE C UNIT	114	18E	28		
35077212870000	MCCASLIN	411	17E	2		
35077212760000	MCCASLIN	41-1	17E	2		
35077212580000	SMITH		18E	20	9141	9386
3507/21280000	LAYDEN	411	IVE	3	12257	
35077212160000	PARKER ALFORD	74	17E	2/	102/0	
3507721000000	HENLEY	_ 14	17E	25	10284	10555
35077209960000	KITCHELL	421	17E	14		
35077209930000	SIVIL	_ ম	17E	22		
35077209800000	DARBY	_ হয	17E	23	9278	
35077209490000	STATEC	<u> 191</u>	18E	28		
35077209350000	WHITNEY	_ 14	17E	34	11101	11372
35077209210000	BENNETT STATE	_ 14	18E	19	8727	9175
35077208700000	JESSIE BENNETT	_ ম	18E	30	99996	10295
35077208580000	ANDREWKURLKO	_ গ	17E	35	10494	10762
35077208090000	HENLEY	714	17E	25	10804	
35077208070000	CAUDRON	<u> 191</u>	17E	26	8998	9262
3507720800000	CAUDRON	_ 14	17E	26	10635	
35077207860000	FABERO	_ 14	17E	24	8998	
35077207810000	SMITH	_ গ্ৰ	18E	20	10471	10658
3507720692000	LEBLANCE	14	IVE	90		
35077205850000	CAUDRON	74	17E	20	9300	9541
3507/20565000	DARBY	71/	IVE	23	9066	9580
35077205280000	FABBRO	74	17E	24	9714	9952
35077205270000	MABRY	421	18E	7		
35077205250000	BENNETT	<u> 9</u> N	18E	30	11388	11651
35077205050000	SMITH	14	18E	20	105/9	10777
35077205040000	BENNETT STATE	14	18E	<u><u>u</u></u>	9260	9552
3507/201050000	KENNEDY	74	18E	52		
35077204810000	BENNETT STATE	111	18E	<u> 1</u>	8481	8/34
35077209540000	D OBES STATE	11	18E	29		
3507720080000	MUCASLIN	411	17E	2		10100
3507/21053000	SIVIL DED DUSIE CELOTE	11	17E	22	982/	10102
350/7210960000	BENNETT STATE	14	18E	24	9441	90/4
35077203090000	WHITNEY	ML N	17E	- 54	10/00	10960
35077204510000	MABRY TRUST	464	17E	12		
55077200790000	PATTISON	411	1/E			0044
3507/210/0000		11	1712	23	9008	9240
3507760030000	M C WATTS	11 <u>1</u>	18E	33		
55077301470000	MABRY	414	18E	9	10011	
55077300110000) L HENLEY	ML	17E	25	10011	

					Spiro	Spiro
					Thnist	Thras
					SkeetD	Sheet D
UWI (AFIIww)	Well Diame	Township	Range	Section	Tops (f)	Bot (f)
35077300040000	MOSE C WATTS	41-1	18E	3		
35077300000000	DARBYSUBDIVISION	ন্দ্র	17E	23		
35077210410000	DARBY	ন্দ্র	17E	23	9131	9460
35077210260000	CAUDRON	_ 142	17E	26	10280	10841
35077210100000	PARKER ALFRED	<u>19</u>	17E	27	8997	
35077204180000	ALFRED PARKER	<u>19</u> N	17E	27	9202	9442
35077204130000	DARBYSUBDIVI	74	17E	23		
35077204020000	FABERO	_ 142	17E	24		
35077204010000	MCCASLIN	41	17E	2	11287	
35077204260000	HUNTER TUCKER	14	18E	31		
3507720390000	SPARKS	411	17E	5	0.011	
35077203520000	SAMS	71	17E	22	9520	9/44
35077203410000	CAUDRON	74	17E	26	9159	9443
35077203360000	SMITH	71	18E	20	1.0000	11000
35077203150000	ANDREW KURILKU	14	17E	<u> </u>	109/8	11222
35077202930000	MABRY TRUST	411	18E	2		
35077202840000	KENNEDY	14	18E	52		11004
35077202810000	WHIINEY	14	17E	- 54	11453	11/06
35077202190000	PSU	411	17E	10		
35077202540000	KENT HEIRS	14	17E	14		
350/720240000	SILVERBULLET	414	ITE	11		
35077201750000	RASPUTNIK	14	17E	10		
35077201740000	VAUGHN	14	17E	12		
350/7201590000	KENI	14	17E	<u>D</u>		
35077201410000	HUNTER TUCKER	11	188	- 51	1 10 52	
3007720090000	ANDREW KORILKO	10 at	1712	- 30	11002	
35077200710000	WHILNEY MADDY 0001 HLD	10	1/E	34	11137	
30077200940000	MABRY 900110-P	414	18E	<u> </u>		
350/7203890000	WORKIMAN) VP-9001	414	18E	22		
25077205740000	MARKYKANCH	9121 	1812			
2507720576000	CTEADS	41.1 AT	105	<u></u>		
25077203970000	CLIADD	41	105	14		<u> </u>
251017204670000	DIALLACE	 	175	- 4		<u> </u>
251212100000	MOSS	411	1/12	12		<u> </u>
2512120820000	TE A	11	105	20	10061	11010
3512121405000	CHARLES CASTER	<u>-11</u>	1712	<u>क</u>	10901	41911
35121214150000	PDROWMAN	- <u>-</u> -	17E	20		
35121214440000	WAVNEWALLACE	40	17E	21		<u> </u>
35121216140000	BOIJMAN	- ম	175	21		
3512121673000	HARE	<u></u>	175		10707	11055
3512121662000	PAULINE BOWMAN	- इंग्रे	17E	1 Di	10/07	
35121214570000	BELUSKO	41	17E	6		
3512121487000	BOWMAN	স	17E	20		
3512121657000	PDBOWMAN	স	17E	29		
35121212080000	WRIGHT	41	17E	18		
3512121278000	EDITHRICHARDS	স	17E	30		
35121210930000	POTICHNY	ন্দ্র	17E	33		
35121213230000	HARTSHORNE	41	17E	6		
35121218070000	USA	N	17E	28	9790	10105
35121213520000	ALEXANDER	41	17E	9		

