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Bureau of Land Management

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ROSA UNIT 03, 04, 05, AND 06 NATURAL GAS WELL PADS AND WATER MANAGEMENT SYSTEM

December 11, 2012

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UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
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Finding of No Significant Impact

ROSA UNIT 03, 04, 05, AND 06 NATURAL GAS WELL PADS AND WATER MANAGEMENT SYSTEM

NEPA No. DOI-BLM-NM-FO10-2012-0402-EA

FINDING OF NO SIGNIFICANT IMPACT:

I have determined that the proposed action, as described in the EA will not have any significant impact, individually or cumulatively, on the quality of the human environment. Because there would not be any significant impact, an environmental impact statement is not required.

In making this determination, I considered the following factors:

1. The activities described in the proposed action do not include any significant beneficial or adverse impacts (40 CFR 1508.27(b)(1)). The EA includes a description of the expected environmental consequences of construction and drilling of seven horizontal wells on four well pads, construction of two fluid management pits, and a subsurface waterline.

2. The activities included in the proposed action would not significantly affect public health or safety (40 CFR 1508.27(b)(2)).

3. The proposed activities would not significantly affect any unique characteristics (40 CFR 1508.27(b)(3)) of the geographic area such as prime and unique farmlands, caves, wild and scenic rivers, designated wilderness areas, wilderness study areas, or areas of critical concern.

4. The activities described in the proposed action do not involve effects on the human environment that are likely to be highly controversial (40 CFR 1508.27(b)(4)).

5. The activities described in the proposed action do not involve effects that are highly uncertain or involve unique or unknown risks (40 CFR 1508.27(b)(5)). Drilling and development in the area has been ongoing since the leases were issued in 1948. There are more than 825 wells and 193.6 miles of road within the Middle Mesa Wildlife Area SDA based on BLM/FFO data as of May 1, 2011. Although types of equipment employed for horizontal drilling as opposed to directional/vertical drilling may vary, the processes are the same. The main variation between the two types of drilling are the trajectory and length of the well bore. As discussed in Section 2.3 of the ROSA UNIT 03, 04, 05, AND 06 NATURAL GAS WELL PADS AND WATER MANAGEMENT SYSTEM EA., a directional well bore traverses the target formation vertically, while horizontal drilling crosses the target formation on a horizontal plane (Figure 2-1). Therefore, horizontal drilling results in a longer well bore, which relates to variances in time, space, and resource use. The reason for using horizontal drilling is to take advantage of the naturally occurring geologic features of the shale formation.

Hydraulic fracturing is consistently used in the basin and has been for decades. Ten years ago, directional drilling was considered "new" technology—but now is commonplace in the basin. Horizontal drilling is a variation of directional drilling.

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NMAAQS	New Mexico Ambient Air Quality Standards
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMED/AQB	New Mexico Environment Department/Air Quality Bureau
NMOCD	New Mexico Oil Conservation Division
NMPIF	New Mexico Partners in Flight
NMSA	New Mexico Statutes Annotated
NO_2	Nitrogen dioxide
NOx	nitrogen oxide
NRCS	Natural Resources Conservation Service
NTL	Notice to Lessee
PL	Public Law
PM	Particulate matter
PM_{10}	Particulate matter with an aerodynamic diameter equal to or less than 10 microns
$PM_{2.5}$	Particulate matter with an aerodynamic diameter equal to or less than 2.5 microns
POD	Plan of Development
ppb	parts per billion
ppm	parts per million
PRMP/FEIS	Proposed Resource Management Plan/Final Environmental Impact Statement
psi	pounds per square inch
RFDS	Reasonably foreseeable development scenario
RMP	Resource Management Plan
ROD	Record of Decision
ROW	Right-of-way
SDA	Specially Designated Area
SO_2	Sulfur dioxide
SUPO	Surface Use Plan of Operations
TDS	Total dissolved solids
USBR	U.S. Bureau of Reclamation
USC	United States Code
USDA	U.S. Department of Agriculture
USDI	U.S. Department of Interior
USDOE	U.S. Department of Energy
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	volatile organic compounds
VPD	Vehicles per day
VRI	Visual Resource Inventory
VRM	Visual Resource Management
WPX Energy	WPX Energy Production, LLC
WQCC	Water Quality Control Commission

WPX Energy is proposing the first phase of that development as the Proposed Action. There are several reasons necessitating phased development: (1) valid period of approved Applications for Permit to Drill (APDs), (2) APD permitting costs, (3) need for additional data, and (4) currency of site-specific surveys.

An APD approval is valid for 2 years from the date that it is approved, or until lease expiration, whichever occurs first. If the operator submits a written request before the expiration of the original approval, the BLM, as appropriate, may extend the APD's validity for up to 2 additional years (43 CFR Part 3160). WPX Energy has drilled two horizontal test wells to the Basin Mancos Formation. Supplementary data are needed to more fully evaluate the resource and extraction techniques. Also, site-specific surveys of proposals are not valid indefinitely due to regulatory and natural environment changes that may occur in an area over any extended period (e.g., more than 2 years). Therefore, it would be impractical for WPX Energy at this time to propose full development of the Basin Mancos Formation in the Middle Mesa portion of the Rosa Unit.

1.1 Background

WPX Energy holds five leases within the Middle Mesa portion of the Rosa Unit, which were unitized in 1948. The New Mexico Statutory Unitization Act of 1978 (70-7-1 to 70-7-21) allows for unitized management, operation, and further development of oil and gas properties to achieve greater ultimate hydrocarbon reserve recovery, prevent waste, and protect the correlative rights of all mineral interest owners in each unitized area. The intent of the act is to substantially increase the recovery of oil and gas above the amount that would be recovered by primary recovery alone.

The Middle Mesa Portion of the Rosa Unit comprises approximately 5,700 acres, of which approximately 4,800 acres are public lands. There are more than 825 wells and 193.6 miles of road within the Middle Mesa Wildlife Area SDA based on BLM/FFO data as of May 1, 2011. WPX Energy's Middle Mesa portion of the Rosa Unit covers approximately 12 percent of the total SDA. Approximately 18.5 miles of roads and 53 well pads containing 98 natural gas wells are located within the Middle Mesa portion of the Rosa Unit.

Access to oil and gas reserves in a particular formation is regulated by spacing rules established by the New Mexico Energy, Minerals and Natural Resources Department Oil Conservation Division (NMOCD). On Federal lands, the BLM generally abides by NMOCD rules but has the authority to establish its own spacing and well density rules.

On July 7, 2011, WPX Energy went to hearing before the NMOCD in its application for a project area for the Mancos Participating Area in the Rosa Unit (Case No. 14663). The NMOCD subsequently issued its order approving the entire Mancos Participating Area (save and except any uncommitted tracts contained therein) as a project area and establishing setback requirements of 660 feet from the outer boundary of the Mancos Participating Area (Order R-13200-C).

The NMOCD proposed to the Oil Conservation Commission the adoption of amendments to the rules concerning horizontal drilling (Case No. 14744). An Order of the Commission was issued January 23, 2012 (Order No. R-13499), amending rules 19.15.14.8 New Mexico Administrative Code (NMAC) and 19.15.16 NMAC. The new rules state, "A horizontal well need not be confined to a single spacing unit, but may be dedicated instead to a 'project area' comprising one or more complete (in one Section or in

and Development Act of 1980 (30 USC § 1601 et seq.); and the Federal Onshore Oil and Gas Leasing Reform Act of 1987 (30 USC § 181 et seq.).

1.3 Decision Framework

In compliance with the Mineral Leasing Act, the decision to be made is in what manner resource development may occur. The decision to be made in this document is whether or not to approve the APDs and Sundry Notices and with what conditions. Under the NEPA, the FFO must determine if there are any significant environmental impacts associated with the proposed action alternative warranting further analysis in an Environmental Impact Statement (EIS). The BLM/FFO Field Manager is the responsible officer who will decide either:

- To approve the proposed APDs and Sundry Notices with design features as submitted by WPX Energy;
- To approve the proposed APDs and Sundry Notices with additional mitigations;
- To analyze the effects of the proposal in an EIS; or
- To deny the APDs and Sundry Notices.

A Sundry Notice (BLM Form 3160-5) is used to request changes to the Surface Use Plan of Operations (SUPO). This includes changes to the SUPO during permitting and any subsequent new construction, reconstruction, or alteration of existing facilities, roads, lines, or other production facilities after a well has been permitted. The proposed fluids management pits and water line would be constructed under Sundries in accordance with the terms and conditions of WPX Energy's existing lease rights. A Sundry Notice must be submitted and approved prior to implementation. The water management system, including the water line and fluid management pits, is evaluated along with the proposed seven APDs in this EA.

1.4 Conformance with Applicable Land Use Plans and Other Environmental Assessments

Pursuant to 40 CFR § 1508.20 and 1502.28, this EA tiers to the information and analysis contained in the 2003 Farmington Proposed Resource Management Plan/Final Environmental Impact Statement (PRMP/FEIS; USDI/BLM 2003*a*). The Proposed Action would be in conformance with the oil and gas leasing and development management actions in the RMP/ROD signed in September 2003 and updated in December 2003 (USDI/BLM 2003*b*). A reasonably foreseeable development scenario (RFDS) was developed for the 2003 RMP that estimated foreseeable oil and gas development in the New Mexico portion of the San Juan Basin, beginning in January 2002 and lasting for a 20-year duration. The RFDS also contemplated that technological advances could alter development of the basin during the 20-year period. The Mancos shale reservoir was analyzed in the RFDS as an emerging gas play over a large part of the basin where it had not been previously developed (Engler et al. 2001). Based on the forecast in the RFDS, the 2003 RMP estimated and analyzed long-term environmental impacts that would result from several alternative development scenarios. The 2003 ROD stipulated that companies applying for APDs may be required to evaluate the use of new technology such as directional drilling from existing pads and

components that may impact the integrity of Navajo Reservoir, or the operation and maintenance of Navajo Reservoir.

The preliminary EA was posted on the BLM/FFO web site on September 12, 2012, for a 30-day public comment period. A total of two comment letters were received. A thorough review of the comments was conducted and each carefully considered and addressed. Final comment resolution included the BLM/FFO Interdisciplinary Team to ensure that all comments were captured and that the response was appropriate. The BLM/FFO Interdisciplinary Team comment response is provided as Appendix B.

1.5.2 Issues

For the purpose of BLM NEPA analysis, an "issue" is a point of disagreement, debate, or dispute with a proposed action based on some anticipated environmental effect. Preliminary issues are frequently identified during the development of the proposed action through scoping. Additionally, supplemental authorities that provide procedural or substantive responsibilities relevant to the NEPA process may help identify issues for analysis. While many issues may arise during scoping, not all of the issues raised warrant analysis. Issues raised through scoping are analyzed if:

- Analysis of the issue is necessary to make a reasoned choice between alternatives.
- The issue is significant (an issue associated with a significant direct, indirect, or cumulative impact, or where analysis is necessary to determine the significance of impacts) (USDI/BLM 2008*b*).

The following issues were identified by the Interdisciplinary Team during internal scoping as potential issues of concern. The BLM also considered comments identified during scoping and public comment during the preparation of the Middle Mesa POD (USDI/BLM 2011*a*).

- Does horizontal drilling to access Mancos shale have unique effects that are distinct from the impacts of drilling technology currently employed in the San Juan Basin?
- How would the alternatives affect air quality in the area?
- How would the alternatives affect cultural resources?
- How would the alternatives affect soils and vegetation?
- How would the alternatives affect drinking water quality and quantity?
- How would the alternatives affect wintering big game and other wildlife in the Middle Mesa SDA?
- How would the alternatives affect special status species including migratory birds?
- How would the alternatives affect socioeconomics in the area?
- How would the alternatives affect traffic levels on Middle Mesa and related public safety and road maintenance concerns?

and determined that the Proposed Action alternative is in compliance with listed species management guidelines outlined in the September 2002 Biological Assessment (Consultation No. 2-22-01-I-389) (USDI/BLM 2002). No further consultation with the U.S. Fish and Wildlife Service (USFWS) is required.

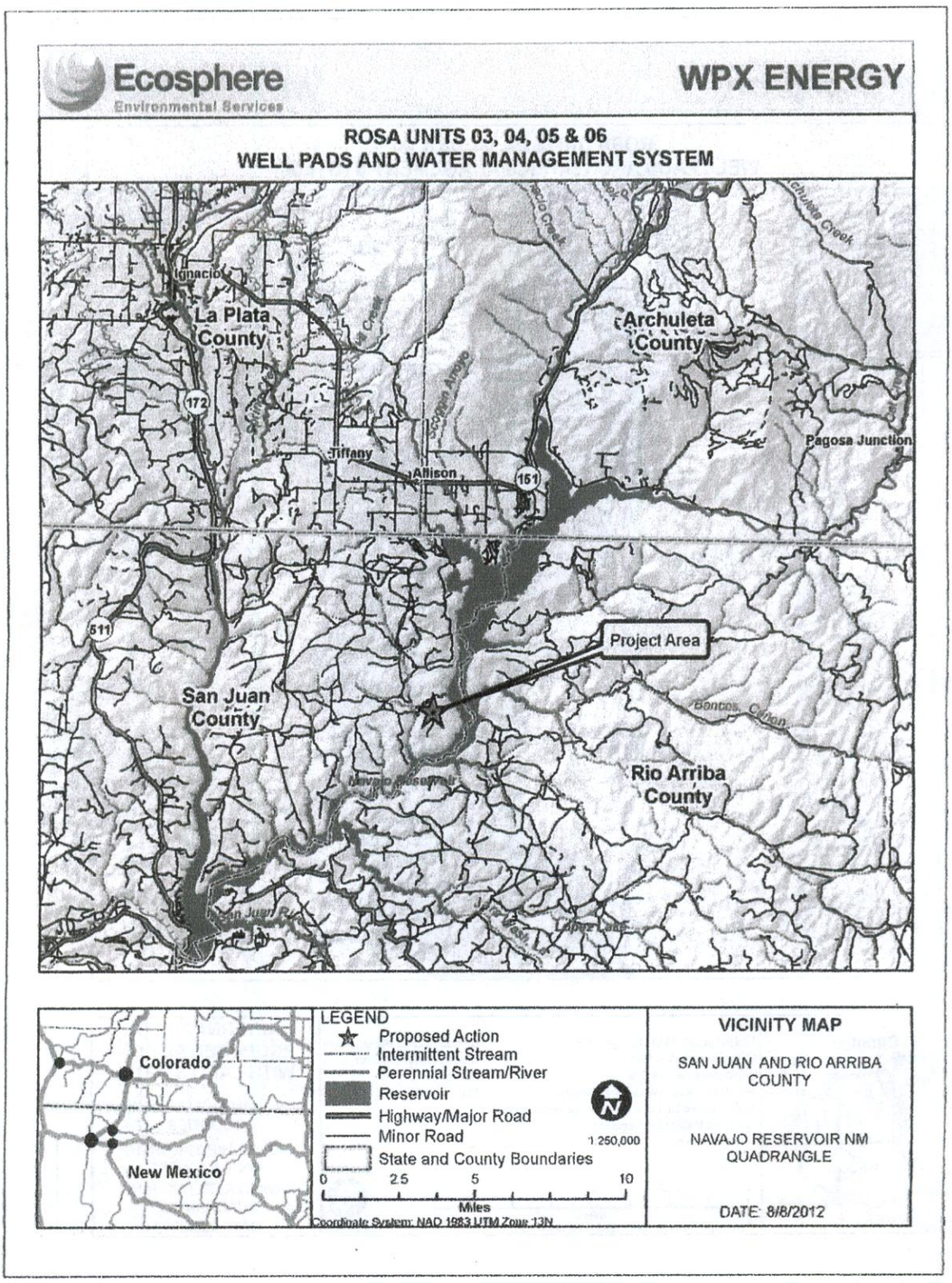

Figure 2-1. Rosa Unit 03, 04, 05, and 06 natural gas well pads and water management system.

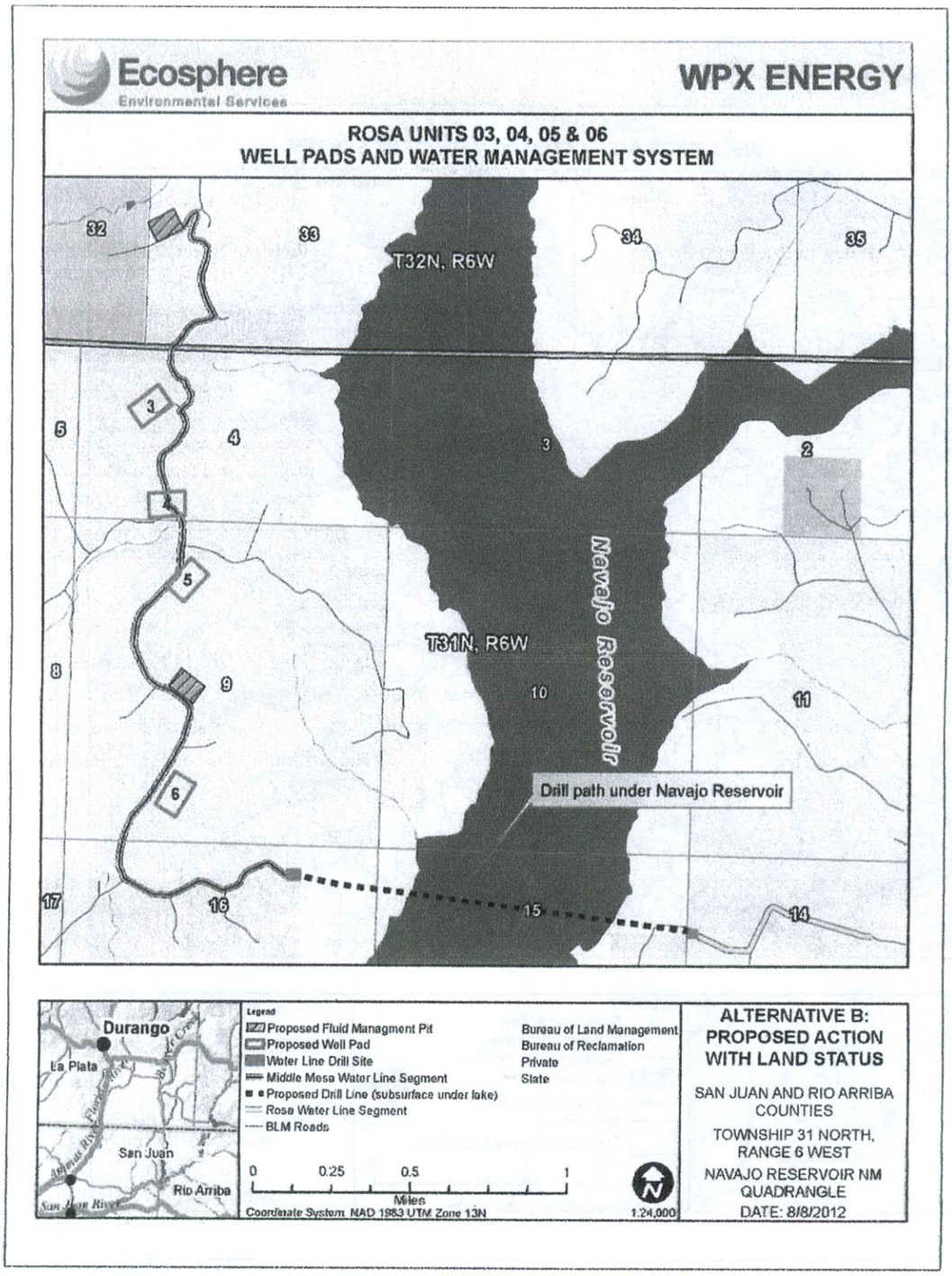

Figure 2-3. Land status of the Proposed Action components.

A single rig would be used for drilling operations. If needed, the rig would be moved once between well pads during the winter closure, between December 1 and March 31, and the move distance would not exceed 1.5 miles. WPX Energy is proposing to commence drilling in 2013.

Each pad would be co-located with existing disturbance; therefore, no new access roads would be required for drilling. Construction activities associated with the Proposed Action alternative would include well pad construction, drilling, stimulation and completion of the natural gas wells, and the installation of any surface equipment necessary for natural gas production. At each well pad, construction crews would remove vegetation and the existing pad would be expanded. Well pad construction would not occur between December 1 and March 31. Cuts and fills would vary between the four proposed pads as shown on the plats in Appendix C. Excavated materials from the cuts would be used on the fill portion of the location to level the pad. Clearing and leveling is needed to provide a level surface for rig and equipment access and drilling. Included in the pad construction would be excavation of a 300-foot by 75-foot cuttings pit. There would be no blow pit; instead a stack flare would be used to burn excess gas during drilling to relieve wellbore pressure.

Natural gas well drilling facility assembly would occur on the well pad after site clearing and leveling. Drilling equipment located on each drilling pad would include: the drilling rig and associated equipment (e.g., blowout preventer, gas buster), pipe storage, and four housing trailers for personnel staying on site.

Some pipe would be stored on location, but given the amount of pipe needed to drill all wells proposed for one pad, additional pipe would need to be stored on a nearby existing location. Pipe stored on nearby locations would be trucked to the location during drilling on an as-needed basis.

Drilling operations would utilize water-based mud for the surface and intermediate hole and oil-based mud for the horizontal lateral. Water-based cuttings would be disposed of on site in a temporary pit. The cuttings are left in the pit, which is then closed according to NMOCD Rule 17, commonly referred to as the "pit rule." For closure, 4 feet of cover is placed on the pit and then reclaimed according to applicable rules of the respective surface management agency.

A closed-loop system would be used for the oil-based mud. Oil-based cuttings would be hauled to a commercial disposal facility or land farmed on private surface. Approximately three loads a day for 5 days (total 15 loads) of cuttings per each well drilled would be transported by truck off site. Each load would be transported in 14 cubic-yard roll-off containers. Cuttings would be transported during daylight hours during the winter closure period.

After well pad construction, all flowlines and production equipment for the proposed wells, as well as potential future wells, would be installed. No additional surface disturbance would occur from the construction of flowlines or other completion equipment installation.

2.2.2 Stimulation Activities

Stimulation (i.e., hydraulic fracturing or "fracking") is a process used to maximize the extraction of underground resources by allowing oil or natural gas to move more freely from the rock pores to production wells that bring the oil or gas to the surface. Fluids, commonly made up of water (99 percent) and chemical additives (1 percent), are pumped into a geologic formation at high pressure during

2.2.3 Water Management System

WPX Energy proposes to utilize produced water gathered from existing wells on Middle Mesa and on the east side of Navajo Lake for well stimulation. Water from wells on Middle Mesa would be trucked to the holding ponds on the proposed fluids management pit locations while water from the east side of the lake would be transported via a proposed liquid gathering system.

WPX Energy proposes to bore under Navajo Lake and construct a water line to transport produced water from Rosa Mesa to Middle Mesa. The sub-surface water line would transport the produced water from an existing liquid gathering system on Rosa Mesa to the proposed fluids management pits. The water line location is shown on Figure 2-2. Following all completion activities on Middle Mesa, the water line would be converted to a liquid gathering system which would transport produced water from Middle Mesa to a disposal facility on Rosa Mesa. The proposed water line would be located within:

Sections 14, 15, 16, 9, and 4, Township 31 North, Range 6 West

Section 33, Township 32 North, Range 6 West

The water line would be approximately 5.15 miles (27,217 feet) in length as shown on survey plats in Appendix D. The majority of the proposed water line would be constructed within existing roads or pipeline rights-of-way (ROWs) minimizing new disturbance. These sections of the line would be constructed within a 30-foot-wide corridor outside the winter closure period. Two sections of the line, totaling approximately 2,894 feet, would be constructed cross-county resulting in about 2.65 acres of new disturbance. The cross-country segments would require a 40-foot-wide corridor to provide for access road construction. The two cross-country segments were designed to avoid impacts to natural resource concerns. Approximately 700 feet (0.3 acre) of existing road would be closed and reclaimed due to natural resource concerns. As a result, approximately 875 feet of new road would be realigned in Section 6, Township 31 North, Range 6 West. Approximately 0.8 acre of new disturbance would occur from road realignment.

According to the survey plats, approximately 6,925 linear feet of the proposed pipeline would be installed under Navajo Reservoir to connect the water line segments on the eastern and western sides of Navajo Lake. To reach the appropriate depth, the actual length of the bore would be longer. The water line in the bore would be a 6-inch steel with 40 mil fusion bond coated pipe connecting to poly-pipe on each side of Navajo Lake. The bore would be drilled at a depth of 150 feet below the true lake bed of the reservoir. The true lake bed is defined as the original river bottom located below the silt layers. The silt layer on top of the original river bottom is estimated at 30 feet. Existing cathodic protection wells in the area would provide geo-technical data for the bore drilling.

To drill under Navajo Lake, the entry point would be located on Middle Mesa adjacent to the road between the existing Rosa Unit No. 274 and the Rosa Unit No. 208Y. This site would be approximately 150 feet by 200 feet (0.69 acre) in size. After drilling operations, valves, a pigging system, automatic emergency shut-off system, generator, transfer pump, and two 500 barrel (bbl) tanks would remain on the site, which would be reclaimed to an approximately 50 by 75 feet (0.086 acre) area. The exit point on the west side of the lake would be adjacent to the road accessing the existing Rosa Unit No. 12. This area

2.2.4 Pipelines

Following completion, pipelines would be constructed to connect the new wells to existing gathering pipelines. Pipelines are expected to be minimal in length and constructed within the proposed well pad disturbance. Existing regional gathering systems, not owned or operated by WPX Energy, are already in place within the Rosa Unit. The current pipeline capacity and the system's ability to handle future produced gas volumes resulting from the Proposed Action are unknown at this time. Additional pipeline capacity may be needed in the future and would be designed (e.g., pipe and easement size, length, etc.) by the pipeline owner/operator and permitted separately from this action. If any additional gathering lines are needed in the future to transport gas produced by the new wells to regional transmission lines, these pipelines would likely be routed to minimize any new surface disturbance, and would be expected to follow existing roads and ROWs. ROWs in the Middle Mesa Wildlife Area SDA are permitted on a case-by-case basis and would be subject to NEPA analysis and review.

2.2.5 Reclamation

The proposed well pads would be partially reclaimed following drilling operations, as WPX Energy would install production facilities on the site before drilling commences. A portion of the pad not required for production equipment and vehicular access would be re-contoured and seeded per the BLM/FFO COAs. Approximately 1 acre for production facilities on each well pad would remain in use for production and vehicle access. These areas would not be reclaimed until final abandonment of the wells. Production equipment that would remain on site would include the wellheads, production unit separators, and meter runs. Ancillary equipment could also be installed at the well pad site, such as a Christmas tree, storage tank(s), dehydrator, and separator. No well head compression is expected.

The two fluids management pits would be completely reclaimed when all drilling activities have been concluded. The water line project, with the exception of the road realignment, would be reclaimed following installation. Areas not needed for permanent equipment placement or the operation on the drill bore entry/exit locations would be reclaimed. During reclamation, the disturbed surface would be restored to near original land contours. The areas would be reseeded with an approved BLM seed mix. For the water line constructed within existing roads, grading and compacting would repair the disturbed roadways to better than, or equal to, preconstruction conditions.

2.2.6 Work Force and Transportation

The drilling process would require activity on the well pad virtually around the clock, 7 days a week. WPX Energy proposes to provide a work force residential camp on private lands for its employees, approximately 0.5 linear mile west of the Rosa Unit boundary on Middle Mesa. During the winter closure period, approximately two vehicle trips per day would be needed to transport workers to and from the drilling pad. Except for emergency situations and one shift change per day, all vehicle traffic would be restricted to daylight hours.

Approximately 15 individuals would be working on the pad during drilling operations. Four of these individuals, the company man, toolpusher, mudlogger, and measurements-while-drilling field engineer, must live on the pad location since they are on-call 24 hours a day. The remaining individuals would

4. If needed, only one rig move will be made between December 1 and March 31, and will not exceed 1.5 miles. WPX Energy will plan drilling activities to avoid moving the rig during the winter closure to the extent practicable. A rig move would happen no more than once per winter.
5. The drilling rig will use natural gas-powered engines and is self-moving between well bores (i.e., does not require multiple trucks or other vehicles to move between well bores drilled on the same pad). Use of natural gas-powered engines will result in less air and noise emissions.
6. Stimulation activities will not be conducted between December 1 and March 31.
7. Fluids management pits will be constructed to minimize surface disturbance.
8. Produced water will be used for well stimulation and will be recycled (i.e., any flowback would be pumped back to the holding pond, filtered, and used in subsequent stimulations).
9. Pipelines from the well stimulation pads will be located in or adjacent to existing roads or ROWs and will be temporary, aboveground steel welded lines.
10. The holding ponds will be in compliance with NMOCD Rule 17.
11. The holding ponds will be lined, netted, and fenced to restrict access. An automatic leak detection system will be installed.
12. Green completion technology will be used.
13. A closed-loop system will be used for the oil-based mud to minimize potential impacts to surface and groundwater quality. A 4-ounce geotextile pad, a 30-mil reinforced liner, followed by an 8-ounce geotextile pad covered with approximately 12 inches of gravel will be laid down under the rig mats and all drilling machinery.
14. A residential camp will be utilized to reduce truck traffic to the drilling rig.
15. Workers will be transported to and from the residential camp by high-capacity vehicles to minimize vehicle traffic. Workers schedules will be 12-hour shifts, 7 days on and 7 days off to minimize vehicle traffic. Workers occupying the residential camp during non-work hours will restrict their excursions outside of the camp boundaries.
16. Except for emergency situations and one shift change per day, all vehicle traffic will be restricted to daylight hours.
17. Well data collection will be conducted utilizing telemetry.
18. All field activities will comply with BLM/FFO road use guidelines.
19. Those areas not needed for access and production would be reseeded with the BLM/FFO seed mix upon completion of all wells on each pad. The fluids management pit would be entirely reclaimed following completion of stimulation.
20. To slow runoff velocities and minimize sediment transfer, silt traps will be installed in the eastern construction zone of Rosa Unit 04 and the southeastern corner of Rosa Unit 05.
21. Culverts will be installed as needed and drainage will be diverted from the site at reclamation.
22. Drilling from the proposed four well pads would be required to meet the noise stipulations outlined in the Notice to Lessee (NTL) 03-1.
23. WPX Energy would be required to monitor disturbed areas and treat any invasive, non-native species for the life of the project.
24. During drilling, stimulation, and completion, a trash receptacle and a chemically treated portable toilet will be on location for trash and sewer disposal.
25. All wastes will be disposed of in a proper manner as required by federal and state law and as described in the COAs.

purpose-built rig would drill downward generally in a vertical direction to the target formation (point of entry) at which point the drill bore would extend horizontally across the formation for a distance of up to 7,000 feet. This consistent contact with the formation is what allows for greater natural gas extraction. Under Alternative C, however, existing rigs from the San Juan Basin fleet would be used to vertically/directionally drill to the target formation. With directional drilling, the drill bore crosses the formation on a nearly vertical plane mainly encountering the vertical extent of the producing formation. Figure 2-4 illustrates the difference in horizontal well and vertical/directional bores. To date, no reservoir drainage areas in excess of 10-acres have been observed by WPX Energy in Rosa Unit vertical Basin Mancos wells.

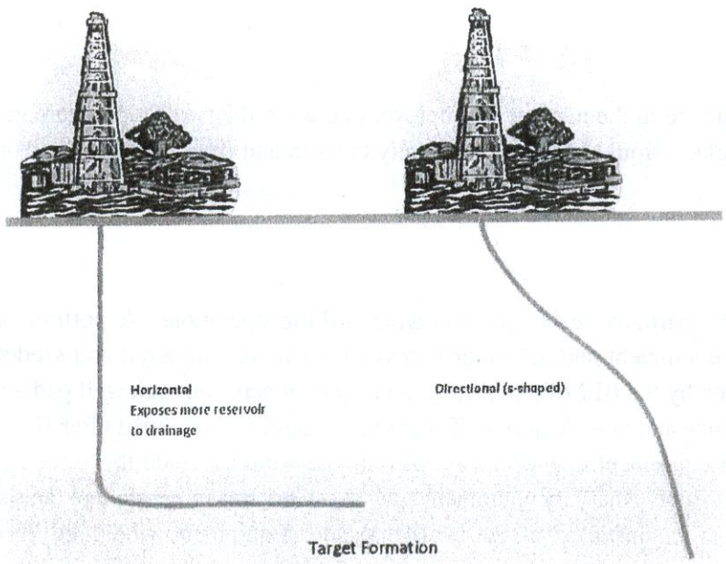

Figure 2-4. Comparison of vertical/directional and horizontal well bores.

Additionally, with the adoption of Order No. R-13499, Case No. 14744, by the Oil Conservation Commission, the spacing of horizontal versus vertical wells complicates direct comparison (refer to Section 1.1). A horizontal well is not confined to a single spacing unit when drilled within a designated Project Area, whereas a vertical well is confined to 8 wellbores per 320 acre spacing unit. The pool rules for vertical development restrict the number of wells that can be drilled in a spacing unit and also restrict their location according to setback requirements.

Taking these issues into account, WPX Energy developed a projected number of wells/pads needed for comparison with Alternative B, based on extracting natural gas resources from the same area. The projected development assumed that existing pads on Middle Mesa have an average of two wells on location. It was also assumed that four directional wells per pad could be drilled from one existing location. Current technology limits directional drilling to a reach of 1,500 feet.

Under Alternative B, the seven proposed horizontal bores transect a total of 31 quarter-quarter sections. Each quarter-quarter section correlates to a 40-acre spacing unit where one vertical/directional Basin Mancos well could be drilled. However, of the 31 40-acre spacing units, five would not be accessible

same for both action alternatives, except that Alternative C would differ in the water source and location of equipment used.

Under Alternative C, well stimulation equipment would be located on site rather than a central off-site location. WPX Energy would purchase fresh water from a decreed source and it would be trucked to the site and stored in tanks on each well pad where stimulation would be occurring. Approximately 20 to 24 500-bbl tanks would be needed on site to store water for stimulation. Water would be pumped from the tanks to the well bore via temporary aboveground flow lines. Any flowback would be recycled back to the storage tanks for use in multiple stimulations. Other equipment needed for stimulation would include pumps, engines, and flow lines. This equipment would be located on the well pad where stimulation is occurring.

Workforce

There would be no difference in the number of employees between the two action alternatives. However, under Alternative C, workers would commute on a daily basis to and from the drill site from Aztec, New Mexico.

2.3.3 Reclamation

The well pads would be partially reclaimed following drilling operations. A portion of the pad not required for production equipment and vehicular access would be re-contoured and seeded per the site-specific COAs determined by the BLM/FFO. Approximately 0.64 acres on each well pad would remain in use for production facilities and vehicle access. These areas would be reclaimed after final abandonment of the wells. Production equipment that would remain on site would include the wellheads, production unit separators, and meter runs. Ancillary equipment such as a Christmas tree, storage tank(s), dehydrator, and separator could also be installed at the well pad site. Equipment would be powered by gas compression engines.

2.3.4 Summary of Disturbance—Alternative C

No construction or drilling would occur during the Middle Mesa Wildlife SDA winter closure period. Alternative C would result in a total (short-term) surface disturbance of approximately 25.74 acres. All six well pads would be twinned with existing well pads, thereby utilizing existing disturbance. Approximately 3.84 acres of long-term disturbance for well operation and maintenance would result from Alternative C. Table 2-4 summarizes the surface disturbance associated with Alternative C.

Table 2-4. Summary of Disturbance under Alternative C.

Component	New Disturbance (acres)	Short-Term Disturbance (acres)	Long-Term Disturbance (acres)
Well Pads	7.7	25.7	3.8

2.4 Alternatives Considered but Eliminated from Further Analysis

Four alternatives, or components of alternatives, were considered but eliminated from further analysis. In order to store sufficient drilling pipe on the well pad, additional area would be needed for a minimum of

5 years, would decrease slightly as some areas disturbed during the first 5 years recovered their value as wildlife habitat. These conclusions were supported by the following reasons: (1) less than 1 percent of the Middle Mesa Wildlife SDA would be affected; (2) habitat fragmentation would be minimized through the use of existing disturbance; (3) the area was characterized as having low wintering big game density with good browse availability; and (4) the effectiveness of specific design features (USDI/BLM 2011*a*, page 63). This alternative was eliminated from detailed consideration as it would not meet the purpose and need of the Proposed Action, and previous analysis determined that potential impacts from construction and drilling during the winter closure would not result in significant effects or population-level effects to big game in the Middle Mesa Wildlife Area SDA.

No other alternatives were identified that would result in fewer environmental impacts and still meet the purpose and need of the Proposed Action.

unpaved roads in La Plata County, the region of influence for indirect air quality impacts associated with vehicular traffic emissions includes La Plata County. The region of influence for ozone includes the Four Corners area as defined in the PRMP/FEIS (USDI/BLM 2003*a*).