					Spiro	Spiro
					2 hnug SkortD	2 knig Short D
TWT (AFTIMum)	Well Jame	Танинайта	Pan aa	Cartine	Tom H	Bat /B
35121212440000	ROCK ISLAND IMPROVE	20 milling/	175	2	rofa Rå	DUE 69
3512121378000	DETTIT	91	175	21		
3512121331000	INTEREE	91	175	18		
3512121321000	ROCKISLAND	41	17E	5		
35121213190000	POTICHNEY	- 31	17E	33	10663	10920
35121213120000	WOODS PROSPECT	ম	16E	36		
35121201110000	POTICHNY	ম	17E	33	11045	
35121201330000	STINE	41	17E	4	10892	
35121218870001	CASTEEL CHARLES 'A'	ম	17E	32	11600	
35121218510000	PDBOWMAN	ম	17E	29		
35121218500000	USA	ম	17E	28		
35121218420000	BOWIMAN	ম	17E	21		
35121218350000	EDITHRICHARDS	ম	17E	- 30		
35121219090000	ANDERSONK	ম	17E	19		
35121205370000	SWEET	41	17E	9		
35121203190000	BOWIMAN	N 1	17E	17		
35121205950000	DURAN	<u> </u>	17E	18		
35121206800000	BERNARDI JONES	ম	16E	10		
35121208900000	COOK	ম	16E	14		
35121213340000	LEWIS	41	16E	12		
35121213490000	NEEDHAM	41	16E	11		
35121207300000	SMALLWOOD	41-1	16E	3		
35121204950000	MCBEE	<u> </u>	16E	23		
35121217630000	PEDEN	<u> </u>	16E	- 24		
35121214820000	AIMERITO	N 1	16E	34		
35121212070000	SMALLWOOD	41	16E	10		
35121211920000	GEORGE PEDEN	ম	16E	- 24		
35121212980000	HAILEY VILLE TOWNSITE	ম	16E	35		
35121212200000	TEX	41-1	16E	14		
35121213080000	MILLER	ম	16E	26		
35121201370000	WOODS PROSPECT	া ফা	16E	36		
35121200920000	GEORGE PEDEN	ম	16E	24		
35121218440000	MASS UNIT	ম	16E	25		
35121228110000	SIRMANS LOS	41	16E	12		
35121202060000	MARCANGELI	ম	16E	34		
35121201580000	USA	ম	16E	27		
35121201680000	W WALLACE	41/	17E	17		
35121206250000	US GOVERNMENT	<u> 3</u> M	16E	27		
35121201770000	USA	ম	16E	35		
35121201980000	NEEDHAM	411	16E	11		
35121202370000	MADDEN	41	16E	2		
3512120229000	FRANIZ NEEDHAM	411	TOF	14		
55121202200000	LEWIS	41	10E	12		
35121202190000	SLAUGHTER	411	16E	1		
35121201450000	REKING	<u> 14</u>	16E	26		
35121201550000	HARTSHORNE	41	17E	6		
35121200310000	PAULINE BOWMAN	<u>N</u>	17E	20		
35121221060000	KING	74	10E	20		
35121221230000	MUBEE	74	10E	23		
35121213390000	ANDERSON	<u>N</u>	17E	19		
35121214230000	WC CAMP	421	16E	4		

					Spiro Thrust SheetD	Spiro Thrust Sheet D
UWI (AFII\tum)	Well Diame	Township	Range	Section	Tops (f)	Bot (ft)
35121210120000	MASS	ম	16E	25		
35121232160000	KENDRICK	41	16E	в		
35121232330000	FINK	ম	16E	- 36		
35121230540000	AIMERITO	ম	16E	- 27		
35121229220000	LEANS LAMES	41	16E	12		
35121228510000	CAMP	ন্দ্র	16E	- 34		
35121230870000	KING	ম	16E	26		
35121220030000	WOODS	ম	16E	- 36		
35121217880000	ANDERSON	ম	17E	19		
35121219200000	USA	ম	16E	- 35		
35121219820000	NEEDHAM	41	16E	11		

					Spero	Spiro
					Thruse Short E	Choat E
UWT (APT)hum)	Well Diame	Танияния	Ran oe	Section	Tors (f)	Bot fft
3507720572000	BLUEMOUNTAIN	41	17E	22	1020 04	200 04
35077206090000	WALLACE	41	17E	15		
35077203220000	W P LERBLANCE	ম	17E	36	10276	10567
35077203380000	JESSIE BENNEIT	मि	18E	30		
35077204690000	HUNTER TUCKER	ম	18E	31	9812	10070
35077205450000	DELLAHOLT	ম	17E	35		
35077205430000	STATE	স	18E	28	10357	10616
35077205310000	DOBBS STATEUNIT MA	স	18E	29	8774	9067
35077214630000	MABRY 12	42-য	17E	12		
35077214470000	SPARKS	41	17E	1		
35077205080001	STATE C UNIT	ন্য	18E	28	9794	10074
35077212870000	MCCASLIN	481	17E	2		
35077212760000	MCCASLIN	41-1	17E	2		
35077212580000	SMITH	ন্য	18E	20	3088	8317
35077212380000	LAYDEN	42-1	17E	3		
35077212160000	PARKER ALFORD	ম	17E	27		
3507721000000	HENLEY	ম	17E	25		
35077209960000	KITCHELL	411	17E	14		
35077209930000	SIVIL	74	17E	22		
35077209800000	DARBY	31	17E	23		0340
3507720949000	SIAIEC	11	18E	28	9083	9342
35077209350000		<u>111</u>	1/E	34		
35077209210000	BENNEIT STATE	111 AT	18E	20	0170	
300/7208/0000	AND FURTHER I		18E	30	9139	9392
25077208080000	ANDREW KORILKO	111 111	1712	20	0706	10075
35077209070000	CAIDRON		175	26	3130	10075
3507720800000	CADRON	11	175	20		
35077207960000	FARERO	91	175	20		
35077207810000	SMITH	91	1712	20	8704	0044
3507720692000	LEBLANCE	<u> </u>	17E	36	11201	11470
3507720.9850000	CAUDRON	- को	17E	26		
35077205650000	DARBY	ম	17E	23		
3507720.5280000	FABERO	ম	17E	24		
35077205270000	MABRY	41	18E	7		
35077205250000	BENNETT	ম	18E	30	9838	10156
35077205050000	SMITH	ম	18E	20	9101	9343
35077205040000	BENNETT STATE	ম	18E	19		
35077201050000	KENNEDY	ম	18E	32		
35077204810000	BENNETT STATE	ম	18E	19		
35077209540000	D OBES STATE	স	18E	29	8925	9159
35077200800000	MCCASLIN	41	17E	2		
35077210530000	SIVIL	ম	17E	22		
35077210960000	BENNETT STATE	স	18E	19		
35077203090000	WHIINEY	ম	17E	34		
35077204510000	MABRY TRUST	41	17E	12		
35077200790000	PATTISON	41	17E	1		
35077210700000	CAUDRON	ম	17E	23		
35077600300000	M C WATTS	म	18E	33		
35077301470000	MABRY	41	18E	9		
35077300110000	J L HENLEY	া স	17E	25		