Much of the information referenced in this section is incorporated from the *Air Resources Technical Report for BLM Oil and Gas Development in New Mexico, Kansas, Oklahoma, and Texas* (herein referred to as Air Quality Technical Report; USDI/BLM 2011*b*). This document summarizes the technical information related to air resources and climate change associated with oil and gas development and the methodology and assumptions used for analysis.

3.2.1.1 Criteria Air Pollutants

The Air Quality Technical Report describes the types of data used for description of the existing conditions of criteria pollutants, how the criteria pollutants are related to the activities involved in oil and gas development, and provides a table of current national and state standards (USDI/BLM 2011*b*). The U.S. Environmental Protection Agency (USEPA) Green Book web page reports that all counties in the FFO analysis area, including San Juan, McKinley, Rio Arriba, and Sandoval Counties in New Mexico and La Plata County, Colorado, are in attainment of all National Ambient Air Quality Standards (NAAQS) as defined by the Clean Air Act. The area also does not violate any New Mexico Ambient Air Quality Standards (NMAAQS). The current criteria pollutant concentrations in the FFO analysis area are described below. Total emissions of criteria pollutants from each source sector were calculated by adding together the emissions from the four counties that are located in the FFO analysis area: San Juan, McKinley, Rio Arriba, and Sandoval.

Table 3-1 shows monitoring values for ozone in recent years for each of the three San Juan County ozone monitoring stations. There is no Colorado Department of Public Health (CDPHE), Air Pollution Control Division, Technical Services Program quality-assured and verified ozone monitoring station in La Plata County. The nearest CDPHE quality-assured and verified ozone monitoring station is located at Cortez, Colorado. Table 3-1 includes ozone monitoring values from the Cortez monitoring station.

Table 3-1. Ozone monitored values in the Four Corners Region.

State Air Monitoring Station	8-hour Ozone Design Value (ppm)			NAAQS
	2007-2009	2008-2010	2009-2011	2008
Substation, NM	0.067	0.063	0.063	0.075
Bloomfield, NM	0.061	0.060	0.061	0.075
Navajo Lake, NM	0.069	0.066	0.068	0.075
Cortez, CO		0.064	0.066	0.075

Source: NMED 2012

Key: NAAQS = National Ambient Air Quality Standards; ppm = parts per million.

Table 3-2 summarizes monitored values for other criteria pollutants in San Juan County. The primary impact to air quality associated with vehicle traffic on unpaved roads in La Plata County is particulate matter (PM). The nearest air monitoring station for PM near these roads is located at Navajo Lake in San Juan County, New Mexico; monitored criteria values in the region are included in Table 3-2.

are not necessarily comparable from one geographic area to another. The 2005 NATA analysis estimated tract level total cancer risk for the FFO analysis area as 25 to 50 per one million, and the estimated tract level total respiratory hazard index was zero to 1. The USEPA estimates the average national cancer risk for 2005 was 50 per one million, meaning 1 person out of every 20,000 had an increased likelihood of contracting cancer from breathing air toxics from outdoor sources if exposed to 2005 emission levels over their lifetime. A respiratory hazard index below 1 indicates that exposures in the area do not exceed reference levels that would have adverse effects for human health.

3.2.1.3 Climate

The analysis area is located in a semiarid climate regime typified by dry windy conditions and limited rainfall. Summer maximum temperatures are generally in the range of 80 or 90 degrees Fahrenheit (°F), and winter minimum temperatures are generally in the teens to 20s. Temperatures occasionally reach above 100°F in June and July and have dipped below zero in December and January. Precipitation is divided between summer thunderstorms associated with the southwest monsoon and winter snowfall as Pacific weather systems drop south into New Mexico. Table 3-3 shows climate normals for the 30-year period from 1981 to 2010 for Farmington.

Table 3-3. Climate normals for the Farmington area 1981-2010.

Data [1]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Temperature (°F)	30.5	35.8	43.2	50.4	60.4	69.8	75.4	73.2	65.4	53.3	40.5	31.0
Average Max Temperature (°F)	40.8	46.8	56.1	64.7	74.8	85.1	89.6	86.5	79.1	66.4	52.2	41.2
Average Min Temperature (°F)	20.3	24.8	30.3	36.2	46.1	54.5	61.2	59.8	51.7	40.1	28.8	20.7
Average Precipitation (inches)	0.53	0.59	0.78	0.65	0.54	0.21	0.9	1.26	1.04	0.91	0.68	0.50

Source: USDI/BLM 2011*b*

1 Data collected at New Mexico State University Agricultural Science Center – Farmington.

3.3 Cultural Resources

The project is located within the archaeologically rich San Juan Basin of northwestern New Mexico. In general, the prehistory of the San Juan Basin can be divided into five major periods: PaleoIndian (ca. 10000 B.C. to 5500 B.C.), Archaic (ca. 5500 B.C. to A.D. 400), Basketmaker II to III and Pueblo I to IV periods (A.D. 1 to 1540), and the historic (A.D. 1540 to present), which includes Native American as well as later Hispanic and Euro-American settlers. A detailed description of these various periods and select phases within each period is provided in the Farmington PRMP/FEIS (USDI/BLM 2003*a*).

The Proposed Action would be located within the Navajo Reservoir watershed. Based on the Farmington PRMP/FEIS (USDI/BLM 2003*a*), a total of 4,329 sites representing Archaic Period, Basketmaker II, Basketmaker III, Unknown Anasazi, Pueblo I, Pueblo II, Pueblo III, Pueblo IV, Unknown Navajo, Dinétah/Gobernador Phase, Cabezon Phase, Reservation Phase, Apache, Pueblo, Hispanic, and Euro-Anglo temporal/cultural components have been documented within the watershed. Of the 18 categories of

Site Number	Cultural Affiliation	Site Type	Eligibility
171956	Historic-Modern	Camp	Not Eligible
171957	Anasazi Pueblo/Early Navajo	Habitation/habitation	Eligible
26274	Anasazi Pueblo I	Scatter with features	Eligible
79026	Anasazi Pueblo I Early Navajo	Habitation	Eligible
79028	Anasazi Pueblo I	Habitation	Eligible
80219	Anasazi Pueblo I/Pueblo II	Habitat, multiple residence	Eligible
80494	Anasazi Pueblo I/Early Navajo	Artifact scatter/scatter with features	Eligible
81525	Anasazi Pueblo I/Pueblo II	Habitation	Eligible
81527	Anasazi Pueblo/Early Navajo	Habitation/Scatter with features	Eligible
81528	Early Navajo	Scatter with features/ Habitation	Eligible
104500	Early Navajo	Scatter with features	Eligible
104501	Anasazi Pueblo I	Artifact scatter	Eligible
107776	Early Navajo	Habitation	Eligible
127949	Anasazi Pueblo I	Artifact scatter	Eligible
127950	Unknown	Scatter with feature	Not Eligible
127951	Unknown historic	Isolated feature	Not Eligible
128406	Unknown	Artifact scatter	Eligible
128407	Early Navajo	Isolated feature	Eligible
166392	Anasazi Pueblo I	Artifact scatter	Need Additional Data
171952	Anasazi Basketmaker II	Habitation	Eligible
171953	Early Navajo	Habitation	Eligible
172531	Unknown	Artifact scatter	Not Eligible
172532	Early Navajo	Artifact scatter	Need Additional Data
172533	Unknown	Scatter with feature	Eligible
172534	Early Navajo	Artifact scatter	Need Additional Data
172536	Anasazi Unknown	Scatter with feature	Eligible
172663	Early Navajo	Scatter with feature	Eligible

3.4 Soils

The principal geological formation underlying the Rosa Unit is the San Jose Formation (Manley et al. 1987). Two major soil mapping units occur within the Middle Mesa portion of the project area: Penistaja-Buckle association, gently sloping, and Travessilla-Weska-Rock outcrop complex, extremely steep (NRCS 1980). The Natural Resources Conservation Service (NRCS) has mapped two soil units in the

3.5 Vegetation

Extensive areas of Middle Mesa have undergone vegetation treatments. Beginning in the late 1960s, anchor chaining was conducted in piñon-juniper woodlands, and more recently prescribed fire and herbicide treatments have been employed to facilitate the growth of grasses and browse. Three major vegetation communities occur within the Middle Mesa portion of the Rosa Unit: reclaimed shrub grassland habitat associated with the existing disturbance, piñon-juniper woodland, and Great Basin desert scrub sagebrush series. A more detailed description of vegetation communities within the project area is provided in the Biological Survey Reports (BSRs) in Appendix F.

Dominant species in the reclaimed shrub grassland habitat include western wheat (*Pascopyrum smithii*), crested wheat (*Agropyron cristatum*), and smooth brome (*Bromus inermis*), with scattered four-winged saltbush (*Atriplex canescens*), rubber rabbitbrush (*Ericameria nauseosa*), and big sagebrush (*Artemisia tridentata*). Typically vegetative cover ranges widely from 2 to 70 percent in this vegetation type.

The piñon-juniper woodland is dominated by piñon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) with an understory dominated by broom snakeweed (*Gutierrezia sarothrae*), big sagebrush, Indian ricegrass (*Achnatherum hymenoides*), and James' galleta grass (*Pleuraphis jamesii*). Trees in the woodland vary widely in size and stature, and are a mix of juvenile and mature. Tree canopy varies within woodland areas and ranges from 25 to 40 percent with understory cover widely ranging from approximately 15 to 30 percent. Approximately 500 piñon and juniper trees occur within the area of potential effect.

The Great Basin desert scrub sagebrush series is dominated by big sagebrush, broom snakeweed, Indian ricegrass, and James' galleta grass. Vegetative cover varies from an estimated 25 to 40 percent.

3.6 Water Resources

The proposed project area is located in the Upper Colorado River Hydrologic Region and is part of the San Juan River sub-region. The proposed project area is more specifically located within the Navajo Reservoir sub-watershed. The Proposed Action would be located on Middle and Rosa mesas, which are separated by Navajo Lake. The four proposed well pads and two fluids management pits would be located approximately 2,500 feet to 1 mile east of Navajo Lake on Middle Mesa. The proposed water line would directionally drill under Navajo Lake from Rosa Mesa to Middle Mesa (Figure 2-1). There are no well-defined drainages within the proposed well pads or fluids management pits. Two small erosional drainages cross the fluids management pit through the middle and east corner of the area. The proposed water line would not cross any ephemeral stream or intermittent drainage, according to the U.S. Geological Survey (USGS) National Hydrography Dataset (refer to Figure 2-2). There are no wetlands, seeps, or springs within the proposed area of disturbance associated with the well pads, fluids management pits, or water line.

The primary aquifers in the BLM/FFO area are the sandstone based Uinta-Animas and the Mesaverde. Figure 3-1 shows the geologic time column that relates to aquifers in the San Juan Basin. The Uinta-Animas aquifer is composed primarily of Lower Tertiary rocks consisting of the San Jose Formation, the underlying Animas Formation and its lateral equivalent, the Nacimiento Formation, and the Ojo Alamo Sandstone. The aquifer thickness generally increases toward the central part of the basin.

A search of the New Mexico State Engineer's Office Water Administration and Technical Engineering Resource System database for the proposed project area and vicinity (1-mile radius) was performed. The database has no records of water wells located within the proposed project area or within a 1-mile radius. The database does list a pump located approximately 1 mile southwest of the eastern bore site. The pump is a point of diversion registered with the New Mexico State Engineer's Office and is owned by San Juan Water Haulers.

Most onshore produced water is injected deep underground for either enhanced recovery or disposal. With the passage of the Safe Drinking Water Act in 1974, the subsurface injection of fluids came under federal regulation. In 1980, the USEPA promulgated the Underground Injection Control regulations. The program is designed to protect underground sources of drinking water. The NMOCD regulates oil and gas operations in New Mexico. The NMOCD has the responsibility to gather oil and gas production data, permit new wells, establish pool rules and oil and gas allowables, issue discharge permits, enforce rules and regulations of the division, monitor underground injection wells, and ensure that abandoned wells are properly plugged and the land is responsibly restored. The New Mexico Environment Department (NMED) administers the major environmental protection laws. The Water Quality Control Commission (WQCC), which is administratively attached to the NMED, assigns responsibility for administering its regulations to constituent agencies, including the NMOCD. The NMOCD administers, through delegation by the WQCC, all Water Quality Act regulations pertaining to surface and groundwater (except sewage not present in a combined waste stream).

According to the NMOCD, produced water, if predictable in salt concentration, can be used for drilling and completion and possibly cementing (Jones, pers. comm. 2012). The use of produced water for drilling fluid is authorized under New Mexico State regulation (19.15.2.51 NMAC).

3.7 Wildlife

The BLM is responsible for the wildlife stewardship and habitat in the project area. The project area includes portions of the Middle Mesa Wildlife and Rosa Mesa SDAs, both of which are managed by the BLM/FFO to preserve and protect big game habitat (USDI/BLM 2003*a*). The vegetation in the project area generally consists of piñon-juniper woodlands on mesa tops and ridges with sagebrush grasslands at lower elevations. The natural vegetation has been highly disturbed since the late 1960s by mechanical and chemical treatments. Additionally, oil and gas activities have been underway for more than 50 years within the Middle Mesa Wildlife Area SDA contributing to vegetation and habitat disturbance (USDI/BLM 2011*a*).

In 2006, the BLM estimated 100 to 150 mule deer and fewer than 50 elk use all of Middle Mesa (USDI/BLM 2008*a*). The New Mexico Department of Game and Fish characterizes the project area as low wintering big game density with good browse availability (USDI/BLM 2011*a*, page 60).

Piñon-juniper and sagebrush grassland vegetation communities provide habitat not only for mule deer and elk, but a variety of other terrestrial wildlife species. Wildlife and sign of wildlife identified throughout the project area included mule deer (*Odocoileus hemionus*), elk (*Cervus elaphus*), coyote (*Canis latrans*), pocket gopher (*Thomomys* sp.), desert cottontail (*Sylvilagus audubonii*), and black-tailed jackrabbit (*Lepus californicus*). No prairie dog burrows were recorded within the area of potential effect.

Species	Habitat Associations	Presence[1]
(*Coccyzus americanus occidentalis*)	vegetation.	
Prairie falcon (*Falco mexicanus*)	Found in arid, open grasslands and shrub-steppe habitats. Prairie falcons require cliffs for nesting.	NP
American peregrine falcon (*Falco peregrinus anatum*)	Rugged terrain with rocky cliffs and canyons (30-1,000+ feet high), adjacent to rivers, lakes, or streams. Urban areas with towers and buildings are also inhabited.	S
Bald eagle (*Haliaeetus leucocephalus*)	Nests in forested areas adjacent to large bodies of water.	S
Aztec gilia (*Aliciella formosa*)	Salt desert scrub communities in soils of the Nacimiento Formation (5,000-6,000 feet).	NP
Brack's hardwall cactus (*Sclerocactus cloveriae ssp. brackii*)	Sandy clay of the Nacimiento Formation in sparse shadscale scrub (5,000-6,000 feet).	NP

1 K - Known, documented observation within project area; S - Habitat suitable and species suspected to occur within the project area; NS - Habitat suitable but species is not suspected to occur within the project area; NP - Habitat not present and species unlikely to occur within the project area.

The proposed project area contains potential habitat for four BLM/FFO special management species: golden eagle (*Aquila chrysaetos*), prairie falcon (*Falco mexicanus*), American peregrine falcon (*Falco peregrinus anatum*), and bald eagle (*Haliaeetus leucocephalus*).

Navajo Reservoir, located east and southeast of the proposed project area, provides perching, roosting, and foraging opportunities for bald eagle; however, this species is not known to nest in San Juan County (USDI/BLM 2003*a*). Bald eagles are common winter residents in the area. Three BLM-designated Bald Eagle Area of Critical Environmental Concern (ACEC) units are located near the proposed project, San Juan No. 5, 6, and 7 units. These three ACEC units are located within 2,250 to 4,000 feet of the proposed fluids management pit. Because of the project area's proximity to Navajo Reservoir and designated ACEC units, bald eagles are likely to occur in the area between November and March.

According to the BLM/FFO, there are three recorded historic or currently active golden eagle nests and three American peregrine falcon nests within 15 miles of the project area (USDI/BLM 2012, unpublished data). There are no documented prairie falcon nests within 15 miles of the proposed project area. However, the area does provide suitable foraging habitat for this species. The proposed area of disturbance associated with the Proposed Action was not found to contain suitable nesting substrate for any of these raptor species.

The proposed project area does not contain potential habitat for any other BLM special status species. No special status species, or signs thereof, were observed during the field investigations conducted in September and October 2011, and in January and June 2012.

3.10 Socioeconomics

The socioeconomic impacts of the alternatives are related to the jobs, wages, spending, and tax revenues generated by activities and natural gas production associated with the alternatives. The area that would experience socioeconomic effects includes San Juan and Rio Arriba counties in New Mexico and La Plata

natural gas production taxes total 8.84 percent of production value (Lillywhite and Starbuck 2008). In 2009, these production taxes from both oil and gas production in San Juan County amounted to over one-third of San Juan County's General Fund Revenue.

The State of New Mexico collects oil and gas production taxes and distributes the revenue as follows: about one-third goes to the State General Fund, about one-quarter goes to local schools, about one-fifth goes to the State Severance Tax Bond Fund and the Land Grant Permanent Fund, and the remainder to local governments and state institutions (Headwaters Economics 2011). In Fiscal Year 2009, more than 18 percent of the State General Fund (almost $1 billion) was funded by taxes on oil and gas production (Starbuck 2009).

In addition to State taxes, Federal Royalty of 12.5 percent is levied on the natural gas produced on BLM lands (Headwaters Economics 2011). About half of this royalty payment is returned to New Mexico and the other half is retained by the U.S. Treasury. In 2009, the Federal Royalty revenue from natural gas production in San Juan County was estimated to be more than $300 million.

3.11 Transportation and Traffic

In the PRMP/FEIS, the transportation infrastructure serving the planning area is described as a regional network of federal and state highways with U.S. Highway 550 serving as the major highway link between Aztec, Farmington, and Bloomfield, and the oil and gas fields (USDI/BLM 2003*a*, page 3-57). For the Proposed Action, the point of origin for the majority of traffic is assumed to be Aztec, New Mexico. The proposed travel route from Aztec to Middle Mesa would use these roads: U.S. Highway 550, La Plata County Road 310, Colorado Highway 172, Colorado Highway 151, La Plata County Road 328, La Plata County Road 330, San Juan County Road 4010, and San Juan County Road 4018. All of these roads are paved except for San Juan County Roads 4010 and 4018 and La Plata County Roads 328 and 330, which have a gravel surface. Colorado Highway 172 is a regional north/south state highway that extends from the New Mexico state line to U.S. Highway 160 east of Durango, Colorado. Colorado Highway 151 is a regional east/west state highway that extends from Colorado Highway 172 in Ignacio, Colorado, to U.S. 160 west of Pagosa Springs, Colorado.

U.S. Highway 550 and Colorado Highways 172 and 151 are forecast to have substantial increases in traffic levels during the next 20 years as shown in Table 3-7.

Table 3-7. Traffic conditions along travel route from Aztec, New Mexico, to Middle Mesa.

Road Segment	AADT 2010	Estimated AADT 2030
U.S. Highway 550 North of Aztec (2009 data)	8,400	12,600
U.S. Highway 550 at Stateline	4,900	7,000
Colorado Highway 172 south of Colorado Hwy 151	6,000	9,500
Colorado Hwy 151 east of Colorado Hwy 172	3,400	4,800

Source: USDI/BLM 2011a

Key: AADT = Average Annual Daily Trips.

background views to the north include the San Juan Mountains, the central portion of the San Juan Basin to the south, and the La Plata Mountains to the west. Overall, existing conditions are moderately natural.

Current visual disturbances in foreground and middleground views along public travel corridors include gravel roadways, natural gas well pads, reclaimed utility and pipeline corridors, and areas where anchor chaining has removed woodlands. Overhead power lines are typically single pole but are also present in foreground and middleground views. Viewers within the area consist of industry-related users, recreational users, and private landowners.

The BLM has stewardship responsibility to identify and protect visual values on public lands. Visual Resource Management (VRM) objectives are developed by determining the extent and quality of visual resources by utilizing the Visual Resource Inventory (VRI) process. After the VRI is completed, visual resources are weighed along with all other resource allocations identified during the RMP development process. In 2009, an updated VRI was completed for the FFO planning area. The VRI identified the proposed project area as displaying Class IV VRM values based on landscape changes over the last 30 years.

The VRM classification system is designed to maintain or enhance visual qualities and describe the different degrees of modification to the landscape (USDI/BLM 2003*a*). Modifications to the visual resource must follow the guidelines for the types of change suitable for each class. The Proposed Action would be located in a Class II VRM area (USDI/BLM 2003*a*). Management objectives for the Class II VRM are to retain the existing character of the landscape and the level of change should be low.

industrialized with oil and gas well development. The surface disturbance for each project that has been permitted has resulted in dispersed development and habitat fragmentation. The cumulative impacts fluctuate with the gradual reclamation of plugged and abandoned wells and the creation of new additional surface disturbances in the construction of new access roads and well pads. The Proposed Action would be one of a number of projects that have taken place or may reasonably be expected to take place in the region.

The action alternatives would be located within the Middle Mesa portion of the Rosa Unit, which comprises approximately 5,700 acres, of which approximately 4,800 acres are public lands. The Middle Mesa Wildlife Area SDA encompasses a total of 46,052 acres, of which 31,390 acres are public land and 40,317 acres are federal mineral acres. Drilling and development in the area has been ongoing since the leases were issued in 1948. There are more than 825 wells and 193.6 miles of road within the Middle Mesa Wildlife Area SDA based on BLM/FFO data as of May 1, 2011. The Middle Mesa portion of the Rosa Unit covers approximately 12 percent of the total SDA. Approximately 18.5 miles of roads and 53 well pads containing 98 natural gas wells are located within the Middle Mesa portion of the Rosa Unit. This current surface disturbance is the result of all companies operating in the area, including WPX Energy.

Cumulatively, under the Proposed Action, WPX Energy projects a total of 65 wells (53 horizontal Basin Mancos and 12 directional Mesaverde) could be drilled in the Middle Mesa portion of the Rosa Unit. A total of eight existing well pads would be expanded to drill the wells.

Under Alternative C, a total of 138 Basin Mancos 40-acre spacing units are included within the Middle Mesa portion of the Rosa Unit. Twenty of these spacing units would not be accessible using current directional technology, while nine have already been drilled. Therefore, a total of 109 directional wells could be drilled in the future. Based on the assumptions outlined in Section 2.2, approximately 27 well pads would be needed to access the same gas pool area as the four well pads under the Proposed Action. WPX Energy would drill approximately nine wells per year outside the seasonal closure for the SDA. The drilling program would not implement a residential camp, natural gas-powered engines, purpose-built rig, or other design features of the Proposed Action, as the cost associated with these features outweighs the economic return. Additionally, 12 directional Mesaverde wells could also be drilled under this scenario (total 121 wells).

Table 4-1 provides a summary comparison between the anticipated cumulative scenario of the action alternatives that includes the estimated number of wells and pads, surface disturbance, duration of drilling, and natural gas production. Time frames associated with drilling duration are based on 18 days per directional well and 25 days per horizontal well.

Chapters. WPX Energy is considering a pilot project on the east side of Navajo Reservoir to drill horizontal wells to the Basin Mancos gas pool; specific details have not yet been developed. The Southern Ute Indian Tribe is proposing the development of up to 48 natural gas wells to access the Mancos Shale Formation in Archuleta County, Colorado. The Gothic Shale Gas Play is a 646,403-acre shale gas formation that was discovered within Dolores and Montezuma counties, and to a lesser extent in San Miguel and La Plata counties in Colorado. There is potential for up to 1,769 new Gothic shale wells to be drilled within the gas play. However, to date few if any wells have been drilled to the Gothic Formation, and development is unlikely to occur at the scale and pace originally proposed. All of these activities would require well pads, construction areas, access roads, pipelines, or distribution power lines as needed.

Power Plants and Transmission Lines

The Four Corners Generating Station was built between 1963 and 1970. Operations are anticipated to change based on regional haze compliance plans that will result in closure of Units 1, 2, and 3, and installation of air pollution control on Units 4 and 5 by 2014. The extent and timing are uncertain and will require approvals. The post-2016 lease for Four Corners Generating Station with the Navajo Nation has been extended until 2041, pending approval.

San Juan generating station, built between 1976 and 1982, will experience a change in existing operations based on the Best Available Retrofit Technology requirements for regional haze, which may require expensive retrofit on all four units. This could result in closure of some units to avoid costly retrofit. A final compliance plan has not been approved at this time.

A variety of projects, including Navajo Transmission Project and San Juan Basin Interconnect Project, are proposed to expand the capacity of electric transmission across New Mexico to move renewable power, shift gas-fired compressors to electricity, and meet increased electric demand in the San Juan Basin. The construction dates for these projects have yet to be finalized.

Coal Mining Projects

Navajo Mine supplies coal to Four Corners Generating Station. Mining activities in Areas I and II have concluded. Reclamation is ongoing in Area II. Area III is actively mined in two pits with contemporaneous reclamation. San Juan Coal Company operates San Juan Mine, an underground mine that is the exclusive supplier of coal to the San Juan Generating Station. Surface mining at San Juan reached a depth in the early 2000s that represented an economic limit, but underground mining is feasible and the coal supply contract extends through 2017. Approximately 5,400 acres have been disturbed as of 2010. San Juan Coal Company La Plata Mine supplied coal to the San Juan Generating Station from 1986 to 2002. The mine ceased operation in 2002, and reclamation continued through 2005 and is now completed.

Other Development

Urban development in the area is expected to continue to expand with the population of San Juan County, New Mexico, projected to increase by nearly 25 percent between 2010 and 2030.

The Animas-La Plata Project development will include Ridges Basin Dam and Reservoir, Durango Pumping Plant, Ridges Basin Inlet conduit, and construction of a pipeline to deliver water for domestic

Table 4-3. Comparison of horizontal and directional drilling per well and associated design features.

Directional Drilling	Horizontal Drilling	Proposed Action Design Feature
Drilling time 18 days	Drilling time 25 days	None
22 wells	7 wells	Horizontal drilling Purpose-built rig
7 bcf natural gas production	30 bcf natural gas production	Horizontal drilling
1.44 acres disturbance [1]	0.68 acres disturbance [1]	Use existing well pads and drill multiple wells from a single pad. Purpose-built rig allows for closer wellhead spacing on the pad (i.e., 12.5 feet vs. 50 feet).
650 metric tons of GHG emissions	318 metric tons of GHG emissions	Use of natural gas-powered engines would reduce criteria air pollutant emissions.
Greater PM_{10}, $PM_{2.5}$, NOx, and VOC emissions	Greater SO_2 and CO emissions	Use of natural gas-powered engines would reduce criteria air pollutant emissions.
1.29 ac-ft of fresh-water	15.5 ac-ft of produced water	Use of produced water for horizontal development would eliminate any fresh-water use.
Cumulatively 27 well pads (121 wells)	Cumulatively 8 well pads (65 wells)	Horizontal drilling Purpose-built rig Twinning of pad

[1] Both Alternative B and C would twin existing well pads and multiple wells would be drilled from single well pads. Estimated disturbance based on total pad size divided by the total number of wells; based on 4 directional wells under Alternative C and 8 wells per pad under Alternative B. Actual number of wells can vary per well pad.

Key: ac-ft = acre-feet; bcf = billion cubic feet; CO = carbon monoxide; GHG = greenhouse gas; NOx = nitrogen oxide; PM^{10} = particulate matter with an aerodynamic diameter equal to or less than 10 microns; $PM_{2.5}$ = Particulate matter with an aerodynamic diameter equal to or less than 2.5 microns; SO_2 = sulfur dioxide; VOC = volatile organic compounds.

The analysis in the following sections compares the impacts of Alternative B (Proposed Action) to Alternative C. Variations, if any, between horizontal and directional drilling are discussed under the affected resource.

4.3 Air Resources

Methodology and assumptions for calculating air pollutant and greenhouse gas emissions are described in the Air Resources Technical Report (USDI/BLM 2011*b*). This document incorporates the sections discussing the modification of calculators developed by the BLM to address emissions for one well. The calculators give an approximation of criteria pollutant, HAP, and greenhouse gas (GHG) emissions to be compared to regional and national emissions levels (USDI/BLM 2011*b*). Also incorporated into this document are the sections describing the assumptions that the FFO used in developing the inputs for the calculator (USDI/BLM 2011*b*). For the Proposed Action and Alternative C, the calculator has been further modified to incorporate project-specific information such as the chemistry of Mancos Shale gas, the use of natural gas-fired engines, drilling time-frames, and design features that minimize traffic volumes/distances and surface disturbance. The assumptions used in populating the emissions calculator

Table 4-4. Criteria pollutant and VOC emissions estimated for the Proposed Action per well and the total for 7 wells.

Activity	PM_{10}	$PM_{2.5}$	NO_x	SO_2	CO	VOC
One Time Operations (tons)						
Well Pad Construction - Fugitive Dust	0.1	0.00	---	---	---	---
Heavy Equipment Combustive Emissions	0.23	0.10	1.76	050	5.05	0.24
Commuting Vehicles - Construction	2.65	0.17	0.07	0.00	0.07	0.02
Wind Erosion	0.33	0.05	---	---	---	---
Completion Venting	---	---	---	---	---	0.00
Sub-total: Construction	**3.23**	**0.32**	**1.83**	**0.50**	**5.11**	**0.26**
Operations (tons/year)						
Well Workover Operations - Fugitive Dust	0.09	0.01	---	---	---	---
Well Workover Operations - On-site Exhaust	0.01	0.01	0.13	0.00	0.04	0.01
Well Workover Operations - On-road Exhaust	0.00	0.00	0.00	0.00	0.00	0.00
Well Visits for Inspection & Repair - Operations	0.15	0.01	0.01	0.00	0.20	0.01
Wellhead and Compressor Station Fugitives	---	---	---	---	---	0.00
Compression	0.00	0.00	0.00	0.00	0.00	0.00
Station Visits - Operations	0.00	0.00	0.00	0.00	0.00	0.00
Dehydrators	0.00	0.00	0.00	0.00	0.00	0.00
Sub-total: Operations	**0.24**	**0.03**	**0.14**	**0.00**	**0.25**	**0.02**
Maintenance (tons/year)						
Road Maintenance [1]	0.00	0.00	0.01	0.000	0.01	0.00
Sub-total: Maintenance	**0.00**	**0.00**	**0.01**	**0.000**	**0.01**	**0.00**
Total Emissions Per Well	**3.47**	**0.35**	**1.99**	**0.51**	**5.37**	**0.28**
Total Emissions of Full Development of Proposed Action (7 Horizontal Wells)	**24.29**	**2.45**	**13.93**	**3.57**	**37.59**	**1.96**

[1] Road Maintenance occurs on existing roads that access numerous wells per day. No new roads will be constructed to develop Alternative B. The emissions generated from the calculator from road maintenance are divided by the total number of wells serviced on the section of road maintained during a day and result in numbers too small to report for PM, SO_2, CO, and VOC.

Key: CO = carbon monoxide; NO_x = nitrogen oxide; PM_{10} = particulate matter with an aerodynamic diameter equal to or less than 10 microns; $PM_{2.5}$ = Particulate matter with an aerodynamic diameter equal to or less than 2.5 microns; SO_2 = sulfur dioxide; and VOC = volatile organic compounds.

oil and gas will be evaluated here because the environmental impacts of GHG emissions from oil and gas consumption, such as refining and emissions from consumer-vehicles, are not effects of the Proposed Action as defined by the CEQ because they do not occur at the same time and place as the action. Thus, GHG emissions from consumption of oil and gas do not constitute a direct effect that is analyzed under the NEPA. Consumption is not an indirect effect of oil and gas production because production is not a proximate cause of GHG emissions resulting from consumption. However, emissions from consumption and other activities are accounted for in the cumulative effects analysis.

The two primary GHGs associated with the oil and gas industry are carbon dioxide (CO_2) and methane (CH_4). Because CH_4 has a global warming potential that is 21 to 25 times greater than the warming potential of CO_2, the USEPA measures CO_2 equivalent (CO_{2eq}), which takes the difference in warming potential into account for reporting GHG gas emissions. Emissions are expressed in metric tons of CO_{2eq} in this document. Table 4-7 summarizes the estimated emissions of CO_2 and CH_4 from the Proposed Action.

Table 4-7. Estimated greenhouse gas emissions from the Proposed Action.

Activity	CO_2	CH_4	CO_{2eq}	CO_{2eq} metric tons
Construction				
Heavy Equipment Combustive Emissions	272.36	0.01	272.82	247.57
Commuting Vehicles - Construction	19.24	0.00	19.32	17.53
Completion Venting	0.00	0.00	0.00	0.00
Sub-total: Construction	291.60	0.01	292.14	265.10
Operations				
Well Workover Operations - On-site Exhaust	10.51	0.00	10.55	9.57
Well Workover Operations - On-road Exhaust	0.45	0.00	0.45	0.41
Well Visits for Inspection & Repair - Operations	3.94	0.00	3.99	3.62
Wellhead and Compressor Station Fugitives	0.19	1.96	41.27	37.45
Dehydrators	0.65	0.00	0.66	0.59
Sub-total: Operations	15.73	1.96	56.91	51.64
Maintenance				
Road Maintenance	1.73	0.00	1.74	1.58
Sub-total: Maintenance	1.73	0.000	1.74	1.58
Total Emissions Per Well	**309.07**	**1.96**	**349.06**	**318.32**
Total Emissions from Full Development of Alternative B (7 Horizontal Wells)	2,163.5	13.7	2,443.4	2,228.2

Key: CO_2 = carbon monoxide; CH_4 = methane; and CO_{2eq} = CO_2 equivalent.

Table 4-9. Estimated greenhouse gas emissions from Alternative C (tons/year).

Activity	CO_2	CH_4	CO_{2eq}	CO_{2eq} metric tons
Construction				
Heavy Equipment Combustive Emissions	616.23	0.01	618.42	561.18
Commuting Vehicles - Construction	38.86	0.00	39.06	35.44
Completion Venting	0.00	0.00	0.00	0.00
Sub-total: Construction	655.09	0.01	657.48	596.62
Operations				
Well Workover Operations - On-site Exhaust	10.51	0.00	10.55	9.57
Well Workover Operations - On-road Exhaust	0.45	0.00	0.45	0.41
Well Visits for Inspection & Repair - Operations	3.94	0.00	3.99	3.62
Wellhead and Compressor Station Fugitives	0.19	1.97	41.66	37.81
Dehydrators	0.54	0.00	0.55	0.50
Sub-total: Operations	15.63	1.98	57.19	51.90
Maintenance				
Road Maintenance	1.56	0.00	1.56	1.42
Sub-total: Maintenance	1.56	0.000		1.42
Total Emissions Per Well	**672.28**	**1.98**	**714.67**	**649.94**
Total Emissions for Full Development of Alternative C (22 Directional Wells)	**14,790**	**43.6**	**15,723**	**14,299**

Key: CO_2 = carbon monoxide; CH_4 = methane; and CO_{2eq} = CO_2 equivalent.

Table 4-10 provides a summary comparison of estimated total emissions between the two action alternatives. Table 4-11 provides a summary comparison of the percent increase in emissions between Alternative B and Alternative C.

4.3.3.1 Cumulative Effects on Air Resources

The following analysis of cumulative impacts on air quality will be limited to the Four Corners area of New Mexico. The cumulative impacts of GHG emissions and their relationship to climate change are evaluated at the national and global levels in the Air Resource Technical Report (USDI/BLM 2011*b*).

4.3.3.2 Effects of Other Past, Present, and Reasonably Foreseeable Actions on Air Resources

The primary activities that contribute to levels of air pollutant and GHG emissions in the Four Corners area are electricity generation stations, fossil fuel industries, and vehicle travel. The Air Quality Technical Report includes a description of the varied sources of national and regional emissions that are incorporated here to represent the past, present, and reasonably foreseeable impacts to air resources (USDI/BLM 2011*b*). It includes a summary of emissions on the national and regional scale by industry source. Sources that are considered to have notable contributions to air quality impacts and GHG emissions include electrical generating units, fossil fuel production (nationally and regionally), and transportation.

4.3.3.3 Cumulative Effects of Alternative B or Alternative C on Air Resources

The emissions calculator estimated that there could be very small direct and indirect increases in several criteria pollutants, HAPs, and GHGs as a result of implementing either Alternative B or Alternative C. Table 4-11. Summary comparison between Alternative B and Alternative C of increased emissions. (Summary comparison between Alternative B and Alternative C of increased emissions) documents that the difference in emissions between Alternative B and C are very small compared to total emissions for the FFO analysis area and are not likely to be measurable. The very small increase in emissions that could result from approval of either alternative would not be expected to result in exceeding the NAAQS for any criteria pollutants in the analysis area.