					Spro	Spro
					Thrust	Thus
			_		Sheet E	SheetE
COWI (AFIINUM)	Well Ivame	10mmsetb	Range	Section	Tops (ff)	Bot (ft)
35077300040000	MOSE C WATTS	41	18E	3		
3507730000000	DARBYSUBDIVISION	<u> </u>	17E	23		
35077210410000	DARBY	<u> 191</u>	17E			
3007721020000			1/12	<u> </u>		
3507721010000	ALEDED DADIED		1/12	<u>4/</u>		
30077204180000	ALFRED PARKER		17E			
30077204030000			1/12	<u>43</u>		
35077204020000	MABERU MABERU		1/12	24		
2507720426000	INCLASIIN UIRITO TITVO	<u> </u>	1/E 1057	2	10101	10440
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2507720250000	C AMC	<u>41</u> 1 - का	175	<u> </u>		
25077202410000	CATERON	 	175	44		
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2507720202000	MADDITTDIET		105	20		
35077202840000	KENNETV	- 121 - 937	1015	2		
2507720281000		- <u>-</u>	105	74		
3507720210000		 	17E 17F	10		
25077202540000	2001	- মা - ক্য	175	10		
3507720246000	SUMER BULLET	41	17E	11		
35077201750000	R ASDULIN	- ন্য	176	10		
35077201740000	VAIDEN	<u></u> ম	1715 1716	10		
3507720190000	KENT	 	17E	15		
3507720141000	HINTER TILLER	- ম	181	31	10085	
35077200960000	ANDREWKURLKO	<u> </u>	17E	33	10000	
35077200710000	WHIINEY	<u>- 1</u>	17E	34		
3507720.5440000	MABRY 9001 JV-P	41	18E	11		
3507720.5890000	WORKMANJ VP-9001	41	18E	22		
35077214300000	MABRYRANCH	- 41	18E	10		
35077205740000	NEWELL	41	18E	23		
35077205760000	SPEARS	41	18E	21		
35077204870000	SHARP	ম	17E	2		
35121216560000	WALLACE	<u>4</u> 1	17E	21		
3512120820000	MOSS	ম	16E	В		
35121214020000	USA	ম	17E	28		
35121214060000	CHARLES CASTEEL	শ	17E	32		
35121214150000	P D B OWIMAN	ম	17E	29		
35121214440000	WAYNE WALLACE	- 4भ	17E	21		
35121216140000	BOWIMAN	ম	17E	21		
35121216730000	HARE	শ	17E	- 33		
35121216620000	PAULINE BOWMAN	ম	17E	20		
35121214570000	BMLUSKO	41	17E	6		
35121214870000	BOWIMAN	ম	17E	20		
3512121657000	PD BOWIMAN	N	17E	29		
35121212080000	WRIGHT	4 1	17E	18		
35121212780000	EDITHRICHARDS	N	17E	30		
3512121093000	POTICHNY	<u> </u>	17E	33		
35121213230000	HARTSHORNE	41	17E	6		
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UNT (APPThum) Well Name Townskip Range Section Tops (?) Bot (?) 33 12121350000 ROCK ISLAND IMPROVE 4N 17E 8 33 12121350000 WEBER 9N 17E 18 33 12121350000 ROCK ISLAND 4N 17E 18 33 12121350000 POTICHNEY 9N 17E 33 33 121213120000 WO ODS PROSPECT 9N 17E 33 33 121213120000 WO ODS PROSPECT 9N 17E 33 33 121213870001 CASTED CHARLES 'A' 9N 17E 32 33 121213870001 CASTED CHARLES 'A' 9N 17E 22 33 121213870001 DOWMAN 9N 17E 23 33 12121380000 DOWMAN 9N 17E 10 33 12121380000 EOWMAN 9N 17E 10 33 1212380000 EOWMAN 9N 17E 10 33 1212380000 EOWMAN 9N 17E 10						Spiro Thrust Sheet F	Spiro Thrust Sheet F
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13 12121330000 PETIT N 17E 31 35 12121310000 WUEBER N 17E 18 35 12121310000 POTICHNEY N 17E 33 35 121213120000 POTICHNEY N 17E 33 35 121213120000 POTICHNEY N 17E 33 35 121213170000 CASTERL CHARLES 'A' N 17E 32 35 12121850000 USA N 17E 22 33 35 12121850000 USA N 17E 28 33 35 12121830000 EOWMAN N 17E 19 33 12121890000 ADDESTONK N 17E 19 35 12120337000 SWEET N 16E 14 13 1212139000 10KAN N 17E 18 35 12120380000 COK N 16E 14 13 1212149000 1	35121213440000	ROCKISLAND IMPROVE	41	17E	8		
35 121213210000 WDERER N 17E 18 35 12121320000 NOCK SLAND 4N 17E 3 35 12121310000 POTICHNEY N 17E 3 35 1212310000 WOUDE FROSPECT 9N 10E 36 35 12121310000 STINE 4N 17E 4 35 1212138000 CASTERL CHARLES 'A' 9N 17E 4 35 1212180000 USA 9N 17E 20 35 1212180000 USA 9N 17E 20 35 1212180000 EDITHRICHARDS 9N 17E 20 35 1212039000 ANDERS ONK 3N 17E 10 35 1212039000 BOWMAN 9N 17E 18 35 1212039000 DURAN 9N 17E 18 35 1212039000 COK 9N 16E 10 35 12121490000 LEWIS 4N 16E 11 35 1212149000	35121213380000	PETTIT	ম	17E	31		
35 121212210000 FOTK ISTAND FN 17E 3 35 121213120000 POTICHNEY SN 17E 33 35 121213120000 POTICHNEY SN 17E 33 35 121213120000 POTICHNY SN 17E 36 35 121213130000 STINE FN 17E 4 35 121213130000 STINE FN 17E 32 35 1212180000 USA SN 17E 28 35 1212180000 EOWMAN SN 17E 28 35 1212180000 EOWMAN SN 17E 19 35 1212180000 EOWMAN SN 17E 19 35 1212039000 AUDERS ONK SN 17E 18 35 1212039000 EOWMAN SN 17E 18 35 1212039000 EOWAN SN 17E 18 35 1212039000 EOWAN SN 17E 18 35 1212039000	35121213310000	WEBBER	ম	17E	18		
35 17E 33 35 121213120000 WOODS PROSPECT SN 16E 36 35 121201130000 STINE 4N 17E 33 35 12120130000 STINE 4N 17E 4 35 12121830000 CASTEL CHARLES 'A' SN 17E 32 35 12121830000 USA SN 17E 28 35 12121830000 EOWMAN SN 17E 28 35 12121800000 EOWMAN SN 17E 30 13121230000 35 12121300000 ANDERS ONK SN 17E 19 1312123000 EOWMAN SN 17E 10 1312123000 EOWMAN SN 17E 10 13121234000 EEWER 4N 10E 10 1312123000 EOWMAN SN 17E 10 13121230000 EOWMAN SN 17E 10 1312123000 10E 14 13121213000 10E 14 </td <td>35121213210000</td> <td>ROCK ISLAND</td> <td>41</td> <td>17E</td> <td>3</td> <td></td> <td></td>	35121213210000	ROCK ISLAND	41	17E	3		
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33 121203370000 SWEET 4N 17E 9 33 121203390000 DURAN 3N 17E 17 33 121203950000 DURAN 3N 17E 18 33 121203950000 DURAN 3N 17E 18 33 121203950000 COOK 3N 16E 10 33 12120390000 COOK 3N 16E 14 33 12121349000 NEEDHAM 4N 16E 11 33 12121370000 SMALLWOOD 4N 16E 3 33 12121492000 AIMERITO 3N 16E 24 33 12121707000 SMALLWOOD 4N 16E 10 33 12121492000 GEORGE PEDEN 3N 16E 24 33 12121307000 SMALLWOOD 4N 16E 14 33 1212132000 GEORGE PEDEN 3N 16E 24 33	35121219090000	ANDERSONK		17E	19		
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35 121201370000 WOODS PROSPECT N IAE 36 35 121201370000 GEDRGE PEDEN N IAE 36 35 121201370000 GEDRGE PEDEN N IAE 36 35 121201370000 MASS UNIT N IAE 24 35 1212014940000 MASS UNIT N IAE 25 35 121228110000 SIRMANS LOE 4N IAE 12 35 12120160000 MARCANGELI N IAE 27 35 121201680000 US A N IAE 27 35 121201680000 WWALLACE 4N I7E 17 35 121201680000 US GOVERNIMENT N IAE 27 35 121201680000 US GOVERNIMENT N IAE 27 35 12120120000 US A N IAE 27 35 12120120000 WADDEN 4N IAE 11 35 121202370000 MADDEN 4N IAE 12 35 121020290000 FRANTZ NEEDHAM 4N<	35121213080000	MILLER	91	16E	26		
35121200920000 GEDRGE PEDEN 9N 16E 24 35121218440000 MASS UNIT 9N 16E 25 35121228110000 SIRMANE LOE 4N 16E 12 35121202060000 MARCANGELI 9N 16E 24 3512120180000 WARCANGELI 9N 16E 27 3512120180000 W MALACE 4N 17E 17 3512120180000 W SA 9N 16E 27 3512120180000 W SA 9N 16E 27 3512120180000 WS GOVERNMENT 9N 16E 27 3512120180000 US GOVERNMENT 9N 16E 27 3512120180000 US A 9N 16E 27 3512120180000 NEEDHAM 4N 16E 11 3512120280000 NEEDHAM 4N 16E 14 3512120280000 JEWIS 4N 16E 14 3512120280000 SLAUGHTER 4N 16E <	35121201370000	WOODS PROSPECT	<u> </u>	16E	36		
351212139440000 MASS UNIT M IGE 25 35121228110000 STEMANS LOE 4N IGE 12 35121228110000 STEMANS LOE 4N IGE 12 351212010000 MARCANGELI 9N IGE 34 351212010000 WARCANGELI 9N IGE 34 351212010000 WWALLACE 4N IFE 17 35121201680000 WWALLACE 4N IFE 17 35121201680000 WWALLACE 4N IFE 17 35121201680000 WS A 9N IGE 27 35121201680000 US A 9N IGE 35 35121201980000 NEEDHAM 4N IGE 11 3512120290000 FRANTZ NEEDHAM 4N IGE 14 3512120290000 FRANTZ NEEDHAM 4N IGE 14 3512120290000 SLAUGHTER 4N IGE 14 35121201450000 R EKING 9N IGE	3512120022000	(#DIRGE: PEDEN		16E	24		
35121208110000 STRMANE LOE 4N 16E 12 35121228110000 MARCANGELI 9N 16E 12 35121201580000 USA 9N 16E 27 35121201580000 WWALLACE 4N 17E 17 35121201680000 WWALLACE 4N 17E 17 35121201680000 USA 9N 16E 27 35121201680000 US GOVERNMENT 9N 16E 27 35121201680000 US A 9N 16E 35 35121201770000 US A 9N 16E 11 35121201980000 NEEDHAM 4N 16E 11 35121202370000 MADDEN 4N 16E 14 35121202200000 FRANTZ NEEDHAM 4N 16E 12 35121202200000 LEWIS 4N 16E 12 3512120120200000 REKING 9N 16E 26 3512120150000 HARTSHORNE 4N 17E <td< td=""><td>35121218440000</td><td>MASSIINT</td><td>91</td><td>16E</td><td>25</td><td></td><td></td></td<>	35121218440000	MASSIINT	91	16E	25		
35121202060000 MARCANGELI N 16E 34 35121202060000 USA N 16E 34 35121201580000 USA N 16E 27 35121201680000 WWALLACE 4N 17E 17 35121201680000 US GOVERNMENT N 16E 27 35121201770000 US GOVERNMENT N 16E 35 35121201880000 NEEDHAM 4N 16E 11 35121201980000 NEEDHAM 4N 16E 1 35121202370000 MADDEN 4N 16E 1 35121202290000 FRANTZ NEEDHAM 4N 16E 1 35121202290000 FRANTZ NEEDHAM 4N 16E 1 35121202290000 SLAUGHTER 4N 16E 1 35121201450000 R EKING 5N 16E 26 3512120150000 HARTSHORNE 4N 17E 6 3512120160000 KING 5N 16E <	3512122811000	STRMANS LOTS	401	16E	12		
35121201380000 USA 9N 16E 27 35121201380000 WWALLACE 4N 17E 17 35121201680000 WWALLACE 4N 17E 17 35121201680000 US GOVERNMENT 9N 16E 27 35121201680000 US GOVERNMENT 9N 16E 27 35121201770000 US A 9N 16E 35 35121201980000 NEEDHAM 4N 16E 11 35121201980000 NEEDHAM 4N 16E 11 35121202370000 MADDEN 4N 16E 14 35121202390000 FRANTZ NEEDHAM 4N 16E 14 35121202300000 LEWIS 4N 16E 1 35121202190000 SLAUGHTER 4N 16E 1 35121201450000 R EKING 9N 16E 26 3512120150000 HARTSHORNE 4N 17E 6 351212030000 PAULINE BOWMAN 9N 17E	35121202060000	MARCANGELI	91	16E	74		
35121201680000 W WALLACE 4N 17E 17 35121201680000 US GOVERNMENT 9N 16E 27 35121201770000 US GOVERNMENT 9N 16E 27 35121201770000 US A 9N 16E 35 35121201770000 US A 9N 16E 35 35121201980000 NEEDHAM 4N 16E 11 35121202370000 MADDEN 4N 16E 2 35121202390000 FRANTZ NEEDHAM 4N 16E 14 35121202290000 FRANTZ NEEDHAM 4N 16E 14 35121202290000 LEWIS 4N 16E 1 35121202190000 SLAUGHTER 4N 16E 1 35121201450000 R EKING 9N 16E 26 35121201550000 HARTSHORNE 4N 17E 6 3512120160000 RING 9N 16E 26 35121221080000 MING 9N 16E	35121201980000	IISA	91	16E	27		
3512120625000 US GOVERNMENT N IGE 27 35121201770000 US A N IGE 35 35121201770000 US A N IGE 35 35121201770000 NEEDHAM 4N IGE 11 35121201280000 NEEDHAM 4N IGE 11 35121202370000 MADDEN 4N IGE 14 35121202290000 FRANTZ NEEDHAM 4N IGE 14 35121202290000 FRANTZ NEEDHAM 4N IGE 14 35121202290000 ILEWIS 4N IGE 12 3512120230000 SLAUGHTER 4N IGE 1 35121201450000 R EKING 5N IGE 26 35121201550000 HARTSHORNE 4N ITE 6 35121200310000 PAULINE BOWMAN 5N ITE 20 35121221230000 KING 5N IGE 26 3512122130000 MCBEE 5N IGE	35121201680000	WWALLACE	41	17E	17		
35121201770000 USA 9N 16E 35 35121201980000 NEEDHAM 4N 16E 11 35121201980000 MADDEN 4N 16E 11 35121202390000 MADDEN 4N 16E 1 35121202290000 FRANTZ NEEDHAM 4N 16E 1 35121202290000 FRANTZ NEEDHAM 4N 16E 14 35121202290000 ILEWIS 4N 16E 12 35121202190000 SLAUGHTER 4N 16E 1 35121201450000 R EKING 5N 16E 26 35121201550000 HARTSHORNE 4N 17E 6 35121200310000 PAULINE BOWMAN 5N 17E 20 35121221060000 KING 5N 16E 26 35121221230000 MCBEE 5N 16E 23 3512122130000 MCBEE 5N 16E 23 35121213390000 ANDERS ON 5N 17E <t< td=""><td>35121206250000</td><td>US GOVERNMENT</td><td></td><td>16E</td><td>27</td><td></td><td></td></t<>	35121206250000	US GOVERNMENT		16E	27		
35121201980000 NEEDHAM 4N 16E 11 35121201980000 MADDEN 4N 16E 11 35121202370000 MADDEN 4N 16E 1 35121202290000 FRANTZ NEEDHAM 4N 16E 1 35121202200000 FRANTZ NEEDHAM 4N 16E 14 35121202200000 LEWIS 4N 16E 12 35121202200000 SLAUGHTER 4N 16E 1 35121201450000 R EKING 5N 16E 26 35121201550000 HARTSHORNE 4N 17E 6 35121200310000 PAULINE BOWMAN 5N 17E 20 35121221060000 KING 5N 16E 26 35121221060000 MCBEE 5N 16E 23 351212213390000 ANDERS ON 5N 17E 19 35121214230000 WC CAMP 4N 16E 4	3512120177000	USA	91	1612	35		
35121202370000 MADDEN 4N 16E 2 35121202370000 FRANTZ NEEDHAM 4N 16E 2 35121202200000 FRANTZ NEEDHAM 4N 16E 14 35121202200000 LEWIS 4N 16E 12 35121202200000 SLAUGHTER 4N 16E 1 35121201200000 SLAUGHTER 4N 16E 1 35121201450000 R EKING 3N 16E 26 35121201550000 HARTSHORNE 4N 17E 6 35121200310000 PAULINE BOWMAN 3N 17E 20 35121221060000 KING 3N 16E 26 35121221230000 MCBEE 3N 16E 26 3512122130000 MCBEE 3N 16E 23 35121213390000 ANDERS ON 3N 17E 19 35121214230000 WC CAMP 4N 16E 4	35121201980000	NEEDHAM	41	16E	11		
35121202290000 FRANTZ NEEDHAM 4N 16E 14 35121202290000 LEWIS 4N 16E 14 35121202290000 LEWIS 4N 16E 12 35121202190000 SLAUGHTER 4N 16E 1 35121202190000 REKING 3N 16E 26 35121201450000 REKING 3N 16E 26 35121201550000 HARTSHORNE 4N 17E 6 35121200310000 PAULINE BOWMAN 3N 17E 20 35121221060000 KING 3N 16E 26 35121221060000 KING 3N 16E 26 35121221060000 MCBEE 3N 16E 26 3512122130000 MCBEE 3N 16E 23 35121213390000 ANDERS ON 3N 17E 19 35121214230000 WC CAMP 4N 16E 4	3512120237000	MADDEN	401	16E	2		
35121202200000 LEWIS 4N I6E 12 35121202190000 SLAUGHTER 4N I6E 1 35121202190000 SLAUGHTER 4N I6E 1 35121201450000 R EKING 5N I6E 26 35121201550000 HARTSHORNE 4N 17E 6 35121201550000 PAULINE BOWIMAN 5N 17E 20 35121221060000 KING 5N I6E 26 35121221060000 KING 5N I6E 26 35121221060000 KING 5N I6E 26 3512122130000 MCBEE 5N I6E 23 35121230000 ANDERS ON 5N 17E 19 35121214230000 WC CAMP 4N I6E 4	35121202290000	FRANTZ NEEDHAM	41	16E	14		
35121202190000 SLAUGHTER 4N 16E 1 35121201450000 R EKING 9N 16E 26 35121201450000 R EKING 9N 16E 26 35121201550000 HARTSHORNE 4N 17E 6 35121201550000 PAULINE BOWMAN 9N 17E 20 35121221060000 RING 9N 16E 26 35121221060000 KING 9N 16E 26 35121221060000 MCBEE 9N 16E 26 3512122130000 MCBEE 9N 16E 23 35121213390000 ANDERS ON 9N 17E 19 35121214230000 WC CAMP 4N 16E 4	3512120220000	LEWIS	41	16E	12		
35 121 20 1450000 R EKING N 16E 26 35 121 20 1550000 HARTSHORNE 4N 17E 6 35 121 20 1550000 HARTSHORNE 4N 17E 6 35 121 20 03 10000 PAULINE BOWMAN 2N 17E 20 35 121 22 106 0000 KING 2N 16E 26 35 121 22 106 0000 KING 2N 16E 26 35 121 22 128 0000 MCBEE 2N 16E 23 35 121 21 23 0000 MCBEE 2N 16E 23 35 121 21 23 0000 ANDERS ON 2N 17E 19 35 121 21 423 0000 W C CAMP 4N 16E 4	35121202190000	SLAUGHTER	41	16E	1		
35 121 20 1550000 HARTSHORNE 4N 17E 6 35 121 20 0310000 PAULINE BOWMAN 2N 17E 20 35 121 22 1060000 PAULINE BOWMAN 2N 17E 20 35 121 22 1060000 KING 2N 16E 26 35 121 22 1230000 MCBEE 2N 16E 23 35 121 22 1330000 ANDERS ON 2N 17E 19 35 121 21 4230000 WC CAMP 4N 16E 4	35121201450000	R EKING	श	16E	26		
35 121 200310000 PAULINE BOWMAN 9N 17E 20 35 121 22 1060000 KING 9N 16E 26 35 121 22 1060000 KING 9N 16E 26 35 121 22 1230000 MCBEE 9N 16E 23 35 121 22 1230000 ANDERS ON 9N 17E 19 35 121 21 4230000 WC CAMP 4N 16E 4	35121201550000	HARTSHORNE	401	175	6		
35 12122 1060000 KING 9N 16E 26 35 12122 1230000 MCBEE 9N 16E 23 35 12122 1230000 MCBEE 9N 16E 23 35 12122 1230000 ANDERS ON 9N 17E 19 35 12121 4230000 WC CAIMP 4N 16E 4	3512120031000	PAILINE BOWMAN	ঞ	175	ž		
35121221230000 MCBEE 9N 16E 23 35121213390000 ANDERSON 9N 17E 19 35121214230000 WC CAMP 4N 16E 4	35121221060000	KING	- को	16E	26		
35121213390000 ANDERS ON 2N 17E 19 35121214230000 WC CAMP 4N 16E 4	3512122123000	MCBEE	য	1615	23		
35121214230000 WC CAMP 4N 16E 4	35121213390000	ANDERSON	ন্য	175	10		
	35121214230000	WC CAMP	41	16E	4		