4.3.3.4 Cumulative Effects of the Proposed Action on Climate Change

The very small increase in GHG emissions that could result from implementing either Alternative B or Alternative C would not produce climate change impacts that differ from the No Action Alternative. This is because climate change is a global process that is impacted by the sum total of GHGs in the Earth's atmosphere. The incremental contribution to global GHGs from the action alternatives cannot be translated into effects on climate change globally or in the area of this site-specific action. It is currently not feasible to predict with certainty the net impacts from the action alternatives on global or regional climate.

The Air Resources Technical Report (USDI/BLM 2011*b*) discusses the relationship of past, present, and future predicted emissions to climate change and the limitations in predicting local and regional impacts related to emissions. It is currently not feasible to know with certainty the net impacts from particular emissions associated with activities on public lands.

4.5 Soils

4.5.1 Direct and Indirect Effects of Alternative B (Proposed Action) on Soils

Construction would result in temporary displacement, compaction, and mixing of approximately 59 acres of soils. Approximately 4 acres would remain as bare, compacted soil for the life of the project (approximately 30 years) and would be subject to an undetermined amount of wind and water erosion until the well pads are completely reclaimed. Approximately 0.5 acre of long-term disturbance would occur at the drilling entry/exits points and on a small portion of new road that would be constructed. The road construction would result from rerouting an existing road in order to avoid impacting cultural resources. Compaction of the soils during construction and operation, coupled with the implementation of design features, would limit soil impacts from erosion. The most susceptible period for soil erosion impacts is during construction when strong winds or precipitation events during soil-disturbing activities could mobilize soils. On all proposed pads, drainage will be restored at reclamation. Silt traps will be installed as needed. Culverts will be installed if needed.

4.5.2 Cumulative Effects of Alternative B (Proposed Action) on Soils

The cumulative impact assessment area for soils is the Navajo Reservoir watershed. The PRMP/FEIS determined that "cumulative impacts on soils in the San Juan Basin would comprise the total amount of short-term and long-term surface disturbance due to all new oil and gas development and other activities" (USDI/BLM 2003*a*, page 4-123).

Navajo Reservoir watershed contains 378,389 acres with approximately 1,334 existing oil and gas wells, approximately 7,951 acres of existing disturbance, and a road density of approximately 1.8 miles per square mile (USDI/BLM 2003*a*, page 3-3). Cumulatively, long-term disturbance is associated with wells and facilities related to the development of oil and gas resources, including injection wells, roads, corridors for gathering lines and utilities, compressor stations, and ancillary facilities. At some future date, these wells and facilities would be reclaimed when gas production drops below an economic level.

Reasonably foreseeable development within the Navajo Reservoir watershed may include an estimated additional 1,256 oil and gas wells and related facilities. Surface-disturbing activities that would be associated with these actions may affect an estimated 4,707 acres for the long term, including wells, pipeline, roads, and all associated facilities (USDI/BLM 2003*a*, page 4-7). Other reasonably foreseeable actions expected within the watershed are livestock grazing, recreation including off-road vehicle travel, fire management activities such as prescribed burns, and non-native invasive species control.

The PRMP/FEIS determined that "cumulative impacts on soils in the San Juan Basin would comprise the total amount of short-term and long-term surface disturbance due to all new oil and gas development and other activities" (USDI/BLM 2003*a*, page 4-123). Under the Proposed Action, cumulative effects from soils would occur from the development of approximately 62 acres associated with the expansion of eight existing well pads, two fluids management pits, and the water line. Approximately 8.5 acres of long-term disturbance would impact soils in the watershed.

communities, and approximately 40 percent may occur within the piñon-juniper and juniper savannah communities. Based on the acres of plant community types within the planning area and the estimated total disturbance of future activities, and given the above assumptions, approximately 2.7 percent of the desert grassland and Great Basin desert scrub communities and less than 1 percent of the piñon-juniper and juniper savannah communities would be disturbed within the planning area over 20 years under the reasonably foreseeable future actions (USDI/BLM 2003*a*, page 3-31 and 4-7).

The Proposed Action could cumulatively affect about 62 acres of disturbed and undisturbed vegetation. Changes in vegetation composition and the potential for invasive, non-native species to establish would also cumulatively effect vegetation in the project area.

4.6.3 Direct and Indirect Effects of Alternative C on Vegetation

Alternative C could impact approximately 26 acres of vegetation in the short term. Impacts would result from the removal of vegetation from six existing well pads that would be expanded. Those areas not needed for access and well operation would be reclaimed following completion. There would be long-term impacts to approximately 3.8 acres of vegetation following interim reclamation. Indirect impacts would result from changes in vegetation composition and density, particularly in woodland areas. There would be a long-term potential for the introduction or spread of invasive, non-native species.

4.6.4 Cumulative Effects of Alternative C on Vegetation

Alternative C could cumulatively affect about 116 acres of disturbed and undisturbed vegetation. Changes in vegetation composition and the potential for invasive, non-native species to establish would also cumulatively effect vegetation in the project area.

4.7 Water Resources

4.7.1 Effects Common to Both Action Alternatives

Under both alternatives, vegetation removal and soils disturbance would result in an undetermined increase in sediment transfer. These increases would be expected to be minimal, localized, and proportional to the amount of disturbance. Sediment transfer reaching waterways would result in short-term impacts to surface water quality. These impacts would be greater during and following storm events when soils are more prone to mobilization. Impacts to water quality from sedimentation would continue until the disturbed areas are stabilized and, therefore, would be short term.

Minimal amounts of fuels, lubricants, and industrial materials (gas, diesel, etc.) would be used and stored on location. There would be the potential for accidental spills or releases of these materials, which could impact local water quality. A closed-loop system would be used for the oil-based mud to minimize potential impacts to surface and groundwater quality. A 4-ounce geotextile pad, a 30-mil reinforced liner, followed by an 8-ounce geotextile pad covered with approximately 12 inches of gravel will be laid down under the rig mats and all drilling machinery. The potential for surface water quality impacts from accidental spills or releases of hazardous materials on the well pads would be long term for the life of the wells.

The BLM independently verifies the casing program, and the installation of the casing and cementing operations are witnessed by certified Petroleum Engineering Technicians. Surface casing setting depth is determined by regulation. Adherence to APD COAs and other design measures would minimize potential effects to groundwater quality. The potential for impacts to groundwater from the well bores would be long term for the life of the wells.

4.7.2 Direct and Indirect Effects of Alternative B (Proposed Action) on Water Resources

The Proposed Action would temporarily expose a maximum of 59.1 acres of soil as a sediment source entering area drainage ways. Of this, approximately 26 acres have been previously disturbed. There would be long-term impacts to about 4.5 acres. Impacts to surface water quality from sediment transfer would be short term given the amount of acreage affected and would be minimized by implementing measures that would stabilize soils following well completion.

Approximately 10 to 12 stimulation stages (every 500 feet) would be needed for each horizontal well bore to stimulate the formation, with each stage requiring approximately 10,000 bbls (1.29 ac-ft) of fluid. Stimulation fluid would be recycled for reuse with approximately one-third of the total volume expected to be reused. Approximately 120.000 bbls (15.5 ac-ft) of produced water would be needed per well. A total of 90 ac-ft of water could be used for hydraulic fracturing for the seven wells proposed. No freshwater sources would be used for drilling or completion. Rather, produced water from existing wells would be used and recycled. Currently, WPX Energy's existing wells on Rosa Mesa generate approximately 6,000 to 12,000 bbls of produced water daily. This produced water is transported to an existing saltwater disposal well and reinjected deep underground into the Entrada Formation, as required by regulation. Under the Proposed Action, produced water from an existing liquid gathering system on Rosa Mesa would be transported via a subsurface water line to Middle Mesa and stored in the two fluids management pits. During completion, the produced water would be transported through two temporary aboveground steel water lines to the well being completed. Approximately one-third of the fluid may flowback to the well head where it would be transported back to the fluids management pit. The flowback would be filtered and treated before entering the pit.

There is the potential for the water line to rupture or develop a leak, releasing produced water to the surface or below ground. The life of the pipeline would be 50 to 60 years, but it could be even longer with cathodic protection internal corrosion control and good maintenance. The line under the lake would be a 6-inch outside diameter seamless pipe that would be coated to protect against damage during transportation and installation. The pipe would also be coated to ensure integrity if operating under high temperature and to protect against corrosion. An induced current cathodic protection system strictly dedicated to the under-lake water line would protect the integrity of the pipe during operation. The system would be a 36 volt alternating current rectifier supplying continuous protection to the pipe's external surface. The external cathodic protection system would be monitored on a regular basis. Material reference coupons would be located at the entry and exit points of the under-lake water line. This equipment would determine whether any internal pipe material loss is occurring. The water and coupons would be inspected and tested for bacterial and material loss within 30 days of installation and then every 90 days for the life of the line. Chemical treatments with a corrosion inhibitor and biocide would be conducted as needed based on water samples and bacterial cultures. It is WPX Energy's typical practice

of service, and water removed by pigging. The line would then be repaired or abandoned. A pinhole leak could release minor amounts of produced water, however, based on the depth of the line within bedrock, migration into Navajo Reservoir would be highly improbable. No measurable effects to Navajo Reservoir water quality would be expected to occur from a water line rupture or leak.

The fluids management pits would contain water below ground level; therefore, a surface release of the total pit water volume is not expected to occur. The pit volume would be no more than 56 ac-ft. Should the pit develop a leak, it would be identified almost immediately, and a minimal amount of fluid could be released. This volume of water would not be sufficient to reach Navajo Reservoir between 2,500 feet and 1 mile away. Should a leak occur, there could be potential short-term effects to surface water or groundwater quality in the immediate area. These effects would be limited to increasing the concentrations of some metals, salts, and hydrocarbons in the soil surrounding the leak. Based on the concentrations of these constituents in the produced water and the volume of water that could be released, these effects may not be measurable.

4.7.3 Cumulative Effects of Alternative B (Proposed Action) on Water Resources

The cumulative impact assessment area for water quality is the Navajo Reservoir watershed.

Reasonably foreseeable development within the Navajo Reservoir watershed may include an estimated additional 1,256 oil and gas wells and related facilities. Surface-disturbing activities that would be associated with these actions may affect an estimated 4,707 acres for the long term, including wells, pipeline, roads, and all associated facilities (USDI/BLM 2003*a*, page 4-7). Other reasonably foreseeable actions expected within the watershed are livestock grazing, recreation including off road vehicle travel, fire management activities such as prescribed burns, and non-native invasive species control. These surface-disturbing activities may cause accelerated erosion within the analysis area.

The PRMP/FEIS determined that the primary cumulative impacts on water quality would result from surface disturbance, which would generate increased sediment yields (USDI/BLM 2003*a*, pages 4-123 and 4-124). Cumulative effects to water resources from the Proposed Action would be maximized shortly after construction begins and would decrease over time as reclamation efforts proceed. The Proposed Action would cumulatively disturb about 62 acres within the watershed over an approximate 4- to 5-year period.

No freshwater resources would be used for drilling or completion. Thus, there would be no cumulative effects to water resource volumes in the planning area under the Proposed Action.

4.7.4 Direct and Indirect Effects of Alternative C on Water Resources

Site-specific locations have not been identified for Alternative C. However, 22 directional wells could be drilled under this scenario. This would result in disturbance to about 26 acres on six well pads. Long-term disturbance would affect about 3.8 acres. Impacts to surface water quality from sediment transfer would be short term because mitigation measures would stabilize soils following well completion. Before development, each well pad would be subject to site-specific environmental analysis at the time of APD submittal.

Impacts to wildlife are dependent on a number of variables including timing, duration (years), and intensity. For the proposed activities, the primary impact to wildlife, especially deer and elk, is habitat loss and fragmentation in an environment that is already highly developed. Wildlife may also be exposed to increased mortality associated with increased vehicular traffic.

Direct habitat loss occurs through the removal of vegetation, which reduces the extent or quality of habitat in terms of food and cover. Habitat value to wildlife is lost when vegetation is removed; therefore, direct habitat loss can be quantified by comparing the area of habitat lost to the amount retained. The Proposed Action would impact approximately 59 acres, of which about 26 acres would be new disturbance. New disturbance would result in a direct habitat loss for big game and other wildlife. The majority of direct habitat loss would be short term as areas reclaimed would recover their value as wildlife habitat. There would be a long-term direct habitat loss of approximately 4.5 acres associated with operation facilities and access.

No well pad or water line construction or stimulation activities would take place during the big game winter closure. Construction of the proposed eastern water line segment would result in short-term disturbance to big game and other wildlife from increased noise and activity. These impacts would last for the duration of water line construction and drilling under Navajo Reservoir, approximately 1 month.

Drilling could occur during the SDA winter closure. The Middle Mesa POD EA analyzed the effects on wintering big game from drilling from a single well pad during the SDA seasonal closure. The analysis was based on an approximate 5-year drilling program. The analysis found that wintering mule deer would be impacted through a loss of effective habitat from habitat fragmentation and disturbance. These impacts would be localized, that is centralized around the one active well pad and the access roads leading to it. The severity of impacts could be greater during winters with deep snow when movement is more difficult and browse more challenging to locate. The analysis concluded that these short-term impacts would affect individuals but were not expected to have population-level impacts (USDI/BLM 2011*a*, pages 60-64).

The Middle Mesa POD EA also analyzed the effects of increased traffic levels on big game. Under the Proposed Action, there could be an increase of 10 to 12 more vehicle trips during the winter closure period. There would also be an increase of 8 to 10 more vehicle trips during the remainder of the year under the Proposed Action (USDI/BLM 2011*b*, page 63). Direct impacts from vehicle traffic on roads could include incidental mortality to wildlife. Animal-vehicle collisions are variable depending on time of day, speed and volume of traffic, local topography, structural features of the road, and the size and behavior of the individual impacted (USDI/BLM 2011*b*, page 61). These impacts would be short term for the duration of drilling and completion.

Stimulation activities would occur outside the winter closure. Stimulation activities are not expected to increase the number of vehicle trips, but there would be spatial changes in traffic patterns within the project area as produced water on Middle Mesa would be trucked from existing well pads to the fluids management pits rather than the normal disposal site (USDI/BLM 2011*b*, page 63). The water line transporting produced water from Rosa Mesa to Middle Mesa would supplement produced water volumes needed for stimulation.

No long-term impacts to big game or other wildlife from vehicle traffic, above what are already occurring, would be expected. During operation and maintenance, vehicle trips would not be expected to

WPX Energy maintains a plan to cover eventualities that could arise from an accidental release of hazardous materials.

4.8.4 Cumulative Effects from Alternative C on Wildlife

Cumulative habitat loss under Alternative C would be related to approximately 33 acres of long-term disturbance from well operation and access. Long-term impacts of Alternative C, years 9 to 30, would decrease slightly as some areas disturbed during the first 9 years recover their value as habitat for big game and other wildlife.

4.9 Special Status Species

Four BLM special status species have the potential to occur on Middle Mesa and on Rosa Mesa where the proposed water line would be constructed. Potential foraging habitat for bald eagle, golden eagle, prairie falcon, and American peregrine falcon occurs within the project area.

4.9.1 Direct and Indirect Effects from Alternative B (Proposed Action) on Special Status Species

There would be no direct impacts to potential nesting habitat as none occurs in the proposed area of disturbance. Should any nesting raptors be identified before or during construction activities within one-third mile of proposed activities, the BLM/FFO biologist would be immediately contacted in order to evaluate whether additional resource protection measures are warranted. If needed, mitigation measures would be implemented to minimize impacts.

The Proposed Action would directly impact 59 acres of potential foraging habitat for BLM special status raptor species. Direct impacts would include the removal and modification of vegetation, including the loss of about 500 piñon and juniper trees that could serve as perch sites. There would be a long-term loss of approximately 4.5 acres of foraging habitat, which would overlap existing disturbance. The proposed well pads would be twinned with existing disturbance to minimize effects to raptors and habitat. Indirect impacts could include a change in prey species composition for raptors from the disturbance and modification of vegetation. These impacts would be short to long term and not expected to result in population level impacts given the abundance of suitable foraging habitat and the use of existing disturbance and the consolidation of multiple wells on single well pads..

During construction and drilling, increased human and vehicular activity may cause these raptors to avoid the area of potential effect. These effects would be short term and localized around the area where construction or drilling would be occurring. Raptors could come into contact with chemicals or fluids stored on site or in the fluids management pits. Covering of open cavities and lining, fencing, and netting the fluids management pits would restrict raptors and minimize potential exposure risk. Any spills would be promptly cleaned up, and WPX Energy maintains a plan to cover eventualities that could arise from an accidental release of hazardous materials.

The APDs would have COAs requiring WPX Energy to meet noise stipulations at ACECs located within the Middle Mesa Rosa Unit. Bald eagle ACEC units are designated as Noise Sensitive Areas. For these boundary-focused Noise Sensitive Areas, the NTL 03-1 (FFO) applies. For noise sources located outside

4.9.4 Cumulative Effects of Alternative C on Special Status Species

Alternative C could cumulatively impact up to 116 acres of potential foraging habitat for four BLM special status raptor species. Since existing locations would be expanded, the intensity of these impacts would be minimized. Approximately 33 acres of long-term disturbance would result in a reduction in raptor foraging habitat. After about 9 years when construction and drilling have been completed, no cumulative effects from disturbance above what is already occurring would be expected.

4.10 Migratory Birds

4.10.1 Direct and Indirect Effects of Alternative B (Proposed Action) on Migratory Birds

Approximately 26 acres of new disturbance would affect a variety of tree, shrub, and ground-nesting birds. Approximately 500 piñon and juniper trees of varying ages and sizes would be removed during construction activities, resulting in a long-term loss of potential nesting and perching habitat for breeding birds. There would be a minimal increase in habitat fragmentation or edge effects since the Proposed Action would generally utilize and expand existing disturbance. The proposed water line would result in about 2.65 acres of new disturbance from two segments totaling 2,894 feet in length. Approximately 875 feet of road would be rerouted, also resulting in habitat fragmentation; however, this impact would be offset by closing a portion of an existing road. Following construction activities, disturbed areas would be reseeded with the appropriate BLM seed mix. Noxious weed control measures would minimize the spread of weeds in the project area.

Impacts to migratory birds would be greater from construction and drilling during the breeding season of April 15 through August 30. During the breeding period, disturbance to birds nesting adjacent to activities could result in nest abandonment or reduced nesting success. A pre-construction nest survey would be conducted along the water line and road re-route to identify any nesting bird species, and if needed, mitigation measures would be developed to avoid impacts.

Long-term disturbance would convert approximately 4.5 acres to industrial use, decreasing available foraging and nesting habitat. Sage sparrows, a priority bird species that utilizes sage grasslands that could occur in the project area, have territories that range in size depending on region. In Utah, the average sage sparrow territory was found to be 1.5 hectares (3 acres) (Martin and Carlson 1998). Gray vireos, which have been observed within the project area, are a priority bird species representative of the piñon-juniper woodland habitat type. Gray vireos have been documented as having territories ranging in size from 2 to 4 hectares (4 to 9 acres) (Barlow et al. 1999).