UWI (APIThum)	Well Name	Tawashin	Ran oe	Section	Spiro Thrust Sheet E Tors (ff)	Spiro Thrust Sheet E Bot (B)
35121210120000	MASS	ম	16E	25		04
35121232160000	KENDRICK	41	16E	В		
35121232330000	FINK	ম	16E	- 36		
35121230540000	AIMERITO	ম	16E	- 27		
35121229220000	LEANS JAMES	41	16E	12		
35121228510000	CAMP	ম	16E	- 34		
35121230870000	KING	ম	16E	26		
35121220030000	WOODS	ম	16E	- 36		
35121217880000	ANDERSON	ম	17E	19		
35121219200000	USA	ম	16E	- 35		
35121219820000	NEEDHAM	41	16E	11		

					Spiro	Spiro
					Thnist	Thnist
					Sheet F	Sheet F
UWI (AFIIdum)	Well Diame	Township	Range	Section	Tops (fi)	Bot (ft)
35077205720000	BLUEMOUNTAIN	41	17E	22	13640	13970
35077206090000	WALLACE	41	17E	ឋ	13989	14387
35077203220000	W P LERBLANCE	ম	17E	- 36		
35077203380000	JESSIE BONNETT	ম	18E	- 30		
35077204690000	HUNTER TUCKER	ম	18E	- 31		
35077205450000	DELLAHOLT	ম	17E	35		
35077205430000	STATE	ম	18E	28	12569	12790
35077205310000	DOBBS STATEUNIT MA	ম	18E	29	11430	11630
35077214630000	MABRY 12	41-1	17E	12	12055	12390
35077214470000	SPARKS	41	17E	1	11960	
35077205080001	STATE C UNIT	ম	18E	28		
35077212870000	MCCASLIN	4N	17E	2	11833	12130
35077212760000	MCCASLIN	421	17E	2	11375	
35077212580000	SMITH	ম	18E	20		
35077212380000	LAYDEN	41	17E	3	11812	12085
35077212160000	PARKER ALFORD	ম	17E	- 27		
35077210000000	HENLEY	ম	17E	25		
35077209960000	KITCHELL	41	17E	14	13210	
35077209930000	STVIL	ম	17E	22		
35077209800000	DARBY	ম	17E	23		
35077209490000	STATEC	ম	18E	28	11547	11761
35077209350000	WHITNEY	ম	17E	- 34		
35077209210000	BENNETT STATE	স	18E	19		
35077208700000	JESSIE BENNETT	স	18E	- 30		
35077208580000	ANDREWKURILKO	ম	17E	35		
35077208090000	HENLEY	ম	17E	25		
35077208070000	CAUDRON	ম	17E	26		
35077208000000	CAUDRON	ম	17E	26		
35077207860000	FABBRO	ম	17E	24		
35077207810000	SMITH	ম	18E	20		
35077206920000	LEBLANCE	ম	17E	- 36		
35077205850000	CAUDRON	ম	17E	26		
35077205650000	DARBY	ম	17E	23		
35077205280000	FABBRO	ম	17E	- 24		
35077205270000	MABRY	41	18E	7		
35077205250000	BENNETT	ম	18E	- 30		
35077205050000	SMITH	াম	18E	20		
35077205040000	BENNETT STATE	ম	18E	19		
35077201050000	KENNEDY	ম	18E	32	10892	
35077204810000	BENNETT STATE	ম	18E	19		
35077209540000	D OBES STATE	ম	18E	- 29	11538	11749
35077200800000	MCCASLIN	41	17E	2	11360	
35077210530000	SIVIL	ম	17E	22		
35077210960000	BENNETT STATE	স	18E	19		
35077203090000	WHIINEY	ম	17E	- 34		
35077204510000	MABRY TRUST	41	17E	12		
35077200790000	PATTISON	41	17E	1	11372	
35077210700000	CAUDRON	ম	17E	23		
35077600300000	M C WATTS	ম	18E	- 33		
35077301470000	MABRY	41	18E	9		
35077300110000	J L HENLEY	ম	17E	25		