Construction activities would be confined to the proposed project area to avoid further disruption to migratory birds. During construction, a trash receptacle and a chemically treated portable toilet will be on location for trash and sewer disposal. Any spills would be promptly cleaned up, and WPX Energy maintains a plan to cover eventualities that could arise from an accidental release of hazardous materials. Any open cavities would be covered. Any pits containing hydrocarbons would be netted. The fluids management pits would be lined, fenced, and netted. Any active bird nests found within the proposed

Design features such as netting or covering any open cavities would be applied to minimize these potential impacts.

4.10.4 Cumulative Effects of Alternative C on Migratory Birds

Since site-specific locations have not been identified, the amount of new disturbance cannot be quantified. However, assuming approximately 60 percent of the 33 acres of long-term disturbance is sage-grassland with the remainder piñon-juniper woodland, approximately 20 acres of sage-grassland and 13 acres of piñon-juniper woodland could be cumulatively affected. This amount of habitat acreage equates to about seven sage sparrow territories and three to six gray vireo territories. Alternative C could affect individual migratory birds through habitat reduction; but based on the level of disturbance, the widespread locations where disturbance would occur, and the use of existing infrastructure, no population-level impacts would be expected. After about 9 years when construction and drilling have been completed, no cumulative effects from disturbance to migratory birds above what is already occurring would be expected.

4.11 Socioeconomics

Socioeconomic impacts are measured by the direct and indirect changes to employment, income, and government revenues generated by the alternatives. These changes are estimated using the IMPLAN 3 model and 2010 data for the counties in the affected area, including San Juan and Rio Arriba, New Mexico, as well as La Plata and Archuleta, Colorado.

4.11.1 Direct and Indirect Effects of Alternative B (Proposed Action) on Socioeconomics

The total natural gas production for the Proposed Action is estimated to be 30 bcf. Using an average natural gas price from U.S. Department of Energy (USDOE) market forecasts of $4.14 per Mcf, the estimated total production value is $120 million or approximately $6 million per year (USDOE 2010). It is estimated that the Proposed Action will support 64 jobs and an estimated payroll including benefits of about $6 million per year. The indirect impacts of the natural gas production (output) from the Proposed Action would include 11 additional jobs in the local economy in equipment sales, professional services, and transportation industry. The indirect labor income associated with these jobs would amount to almost $0.5 million annually.

This production value would generate a total of about $0.5 million to the State of New Mexico and San Juan County through severance taxes annually, assuming a tax rate of 8.84 percent. In addition, there would be approximately $0.75 million in Federal royalties, assuming a rate of 12.5 percent, paid to the U.S. Federal Government with about half being disbursed to the State of New Mexico as the state's share of Federal royalty.

4.11.2 Cumulative Effects of Alternative B (Proposed Action) on Socioeconomics

Cumulative socioeconomic impacts are estimated for each of the alternatives by estimating the activities and production associated with full field development using either horizontal or directional drilling techniques. The cumulative impacts analysis area for socioeconomics is the BLM/FFO planning area.

4.12 Transportation and Traffic

4.12.1 Direct and Indirect Effects of Alternative B (Proposed Action) on Traffic and Transportation

The analysis conducted for the Middle Mesa POD determined that there would be an increase of approximately 10 to 12 vehicle trips per day during the winter closure period (USDI/BLM. 2011*a*). Table 4-12 provides a summary of the average daily vehicle trips per alternative. Roads are expected to be used more frequently during construction and drilling of wells than during maintenance and production stages. The number of vehicle trips during the remainder of the year would be similar to the existing baseline: an average of 30 vehicle trips per day. Design measures such as the residential camp and use of produced water for stimulation have been developed to minimize the number of vehicle trips under the Proposed Action.

Table 4-12. Summary average daily vehicle trips per alternative.

During Drilling and Completion			
	Alternative B	**Alternative C** [1]	**Percent Difference**
Average Daily Vehicle Trips Between December and March	20	12	60
Average Daily Vehicle Trips Remainder of the Year	30	30	No Change
During Operation			
Total Annual Vehicle Trips	8,640	8,640	No Change
Average Daily Vehicle Trips Between December and March	25	25	No Change
Average Daily Vehicle Trips Remainder of the Year	25	25	No Change

1 Alternative C would not increase traffic levels above the current baseline as WPX Energy currently drills about 9 wells per year and would continue to drill about 9 wells a year.

Based on an increase of 12 vehicle trips per day during the winter closure, Table 4-13 shows the estimated percent increase on La Plata County Roads from the Proposed Action. Given the fluctuation in traffic counts on La Plata County Roads 330 and 328 (refer to Table 3-8), the average daily traffic counts in Table 4-13 are an average of the last 4 years for each segment.

4.12.3 Direct and Indirect Effects of Alternative C on Traffic and Transportation

WPX Energy currently drills nine wells or fewer per year in the Middle Mesa portion of the Rosa Unit. WPX Energy would continue to drill up to nine vertical/directional wells per year. Currently, an average of 10 to 12 vehicle trips per day occur during the winter closure period for operations and maintenance on completed wells. For the remainder of the year when drilling is occurring, there is an average of 30 vehicle trips per day (USDI/BLM 2011*a*). Traffic levels are not expected to increase above the current baseline. There would be no direct or indirect effects to traffic and transportation from baseline traffic levels.

4.12.4 Cumulative Effects of Alternative C on Traffic and Transportation

No cumulative effects beyond those already analyzed in the PRMP/FEIS on traffic and transportation would occur under Alternative C.

4.13 Visual Resources

The Middle Mesa portion of the Rosa Unit is located within a Class II VRM area. The 2009 VRI classified the area as displaying Class IV VRM values based on landscape changes over the last 30 years. There are no designated scenic areas within the project area. However, Navajo Reservoir would be considered a sensitive receptor.

4.13.1 Direct and Indirect Effects of Alternative B (Proposed Action) on Visual Resources

During construction and drilling operations, the effects of disturbed ground, machinery emissions, above-ground storage tanks, and the presence of the drill rig and construction equipment would result in short-term visual impacts readily visible from access roads. These impacts would be localized around the drilling rig but may be seen from vantages on Navajo Reservoir. Since the well pads would be twinned with existing locations that support above-ground structures and equipment, the level of change following reclamation would be weak to nonexistent in form, line, texture, and color.

Neither the water line nor the two fluids management pits are visible from Navajo Reservoir. The proposed water line would result in short-term impacts during construction and until the area has been reclaimed. Additionally, the fluids management pits would result in short-term impacts for the duration of drilling and completion (about 5 years). Long-term effects would be related to existing landform, vegetation, and structure changes resulting in a weak to moderate degree of contrast in form, line, texture, and color.

4.13.2 Cumulative Effect of Alternative B (Proposed Action) on Visual Resources

The cumulative impact assessment area for visual resources is the Navajo Reservoir watershed.

Existing disturbances have contributed to the current VRM ratings and the VRI classification for the project area. Cumulative impacts have resulted from oil and gas, and electric transmission development on federal and private lands, vegetation management, and residential development on private lands.

5. CONSULTATION AND COORDINATION

The environmental document was prepared by Ecosphere Environmental Services in conformance with the standards of, and under the direction of, the BLM/FFO. This section includes individuals or organizations from the public, public land users, and the interdisciplinary team that were contacted during the development of this document.

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7. GLOSSARY

Acre-foot – Volume of water required to cover 1 acre to a depth of 1 foot: equivalent to a volume of 43,560 cubic feet, approximately 325,829 gallon, or approximately 7,758 barrels.

Abandonment – Termination of fluid minerals operations, production operations, removal of facilities, plugging of the well bore, and reclamation of surface disturbances.

Affected Environment – Surface or subsurface resources (including social and economic elements) within or adjacent to a geographic area that potentially could be affected by gas development and production activities. The environment of the area to be affected or created by the alternatives under consideration (40 CFR 1502.15).

Alternative – A combination of management prescriptions applied in specific amounts and locations to achieve a desired management emphasis as expressed in goals and objectives. One of a number of plans or projects proposed for decision-making.

Ambient (air) – The surrounding atmospheric conditions to which the general public has access.

Blowout preventer – A large valve at the top of a well that may be closed if the drilling crew loses control of formation fluids.

Casing – Steel pipes of varying diameter and weight, joined together by threads and couplings, "inserted" into the well bole for the purpose of supporting the walls of the well and preventing them from caving in. Surface casing is inserted from the ground surface to approximately 250 feet, production casing is inserted to the total depth of the well (smaller diameter pipe than surface casing), cemented in place, and latter perforated for production.

Christmas tree – An assemblage of valves, located at the top of the casings, from which tubing in the well is suspended.

Closed-loop system – a typical closed-loop system includes a series of linear-motion shakers, mud cleaners, and centrifuges followed by a dewatering system. The combination of equipment typically results in a "dry" location where a reserve pit is not required for cuttings and drilling mud.

Co-location – a well pad that is adjacent to or slightly overlaps an existing well pad.

Coalbed Methane – A gas associated with a coal seam.

Completion – The activities and methods to prepare a well for production. Includes installation of equipment for production from an oil or gas well.

Conditions of Approval (COA) – Conditions or provisions (requirements) under which an Application for a Permit to Drill or a Sundry Notice is approved.

Corridor – For purposes of this environmental assessment, a wide strip of land within which a proposed linear facility could be located.

Formation – A body of rock identified by lithic characteristics and stratigraphic position; it is prevailingly but not necessarily tabular, and is mappable at the earth's surface or traceable in the subsurface.

Fugitive dust – Dust particles suspended randomly in the air from road travel, excavation, and/or other operations.

Gas buster - A simple separator vessel used to remove free or entrained gas from fluids circulated in the wellbore, such as mud used during drilling operations. The gas buster typically comprises a vessel containing a series of baffles with a liquid exit on the bottom and a gas-vent line at the top of the vessel.

Green completion – during the flowback stage of the completion, natural gas produced with the water is separated from the water and placed in a pipeline instead of being released to the atmosphere.

Habitat – A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and living space.

Habitat Fragmentation – The disruption (by division) of extensive habitats into smaller habitat patches. The effects of habitat fragmentation include loss of habitat area and the creation of smaller, more isolated patches of remaining habitat.

Habitat Type – An aggregation of all land areas potentially capable of producing similar plant communities at climax.

Historic – Archaeological and archivally known sites related to the activities of non-native peoples, whether they are of Euro-American, Afro-American or Asian-American origin, in the period after the European discovery of the New World (ca. A.D. 1492).

Horizontal drilling – A subset of the more general term "directional drilling," used where the departure of the wellbore from vertical exceeds about 80 degrees. Because a horizontal well typically penetrates a greater length of the reservoir, it can offer significant production improvement over a vertical well.

Hydraulic Fracturing – A method of stimulating production by increasing the permeability of the producing formation.

Hydrocarbons – Organic compounds of hydrogen and carbon, whose densities, boiling points, and freezing points increase as their molecular weights increase. Although composed mostly of carbon and hydrogen, hydrocarbons exist in a great variety of compounds, owing to the strong affinity of the carbon atom for other atoms and itself. The smallest molecules are gaseous; the largest are solids. Petroleum is a mixture of many different hydrocarbons.

Impact – A modification of the existing environment caused by an action (such as construction or operation of facilities).

Indirect Impacts – Secondary effects that occur in locations other that the initial action or later in time.

public health) and secondary standards (based on the air quality criteria and allowing an adequate margin of safety and requisite to protect the public welfare) from any unknown or expected adverse effects of air pollutants.

National Environmental Policy Act of 1969 (NEPA) – An Act that encourages productive and enjoyable harmony between man and his environment and promotes efforts to prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; enriches the understanding or the ecological systems and natural resources important to the Nation, and establishes the Council on Environmental Quality.

Noxious Weed – An undesirable weed species that can crowd out more desirable species.

Produced water – Groundwater pumped to the surface during reservoir production.

Proposed Action – Construction activities, alignments, and other activities proposed by the applicant.

Raptor – Bird of prey with sharp talons and strongly curved beak; e.g., hawk, owl, vulture, eagle.

Reasonably Foreseeable Development Scenario (RFDS) – The prediction of the type and amount of oil and/or gas that would occur in a given area.

Reclamation – The process of converting disturbed land to its former use or other productive uses.

Record of Decision – A document separate from, but associated with, an environmental impact statement that publicly and officially discloses the responsible official's decision on the proposed action.

Reserve Pit - (1) Usually an excavated pit that may be lined with plastic that holds drill cuttings and waste mud. (2) Term for the pit that holds the drilling mud.

Reservoir (oil and gas) – A naturally occurring, underground container of oil and gas, usually formed by deformation of strata and changes in porosity.

Riparian – Situated on or pertaining to the bank of a river, stream, or other body of water. Normally used to refer to the plants of all types that grow along, around, or in wet areas.

San Juan Basin – A large geologic basin located in northwestern New Mexico and southwestern Colorado that has been extensively drilled for oil and gas and is reportedly the second largest gas producing basin in the continental United States.

Scoping – A term used to identify the process for determining the scope of issues related to a proposed action and for identifying significant issues to be addressed in an EIS.

Seasonal timing limitation – A restriction on activities for a specific annual period.

Significant – An effect that is analyzed in the context of the proposed action to determine the degree or magnitude of importance of the effect, either beneficial or adverse. The degree of significance can be related to other actions with individually insignificant but cumulatively significant impacts.

Slope – The degree of deviation of a surface from the horizontal.

APPENDIX A
AUTHORIZING ACTIONS

This Environmental Assessment is prepared under the authority of the National Environmental Policy Act of 1969 (NEPA) (42 USC 4321-4347) and Federal regulations found in the Council on Environmental Quality Regulations (40 CFR 1500-1508).

Multiple use, as mandated by the Federal Land Policy and Management Act of 1976, requires that public lands be managed so that the use of some lands are for "a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and nonrenewable resources, including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish..." (43 USC 35).

Federal law mandates protection of some surface resources that are potentially affected by the development of the proposed action alternative. Cultural resources threatened by development are protected by the Antiquities Act of 1906 (PL 52-209), the National Historic Preservation Act of 1966 (PL 89-665 and PL 52-209) and its regulations (36 CFR 800), and other legislation including NEPA (PL 91-852) and its regulations (40 CFR 1500-1508), the 1971 Executive Order No. 11593, the Archaeological and Historical Conservation Act of 1974 (PL 93-291), the Archaeological Resources Protection Act of 1979 (PL 96-95) and its regulations (36 CFR 296), the American Indian Religious Freedom Act (48 USC 1996), and the Native American Graves Protection and Repatriation Act of 1990. Compliance with Section 106 responsibilities of the National Historic Preservation Act are adhered to by following the BLM–New Mexico State Historic Preservation Office protocol agreement, which is authorized by the National Programmatic Agreement between the Bureau of Land Management (BLM), the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers, and other applicable BLM handbooks.

Under Section 402 of the Clean Water Act, as amended (33 USC § 1251 et seq.), the U.S. Environmental Protection Agency was directed to develop a phased approach to regulate storm water under the National Pollutant Discharge Elimination System (NPDES) program. Industrial activities disturbing land may require permit coverage through a NPDES storm water discharge. Depending on the acreage disturbed, either a Phase I industrial activity (five or more acres disturbance) or a Phase II small construction activities (between 1 and 5 acres disturbance) permit may be required. For oil and gas NPDES permitting requirements, review 40 CFR 122.26(c)(1)(iii). Additionally, a U.S. Army Corps of Engineers Section 404 Permit for the discharge or dredge and fill materials may also be required. Operators are required to obtain all necessary permits and approvals prior to any disturbance activities.

Surface water resources are protected from oil pollution sources by the Federal Water Pollution Control Act (40 CFR 112). The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 and other Federal regulations are designed to control the releases of hazardous materials into the environment and to direct the handling of response to accidental spills.

The New Mexico Energy, Minerals, and Natural Resources Department requires oil and gas operators to follow "pit rule" guidelines contained with the New Mexico Administrative Code 19.15.17 to reduce the potential for groundwater contamination from industry-related activities.

Threatened and endangered flora and fauna species are protected under the Endangered Species Act of 1973, as amended (PL 94-325). Additionally, the Migratory Bird Treaty Act (16 USC 703-712) and the

Eagle Protection Act (16 USC 668-668d) protect other wildlife species potentially occurring in the proposed project area.

Executive Order 11312 of 1999, "Invasive Species," establishes measures to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause. The Executive Order provides guidelines to Federal Agencies to contend with invasive species, to create an Invasive Species Council, and to implement an Invasive Species Management Plan.

The Federal Plant Protection Act of June 2000, the Federal Noxious Weed Act of 1974 (Section 2814), and the New Mexico Statutes Annotated (NMSA) 1978, "Noxious Weed Control Act," provide for the control and management of non-indigenous weeds that injure or have the potential to injure the interests of agriculture and commerce, wildlife resources, or the public health.

Air quality standards in New Mexico are under the jurisdiction of the New Mexico Environment Department/Air Quality Bureau (NMED/AQB). The Environmental Improvement Act, NMSA 1978, and the Air Quality Control Act, NMSA 1978, dictate state air quality standards. Also, 40 CFR 60, "Standards of Performance for New Stationary Sources," is administered by the NMED/AQB.

Executive Order 12898 of 1994, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires implementing procedures to insure that proposed projects within the auspices of Federal agencies do not result in disproportionate shares of negative environmental impacts affecting any group of people due to a lack of political or economic strength. Environmental justice requires "...the fair treatment of people of all races, cultures, incomes, and educational levels with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies." As such, this document includes an assessment of the impacts of the project on minority and low-income populations.

The New Mexico Energy, Minerals, and Natural Resources Department requires oil and gas operators to follow "pit rule" guidelines contained with New Mexico Administrative Code 19.15.17 to reduce the potential for groundwater contamination from industry-related activities.

Additionally, WPX Energy San Juan, LLC would comply with all applicable Federal, State, and local laws and regulations; obtain the necessary permits for drilling, construction, and operation; and certify that Surface Use Agreements have been reached with the private landowners, where required.