					Spro	Spiro
					Thnist	Thrust
					Sheet F	Sheet F
UWI (AFIIvium)	Well Name	Τσινκελίφ	Range	Section	Tops (f)	Bot (ft)
35077300040000	MOSE C WATTS	41-1	18E	3		
35077300000000	DARBYSUBDIVISION	ম	17E	23		
35077210410000	DARBY	ম	17E	23		
35077210260000	CAUDRON	ম	17E	26		
35077210100000	PARKER ALFRED	ম	17E	27		
35077204180000	ALFRED PARKER	ন্য	17E	27		
35077204130000	DARBYSUBDIVI	ম	17E	23		
35077204020000	FABBRO	ম	17E	24		
35077204010000	MCCASLIN	41	17E	2		
35077204260000	HONTER TOCKER	74	18E	31		
35077203900000	SPARKS	41	17E	3		
35077203520000	SAMS	74	17E	22		
35077203410000	CAUDRON	24	17E	26		
35077203360000	SMITH	ম	18E	20		
35077203130000	ANDREW KURILKU	<u> 10</u>	17E	5		L
35077202930000	MABRY TRUST	411	18E	2	10010	
35077202840000	KENNEDY	<u> 14</u>	18E	52	10917	L
35077202810000	WHIINEY	214	17E	- 54	10140	L
35077202190000	PSO	411	17E	10	12140	
35077202540000	KENT HEIRS	21	17E	14	10000	10010
30077202400000	DACDOWNIN	461	17E	11	12325	12010
35077201750000	RASPOINIR	<u></u>	1/12	10		
35077201740000	VAUGHN	<u>114</u>	17E	12		<u> </u>
35077201590000	KENI URBER TURKER	<u>114</u>	17E	21		<u> </u>
2507720191000	ANDERITIER	<u>1</u>	188	25		<u> </u>
25077200710000	UTUTNES	11	175	24		<u> </u>
25077205440000	MARRY 0001 BY D	10	1/12	11		<u> </u>
2507720.5900000	UIOPVM ANI VD 0001		1015	<u> </u>		<u> </u>
25077203690000	MADDYD ANDU	41	101	10		<u> </u>
35077205740000	NEXEL	<u></u>	1012	20		<u> </u>
3507720.5760000	SDEARS		185	21		<u> </u>
35077204870000	SHARD	- মা	171	2		
35121216560000	NI ALL ACK	10	175	21	17390	13700
3512120820000	MOSS	- মা - মা	161	13	1.000	10/00
3512121402000	IEA	<u></u>	175	28		
35121214060000	CHARLES CASTING	<u> </u>	17E	22		
35121214150000	PDBOWMAN	- 31	17E	29		
35121214440000	WAYNE WALLACE	41	17E	21	13248	13578
35121216140000	BOWIMAN	ম	17E	21		
35121216730000	HARE		17E	33		
35121216620000	PAULINE BOWMAN	ন্য	17E	20		
35121214570000	BALUSKO	41	17E	6		<u> </u>
35121214870000	BOWMAN	ম	17E	20		
35121216570000	PD BOWMAN	ম	17E	29		
35121212080000	WRIGHT	41	17E	18		
35121212780000	EDITHRICHARDS	শ	17E	30		
35121210930000	POTICHNY	ম	17E	33		
35121213230000	HARTSHORNE	421	17E	6		
35121218070000	USA	ম	17E	28		
35121213520000	ALEXANDER	421	17E	9	12206	