APPENDIX B
COMMENT RESPONSE

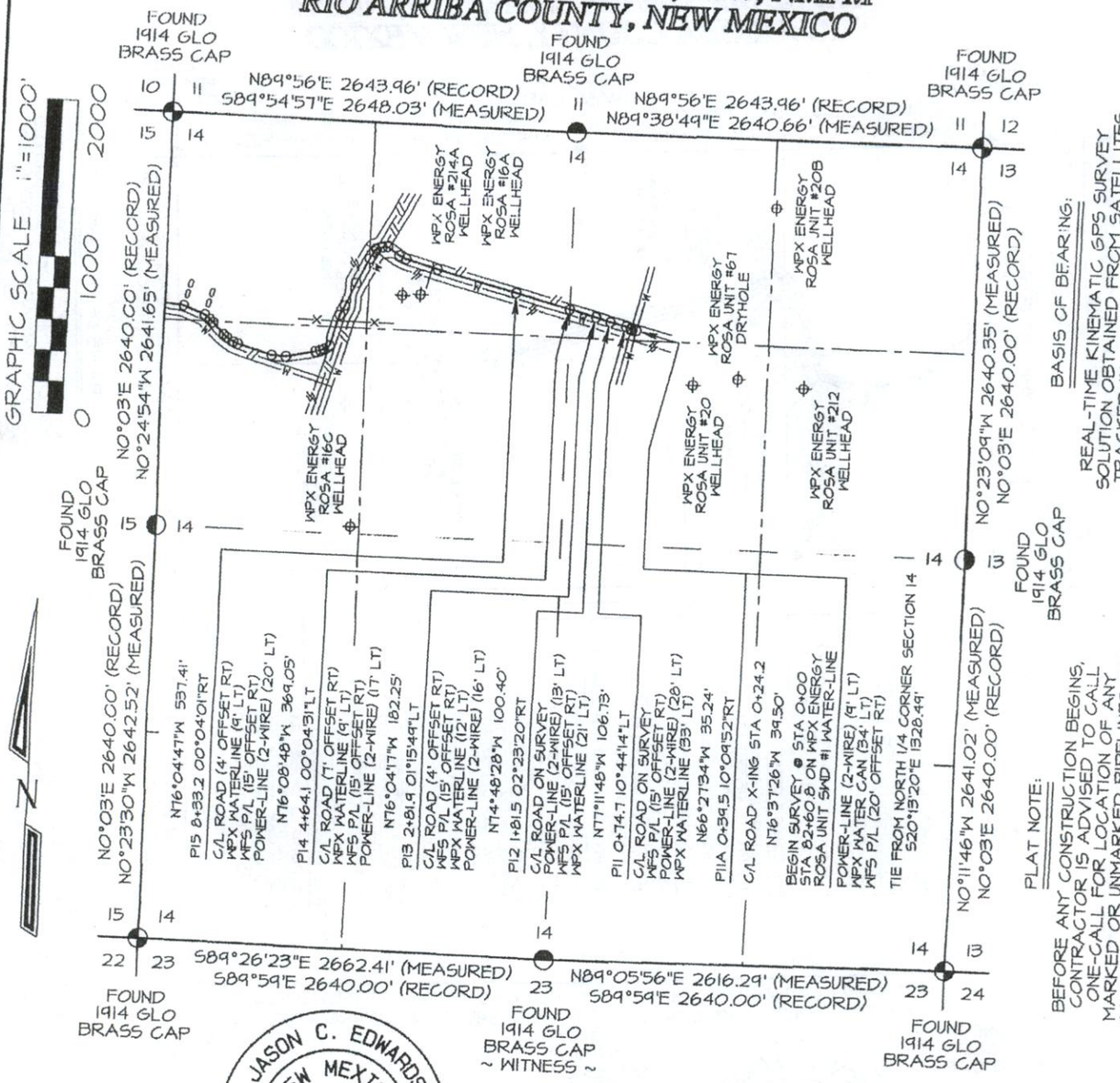
Commenter	Page/ Paragraph	Category	Comment	Action	Response
WildEarth Guardians		General	Request that if the BLM moves to issue the proposed APDs, that the agency review and respond to our prior comments on the Middle Mesa POD.	Beyond Scope of EA	Comments on the Middle Mesa Plan of Development (POD) were addressed in the Final Middle Mesa POD Environmental Assessment (EA).
WildEarth Guardians		Air Quality	There is no estimate of indirect emissions, particularly NO2, VOC, and PM2.5. associated with activities like compressor station operations, frack pond construction and operation, pipeline pigging operations, land farming operation, and other waste disposal activities, power generation activities, including cogeneration facilities.	Already in Document	Emissions associated with the action are included in the baseline. Emissions from multi-well fluids management and waste disposal facilities were included in the emissions calculator. No compressor stations or power generation are proposed or anticipated to be proposed.
WildEarth Guardians		Air Quality	Complete a more robust analysis of air quality impacts and provide a reasonable basis for assessing the significance of impacts or prepare an EIS.	Already in Document	Air quality impacts are adequately analyzed in the EA. The action is consistent with the scale of development analyzed in the Resource Management Plan (RMP) Final Environmental Impact Statement (FEIS). The Farmington planning area is currently in attainment with all National and State Ambient Air Quality Standards (NAAQS/SAAS).
WildEarth Guardians		Water Quality	Request the BLM commit to ensuring baseline and post-drilling groundwater quality monitoring and adopt a Condition of Approval (COA) that prohibits and all groundwater contamination.	Beyond Scope of EA	The Bureau of Land Management (BLM) does not write Conditions of Approval (COA) for actions that are already regulated by other federal and state agencies.
WildEarth Guardians		Water Quality	Request that BLM adopt a COA that ensures no freshwater is used for the duration of proposed drilling.	Beyond Scope of EA	The BLM has a COA in place for water use in drilling. "Water acquired to construct, produce. and maintain actions authorized by this permit to drill must be acquired from permitted water sources, or water authorized for use by the New Mexico Oil Conservation Division (OCD). Upon request, the AO (authorized officer) shall be provided with documentation of water sources."
WildEarth Guardians		T&E Species	Request that BLM prepare a thorough biological assessment for the proposed APDs and formally consult with the USFWS over potential contamination, flow depletions or other impacts to Colorado pikeminnow and razorback sucker. BLM must address indirect effects. It does not appear that BLM assessed the potential for impacts to these species within the actual "action area".	Already in Document	In 1994, U.S. Fish and Wildlife Service (USFWS) designated critical habitat for the Colorado pikeminnow and the razorback sucker, located on the San Juan River in West Farmington and extending downstream to Lake Powell. The proposed project area is approximately 60 river miles from the start of the designated critical habitat for the pikeminnow and razorback sucker in Farmington. Even if there were some discharge of contaminants from the proposed project, the distance to the critical habitat and Navajo Dam (~ 14 river miles from proposed project area) would likely prevent any impacts to the pikeminnow or razorback sucker or their designated habitat. There are no new water depletions associated with this project. Water associated with this project will be produced water in

Commenter	Page/ Paragraph	Category	Comment	Action	Response
			estimated five years for the proposed action? IE. What will the generated ADT's be during and after construction?		
La Plata County	80; Section 4.12.1	Transportation	County roads are not included or discussed for increased vehicle trips wear and tear on roads at all. What is the current ADT for County Roads 328 and 330 and what would the proposed increase be? How will the impacts to gravel roads from the increased traffic and from oil and gas trucks using tire chains on county roads be mitigated?	Edit EA	Additional text has been added to this section.
La Plata County	81; Section 4.12.1	Transportation	The statement that the proposed action would not result in changes to the level of service for any roadways used is not backed up with any information. The existing level of service on county roads has not been identified and this statement is not taking into account additional proposed truck traffic on county roads. The estimated five years for the proposed action does not take into account the increase in traffic on county roads as 5 years of increased truck traffic has the potential to significantly damage county roads. What about the current county road-State Highway intersections? Are warrants already met for perk hour traffic for any turn lanes?	Edit EA	Additional text has been added to this section.
La Plata County	81; Section 4.12.2	Transportation	County roads are not included or discussed for increased vehicle trips wear and tear on roads at all.	Already in Document	Refer to section 4.12.
La Plata County	81; Section 4.12.2	Transportation	What are the current levels of traffic for operations and maintenance on county roads? Increased maintenance cost will result from increased heavy truck traffic.	Edit EA	Additional text has been added to this section.
La Plata County	81; Section 4.12.3	Transportation	If Alternative C does not use the proposed piping for water and plans to use haul trucks for water and completion, the increase of traffic on county roads is not addressed. Traffic levels would increase during the estimated five years of the proposed action and for the estimated duration of the well life. The "current baseline" should be identified.	Already in Document	Under Alternative C there would be no change in the current traffic levels. WPX currently drills 8 months a year within the Middle Mesa portion of the Rosa Unit. The current drilling program includes hauling produced water to disposal facilities.
La Plata County	81; Section	Transportation	Again, Alternative C is proposing to use haul trucks for water and completion, but increased	Already in Document	Under Alternative C there would be no change in the current traffic levels. WPX currently drills 8 months a year within the

APPENDIX C
APPLICATIONS FOR PERMIT TO DRILL

APPENDIX D
WATER MANAGEMENT SYSTEM PLATS

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE
N/2 OF SECTION 14, T31N, R6W, NMPM
RIO ARRIBA COUNTY, NEW MEXICO



JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Land Management	
0+00 TO 36+81.7	3681.7 FT / 223.1 RODS

I, Jason C. Edwards, a registered Professional Surveyor under the laws of the State of New Mexico, hereby certify that this plat was prepared from field notes of an actual survey meeting the minimum requirements of the standards for easement surveys and is true and correct to the best of my knowledge and belief.

JASON C. EDWARDS

Date: April 25, 2012

Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

Prepared for:
WPX ENERGY PRODUCTION
P.O. BOX #640
AZTEC, NM 87410

N C E

Land Surveyor:
Jason C. Edwards

Mailing Address:
Post Office Box 6612
Farmington, NM 87499

Business Address:
111 East Pinon Street
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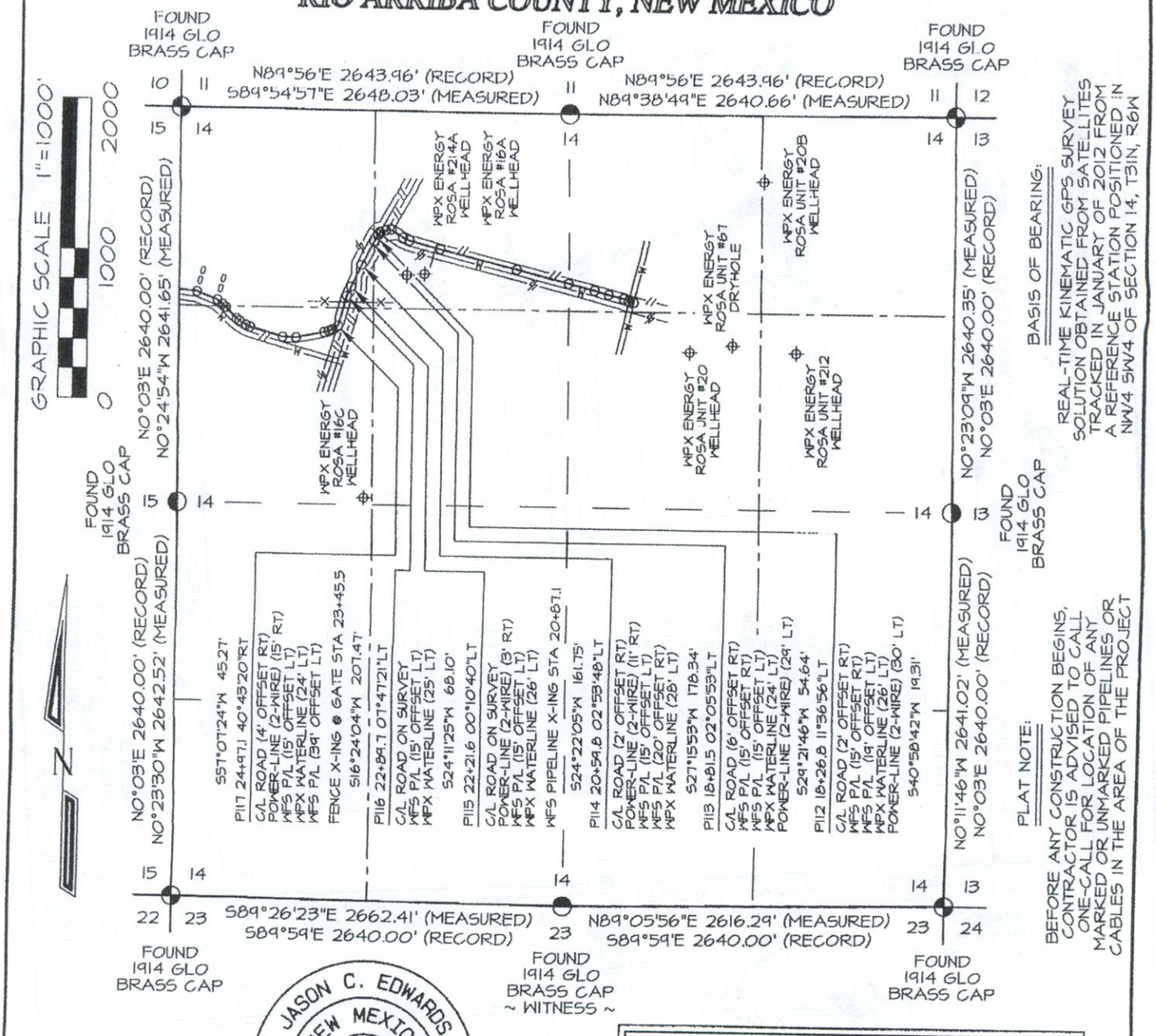
(505) 326-5650 (Fax)

SURVEYS, INC.

SHEET 1 OF 33 | CHECKED BY: JCE
FILENAME: 31614P61 | DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE N/2 OF SECTION 14, T31N, R6W, NMPM
RIO ARRIBA COUNTY, NEW MEXICO



BASIS OF BEARING:

REAL-TIME KINEMATIC GPS SURVEY SOLUTION OBTAINED FROM SATELLITES TRACKED IN JANUARY OF 2012 FROM A REFERENCE STATION POSITIONED IN NW/4 SW/4 OF SECTION 14, T31N, R6W

PLAT NOTE:

BEFORE ANY CONSTRUCTION BEGINS, CONTRACTOR IS ADVISED TO CALL ONE-CALL FOR LOCATION OF ANY MARKED OR UNMARKED PIPELINES OR CABLES IN THE AREA OF THE PROJECT

JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Land Management	
0+00 TO 36+81.7	3681.7 FT / 223.1 RODS

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JASON C. EDWARDS Date: April 25, 2012

Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

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AZTEC, NM 87410

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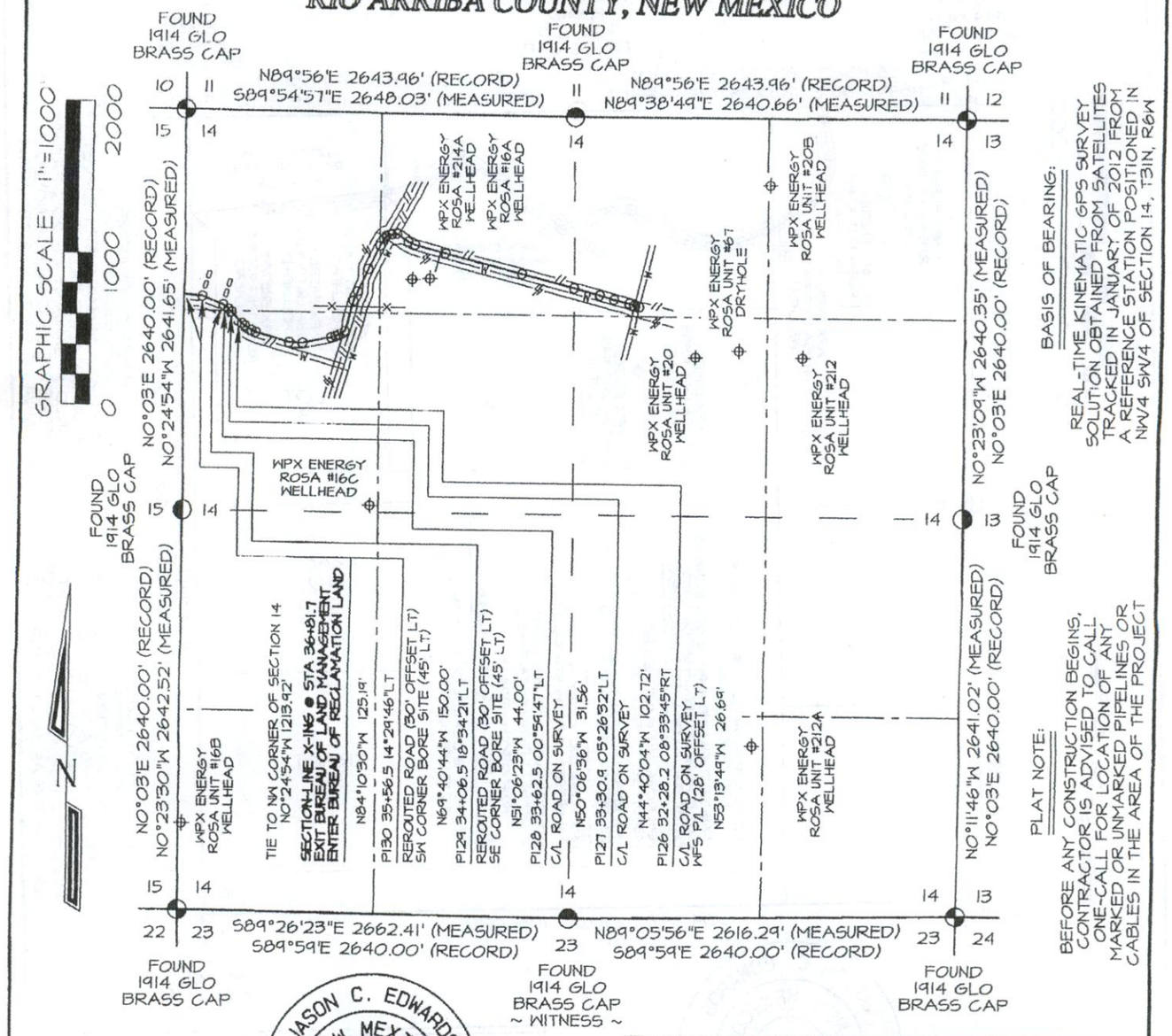
(505) 326-5650 (Fax)

SURVEYS, INC.