					Spiro Thrust	Spiro Thrust
					Sheet F	Sheet F
UWI (AFIIvium)	Well Diame	Township	Range	Section	Tops (f)	Bot (ft)
35121213440000	ROCKISLAND IMPROVE	41	17E	8	12025	
35121213380000	PEITIT	ম	17E	31		
35121213310000	WEBBER	ম	17E	18		
35121213210000	ROCK ISLAND	41	17E	5		
35121213190000	POTICHNEY	ম	17E	- 33		
35121213120000	WOODS PROSPECT	ম	16E	- 36		
35121201110000	POTICHNY	ম	17E	- 33		
35121201330000	STINE	41	17E	4		
35121218870001	CASTEEL CHARLES 'A'	ম	17E	32		
35121218510000	PDBOWMAN	ম	17E	- 29		
35121218500000	USA	ম	17E	28		
35121218420000	BOWIMAN	ম	17E	21		
35121218350000	EDITHRICHARDS	ম	17E	30		
35121219090000	ANDERSONK	ম	17E	19		
35121205370000	SWEET	41	17E	9	12495	
35121203190000	BOWIMAN	ম	17E	17		
35121205950000	DURAN	ম	17E	18		
35121206800000	BERNARDI JONES	ম	16E	10		
35121208900000	COOK	ম	16E	14		
35121213340000	LEWIS	41-1	16E	12		
35121213490000	NEEDHAM	41	16E	11		
35121207300000	SMALLWOOD	41-1	16E	3		
35121204950000	MCBEE	ম	16E	23		
35121217630000	PEDEN	ম	16E	24		
35121214820000	AIMERITO	ম	16E	34		
35121212070000	SMALLWOOD	41	16E	10		
35121211920000	GEORGE PEDEN	ম	16E	24		
35121212980000	HAILEYVILLE TOWNSITE	ম	16E	35		
35121212200000	TEX	41-1	16E	14		
35121213080000	MILLER	ম	16E	26		
35121201370000	WOODS PROSPECT	ম	16E	36		
35121200920000	GEORGE PEDEN	ম	16E	24		
35121218440000	MASS UNIT	ম	16E	25		
35121228110000	SIRMANS LOE	41-1	16E	12		
35121202060000	MARCANGELI	ম	16E	- 34		
35121201580000	USA	ম	16E	27		
35121201680000	W WALLACE	41	17E	17	12750	13042
35121206250000	US GOVERNMENT	ম	16E	27		
35121201770000	USA	ম	16E	35		
35121201980000	NEEDHAM	41-1	16E	11		
35121202370000	MADDEN	41-1	16E	2		
35121202290000	FRANTZ NEEDHAM	41	16E	14		
35121202200000	LEWIS	41	16E	12		
35121202190000	SLAUGHTER	41-1	16E	1		
35121201450000	R EKING	ম	16E	26		
35121201550000	HARTSHORNE	42-1	17E	6		
35121200310000	PAULINE BOWMAN	ম	17E	20		
35121221060000	KING	ম	16E	26		
35121221230000	MCBEE	ম	16E	23		
35121213390000	ANDERS ON	ম	17E	19		
35121214230000	W C CAMP	41	16E	4		

UWI (APDhum)	Well Diame	Township	Range	Section	Spiro Thrust Sheet F Tops (fij	Spiro Thrust Sheet F Bot (ft)
35121210120000	MASS	ন্দ্র	16E	25		
35121232160000	KENDRICK	41	16E	B		
35121232330000	FINK	ম	16E	- 36		
35121230540000	AIMERITO	ন্য	16E	- 27		
35121229220000	LEANS LAMES	4 N	16E	12		
35121228510000	CAMP	ম	16E	- 34		
35121280870000	KING	ম	16E	26		
35121220030000	WOODS	ম	16E	- 36		
35121217880000	ANDERSON	ম	17E	19		
35121219200000	USA	ন্য	16E	- 35		
35121219820000	NEEDHAM	41	16E	11		

					Spiro	Spiro
					Thrust	Thrust
			_		SkeetG	SheetG
UWI (APIINIM)	Well Diame	TOWNSREP	Range	Section	Tops (fi)	Bat (ff)
35077205720000	BLUEMOUNTAIN	411	17E	22		
35077206090000	WALLACE	41-1	17E	<u> </u>		
35077203220000	W P LERBLANCE	ন্য	17E	36		
35077203380000	JESSIE BENNETT	<u>194</u>	18E	30		
35077204690000	HUNTER TUCKER	<u> 194</u>	18E	31		
35077205450000	DELLAHOLT	<u> 10</u>	17E	35		
35077205430000	STATE	714	18E	28		
35077205310000	DUBBS STATE UNIT MA	<u> 194</u>	18E	29		
3507/214630000	MABRY 12	411	17E	12		
35077214470000	SPAKIS CTLATE CLEAT	414	1/E	<u> </u>		
30077203080001	STALL UNIT	10	18E	0		
35077212870000	MCCAGINI	421	1712	4		
350/7212/6000	MULASLIN	414	17E	2		
35077212380000	SMITH LANDEN	11	188.	40		
35077212580000	DADVED ALBORD	414	175	2		
25077212100000	LIENT ESZ	<u>11</u> at	17E	21		
3507721000000	MERLEY MERCIEL	10	1712	40		
30077209900000	AIICHELL CTTT	414	17E	14		
30077209950000	51VIL DADD3Z	<u>114</u>	1712	44		
2507720980000	DARBY STATEC	101 101	1712	40		
25077209490000	0174150	11	105	20		
2507720950000	DENNIETT OT ATE	<u>14</u> 91	1/12	24		
25077209210000	IECCE DENDETT	<u>19</u>	105	20		
2507720070000	AND FULLING	<u>11</u>	105	20		
2507720800000	HENLEY	<u>19</u>	175	30		
35077209070000	CAIDRON	91	175	26		
3507720900000	CAUDRON		175	26		
35077207960000	FARERO	91	175	20		
35077207810000	SWITH		121	20		
3507720692000	LEBLANCE	<u>-</u>	1012	- 20		
3507720.9850000	CAUDRON	- -	175	<u> </u>		
3507720 5650000	DARBY		175	23		
3507720.5280000	FABBRO	<u></u>	17E	24		
3507720 527000	MABRY	41	18E	7	13400	13755
3507720.5250000	BENNETT	ন্দ	18E	र्ज	10100	10/00
35077205050000	SMITH	- ক	18E	1 D		
3507720.5040000	BENNETT STATE	ম	18E	19		
35077201050000	KENNEDY	- 11	18E	32		
35077204810000	BENNETT STATE	31	18E	19		
35077209540000	DOBES STATE		18E	29		
35077200800000	MCCASLIN	41	17E	2		
35077210530000	SIVIL	ম	17E	22		
35077210960000	BENNETT STATE	ম	18E	19		
35077203090000	WHITNEY	ম	17E	34		
35077204510000	MABRY TRUST	41	17E	12	12405	12775
35077200790000	PATTISON	41	17E	1		
35077210700000	CAUDRON	ম	17E	23		
35077600300000	M C WATTS	ম	18E	- 33	11363	
35077301470000	MABRY	4 N	18E	9	13100	
35077300110000	J L HENLEY	N	17E	25		
					Spiro	Spiro
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					Thrust	Thrust
					SheetG	Sheet G
UWI (AFIIhum)	Well Diame	Township	Range	Section	Tops (ft)	Bat (ft)
35077300040000	MOSE C WATTS	41	18E	3	11322	11482
35077300000000	DARBYSUBDIVISION	ম	17E	23		
35077210410000	DARBY	ম	17E	23		
35077210260000	CAUDRON	ম	17E	- 26		
35077210100000	PARKER ALFRED	ম	17E	- 27		
35077204180000	ALFRED PARKER	ম	17E	- 27		
35077204130000	DARBYSUBDIVI	ম	17E	23		
35077204020000	FABERO	ম	17E	- 24		
35077204010000	MCCASLIN	41	17E	2		
35077204260000	HUNTER TUCKER	ম	18E	31		
35077203900000	SPARKS	41-1	17E	3		
35077203520000	SAMS	ন্য	17E	22		
35077203410000	CAUDRON	ন্য	17E	26		
35077203360000	SMITH	ম	18E	20		
35077203130000	ANDREWKURILKO	ন্য	17E	35		
35077202930000	MABRY TRUST	41-1	18E	5	12085	
35077202840000	KENNEDY	ন্য	18E	32		
35077202810000	WHINEY	ন্য	17E	- 34		
35077202190000	PSO	41-1	17E	10		
35077202540000	KENT HEIRS	ন্য	17E	14		
35077202460000	SILVERBULLET	41	17E	11		
35077201750000	RASPOTNIK	ন্য	17E	10		
35077201740000	VAUGHN	ম	17E	12		
35077201590000	KENT	ন্য	17E	ឋ		
35077201410000	HUNTER TUCKER	ন্য	18E	31		
35077200960000	ANDREWKURILKO	_ 2N	17E	35		
35077200710000	WHINEY	_ ম	17E	34		
35077205440000	MABRY 9001 JV-P	421	18E	11	13120	13341
3507720.5890000	WORKMANJ VP-9001	41-1	18E	22	14250	14616
35077214300000	MABRYRANCH	41	18E	10	13260	
35077205740000	NEWELL	421	18E	23	14883	
35077205760000	SPEARS	421	18E	21	13713	14006
35077204870000	SHARP	_ হয	17E	2		
35121216560000	WALLACE	421	17E	21		
35121208200000	MOSS	_ 14	16E	B		
35121214020000	USA	_ গ্ৰ	17E	28		
35121214060000	CHARLES CASTERL	111	I/E	52		
35121214150000	PDBOWMAN	111	I/E	29		
55121214440000	WAYNE WALLACE	411	17E	21		
35121216140000	BOWMAN	<u> 101</u>	17E	21		
55121216/3000	HARE	<u>M</u>	17E	33		
3512121002000	PAOLINE BOWIMAN		1712	20		
351212145/000	BELUSKU	414	1712	~		
351212148/000	BOWMAN	<u> 14</u>	1/E	20		
351212165/000	PD BOWIMAN	<u> 14</u>	1/E	29		
3512121208000	WRIGHT	414	1/E	18		
35121212/8000	PDITH KICHARDS	<u>14</u> at	17E	20		
25 12121095000	POIICHNY LIADTELIODATE		1/E	- 33		
3512121325000	HARISHUKNE	414	1/E			
351212180/000		11	1712	28		
5512121352000	ALEXANDER	964	1/E	9	I	

					Spiro	Spiro
					Threat	Threat
			_		SheetG	SheetG
UWI (AFIINIM)	Well Diame	TOWNSREP	Range	Section	Tops (ft)	Bat (††)
35121213440000	ROCKISLAND IMPROVE	421	17E	8		
35121213380000	PEITIT	34	17E	31		
35121213310000	WEBBER	ম	17E	18		
3512121321000	RUCK ISLAND	411	I/E	2		
35121213190000	POTICHNEY	74	I/E	- 33		
3512121312000	WOODS PROSPECT	74	10E	- 20		
35121201110000	POTICHNY	74	17E	- 33		
35121201330000	STINE	41/	17E	4		
351212188/0001	CASTEEL CHARLES 'A'	21	17E	52		
3512121851000	PDBOWMAN	14	17E	29		
3512121850000	USA	14	17E	28		
3512121842000	BOWIMAN	14	17E	21		
3512121850000	EDITHRICHARDS	74	17E	30		
3512121909000	ANDERSONK	11	17E	<u><u>u</u></u>		
351212033/000	SWEET	411	17E	9		
3512120319000	BOWINAN	14	IVE	17		
35121205950000	DURAN	14	ITE	18		
3512120680000	BERNARDI JUNES	214	TOF	<u>m</u>		
351212080000	LUUK	214	TOF	14		
35121213340000	LEWIS	41	10E	12		
3512121349000	NEEDHAM	411	10E	<u> </u>		
3512120730000	SMALLWOOD	411	10E	3		
35121204950000	MUBER	14	LOF	23		
3512121763000	PEDEN	101	TOF	24		
3512121482000	ALMERITO		LOF	<u>54</u>		
351212120/000	SINALLWOOD	461	1012	- 10		
3512121192000	GEORGE PEDEN		10E	24		
35121212480000	HALLEY VILLE TOWNSITE		1012	30		
3512121220000	1 EX	411	1012	14		
3512121308000	MILLER WOODS DROSDECT	<u>111</u>	10E	20		
251212015/000	WOODS PROSPECT	11	1012	30		
2512120092000	MACCIBIT	11	105	24		
25121210440000	CIDMANE LOF		1012	10		
25 121 22 811 0000	MADCANCELL	41	1012	24		
2512120200000			105	24		
25121201680000		11	1012	17		
25121206250000	TIS CONFRANT	91	161	27		
25121201270000		91	1612	25		
25121201770000	NEEDUAM		1012	11		
25121201960000	MADDEN	41	1012			
3512120257000	READER	41	1012	14		
3512120220000	LEARS	41	165	10		
3512120210000	SLATICHTER	41	161	1		
35121201450000	R EKING	ন্য	161	26		
3512120155000	HARTSHOPNE	10	175	6		
3512120021000	DATE THE BOILTMAN	91	175	20		
3512122106000	KING	<u>-</u>	165	26		
3512122128000	MCBEE		1615	23		
3512121330000	ANDERSON	ন্	175	10		
3512121428000	WCCAMP	41	1615	4		

UWI (AFIMum)	Well Name	Township	Range	Section	Spiro Thrust Sheet G Tops (fij	Spiro Thrust Sheet G Bot. (ft)
35121210120000	MASS	N	16E	25		
35121232160000	KENDRICK	41	16E	в		
35121232330000	FINK	ম	16E	36		
35121230540000	AIMERITO	ম	16E	- 27		
35121229220000	LEANS JAMES	4 N	16E	12		
35121228510000	CAMP	ম	16E	- 34		
35121230870000	KING	ম	16E	26		
35121220030000	WOODS	ম	16E	- 36		
35121217880000	ANDERSON	ম	17E	19		
35121219200000	USA	ম	16E	- 35		
35121219820000	NEEDHAM	41	16E	11		







Scale

0

NW



NW









SE





20.00 R



O ⊕ Strike Slip Fault With Directions Symbols

3D Coverage

Intersection with other Cross sections

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IP Pennsylvanian Formations

000 ft

20 00 R







Faults Strike Slip Fault With Directions Symbols 3D Coverage Intersection with other Cross sections Red Oak Brazil Spiro -⇔- Dry Well -¢⊱ Gas Well Q Quaternary Formations IP Pennsylvanian Formations

VITA

AbdulWahab Mohammed Sadeqi

Candidate for the Degree of

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 18th 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

Name: AbdulWahab Mohammed Sadeqi

Date of Degree: May, 2007

Institution: Oklahoma State University

Location: Stillwater, Oklahoma

Title of Study: STRUCTURAL GEOMETRY OF THE LATE PALEOZOIC THRUSTING IN THE HARTSHORNE, HIGGINS, ADAMSON AND GOWEN QUADRANGLES, SOUTHEASTERN OKLAHOMA

Pages in Study: 101

Candidate for the Degree of Master of Science

Major Field: Geology

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.).