SHEET 3 OF 33 | CHECKED BY: JCE
FILENAME: 316141P03 | DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE
N/2 OF SECTION 14, T31N, R6W, NMPM
RIO ARRIBA COUNTY, NEW MEXICO



~ SURFACE OWNERSHIP ~ Bureau of Land Management	
0+00 TO 36+81.7	3681.7 FT / 223.1 RODS

JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

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JASON C. EDWARDS Date: April 25, 2012

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New Mexico L.S. #15269

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P.O. BOX #640
AZTEC, NM 87410

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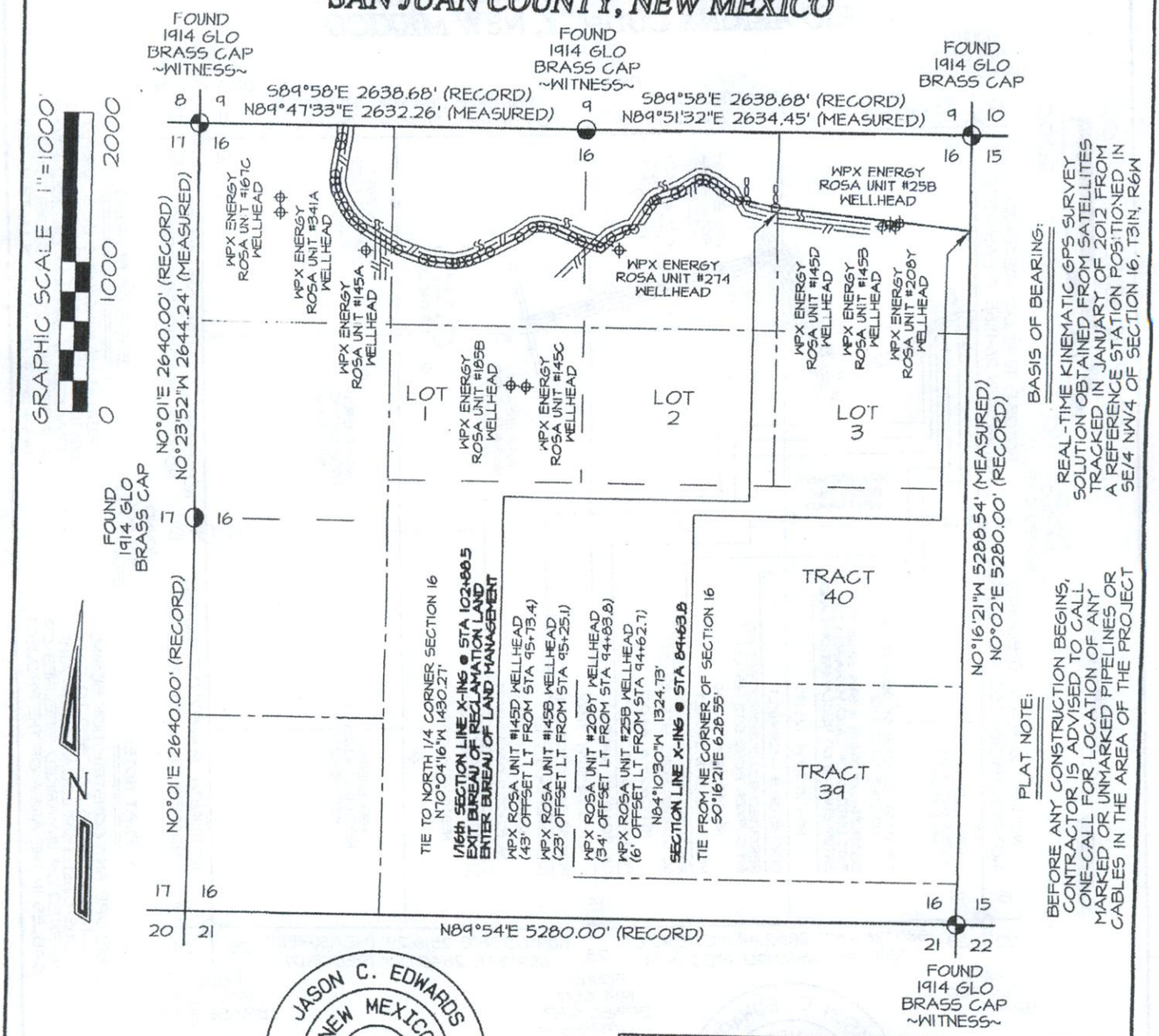
SHEET 5 OF 33 | CHECKED BY: JCE
FILENAME: 3161APGS | DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE N/2 N/2 OF SECTION 16, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO



BASIS OF BEARING:
REAL-TIME KINEMATIC GPS SURVEY SOLUTION OBTAINED FROM SATELLITES TRACKED IN JANUARY OF 2012 FROM A REFERENCE STATION POSITIONED IN SE/4 NW/4 OF SECTION 16, T31N, R6W

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JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Reclamation Land	
89+63.8 TO 102+88.5	1324.7 FT / 80.3 RODS

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JASON C. EDWARDS Date: April 25, 2012

Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

Prepared for:
WPX ENERGY PRODUCTION
P.O. BOX #640
AZTEC, NM 87410

N C E
SURVEYS, INC.

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Jason C. Edwards

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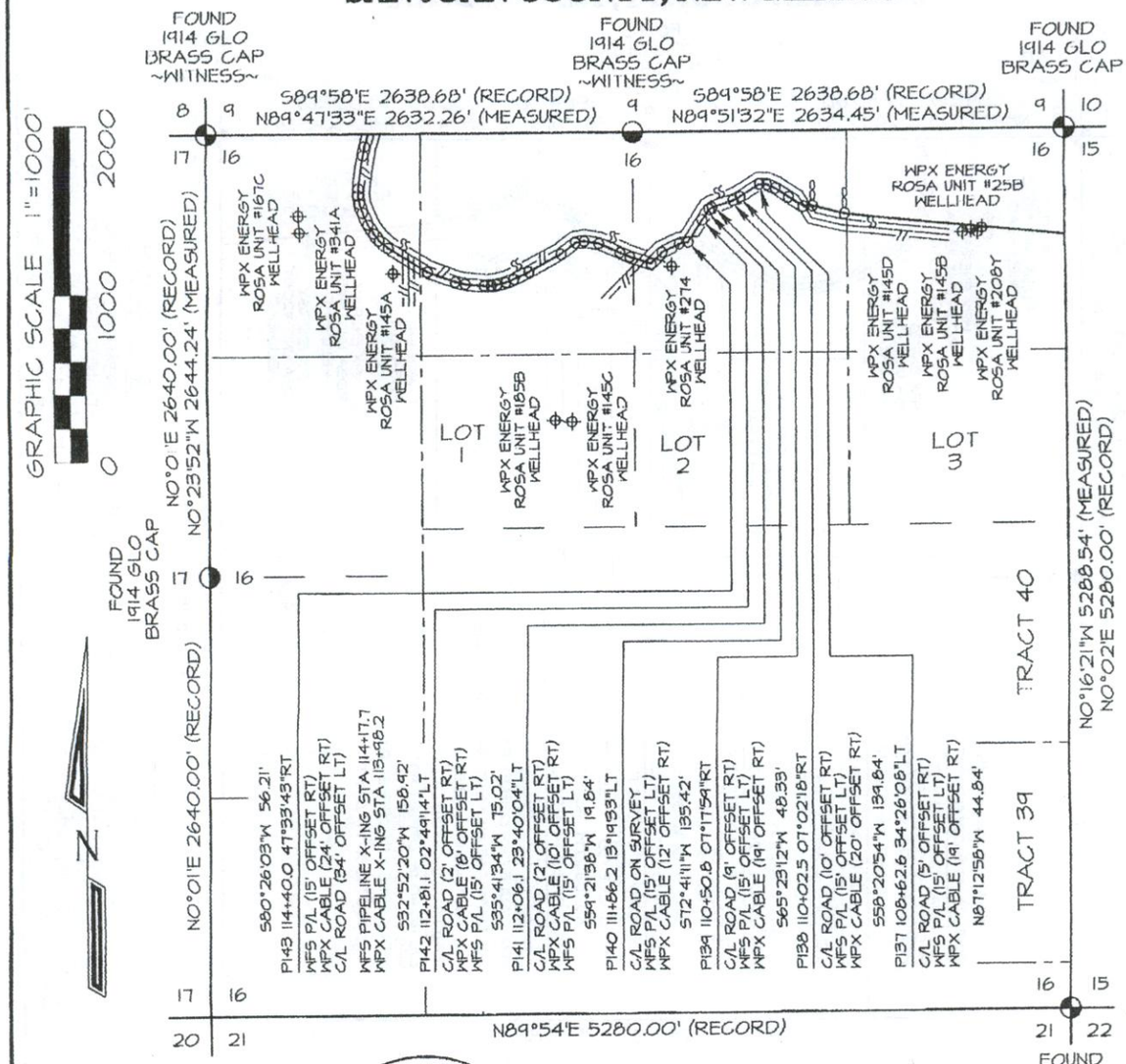
(505) 325-2654 (Office)
(505) 326-5650 (Fax)

SHEET 1 OF 33 | CHECKED BY: JCE
FILENAME: 3161GP67 | DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE N/2 N/2 OF SECTION 16, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO



BASIS OF BEARING:

REAL-TIME KINEMATIC GPS SURVEY SOLUTION OBTAINED FROM SATELLITES TRACKED IN JANUARY OF 2012 FROM A REFERENCE STATION POSITIONED IN SE/4 NW/4 OF SECTION 16, T31N, R6W

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JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Land Management	
102+88.5 TO 142+20.8	3932.3 FT / 238.3 RODS

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JASON C. EDWARDS Date: April 25, 2012

Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

Prepared for:
WPX ENERGY PRODUCTION
P.O. BOX #640
AZTEC, NM 87410

N C E

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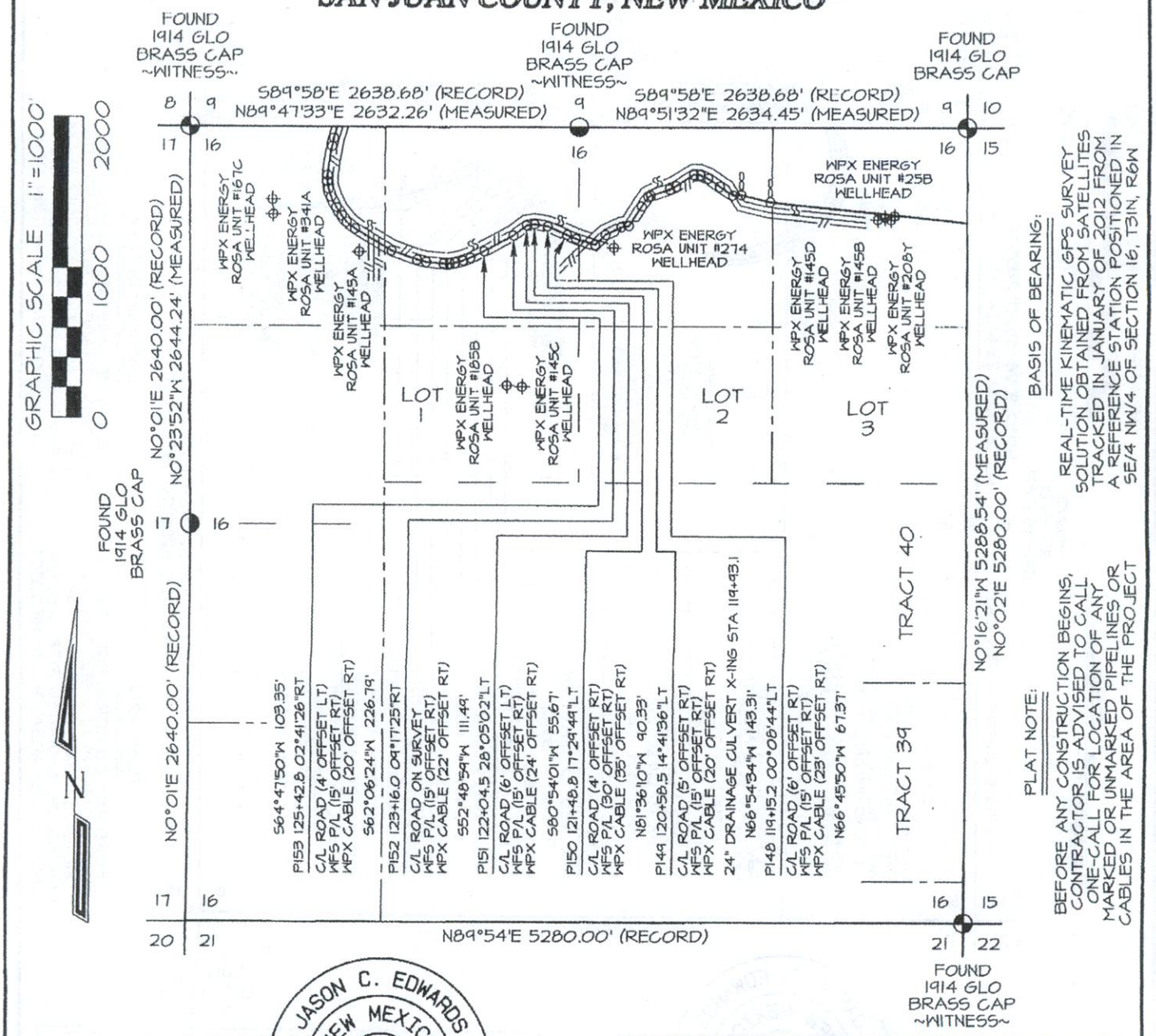
(505) 326-5650 (Fax)
SURVEYS, INC.

CHECKED BY: JCE
DRAWN BY: SLE
SHEET 9 OF 33
FILENAME: 3161GPSA

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE
N/2 N/2 OF SECTION 16, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO



BASIS OF BEARING:
REAL-TIME KINEMATIC GPS SURVEY SOLUTION OBTAINED FROM SATELLITES TRACKED IN JANUARY OF 2012 FROM A REFERENCE STATION POSITIONED IN SE/4 NW/4 OF SECTION 16, T31N, R6W

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JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Land Management	
102+88.5 TO 142+20.8	3932.3 FT / 238.3 RODS

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JASON C. EDWARDS Date: April 25, 2012

Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

Prepared for:
WPX ENERGY PRODUCTION
P.O. BOX #640
AZTEC, NM 87410

N C E
SURVEYS, INC.

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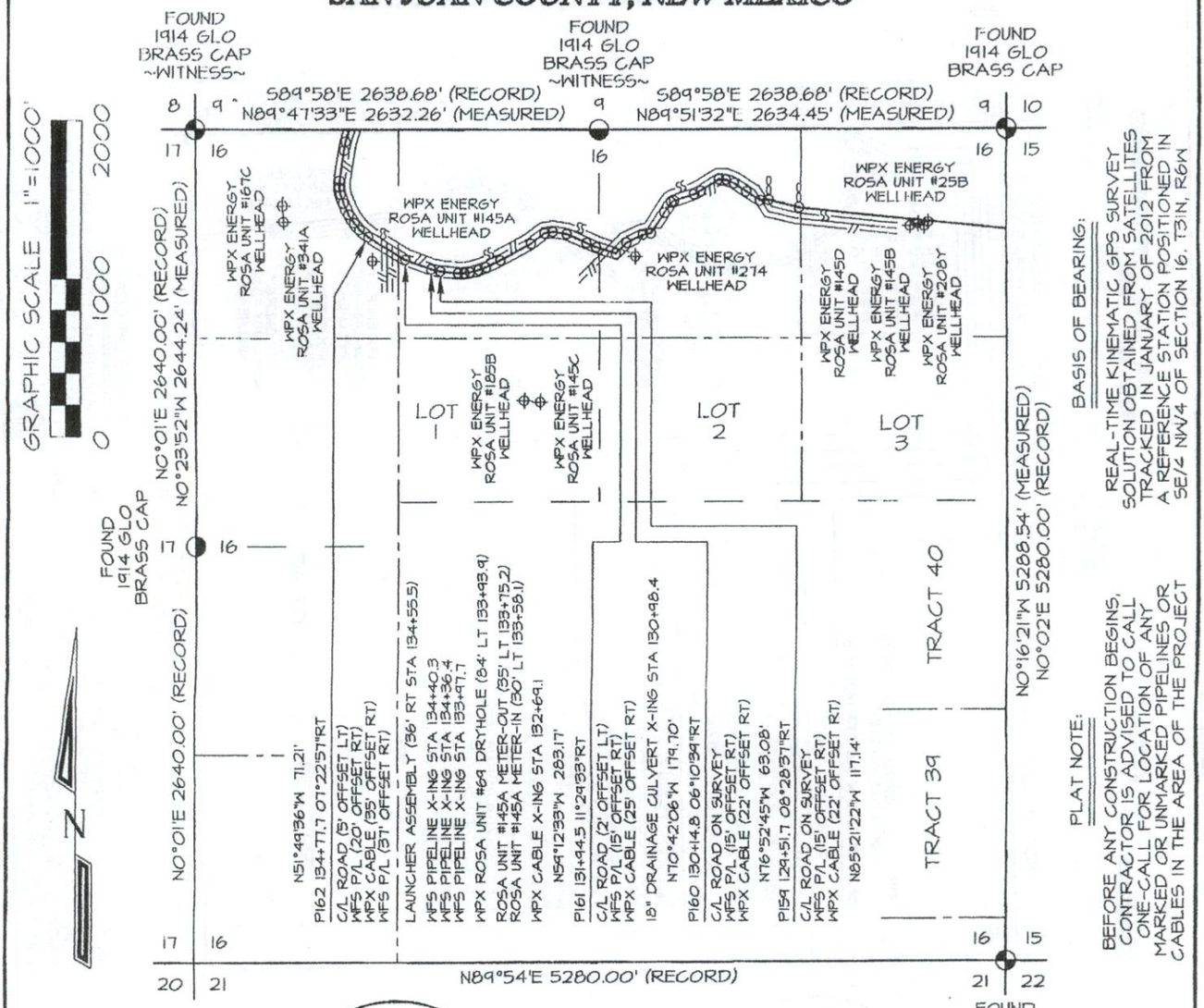
(505) 325-2654 (Office)
(505) 326-5650 (Fax)

SHEET 11 OF 33
FILENAME: 31616P11
CHECKED BY: JCE
DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE N/2 N/2 OF SECTION 16, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO



BASIS OF BEARING:

REAL-TIME KINEMATIC GPS SURVEY SOLUTION OBTAINED FROM SATELLITES TRACKED IN JANUARY OF 2012 FROM A REFERENCE STATION POSITIONED IN SE/4 NW/4 OF SECTION 16, T31N, R6W

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JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Land Management	
102+88.5 TO 142+20.8	3932.3 FT / 238.3 RODS

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JASON C. EDWARDS Date: April 25, 2012

Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

Prepared for:
WPX ENERGY PRODUCTION
P.O. BOX #640
AZTEC, NM 87410

N C E SURVEYS, INC.

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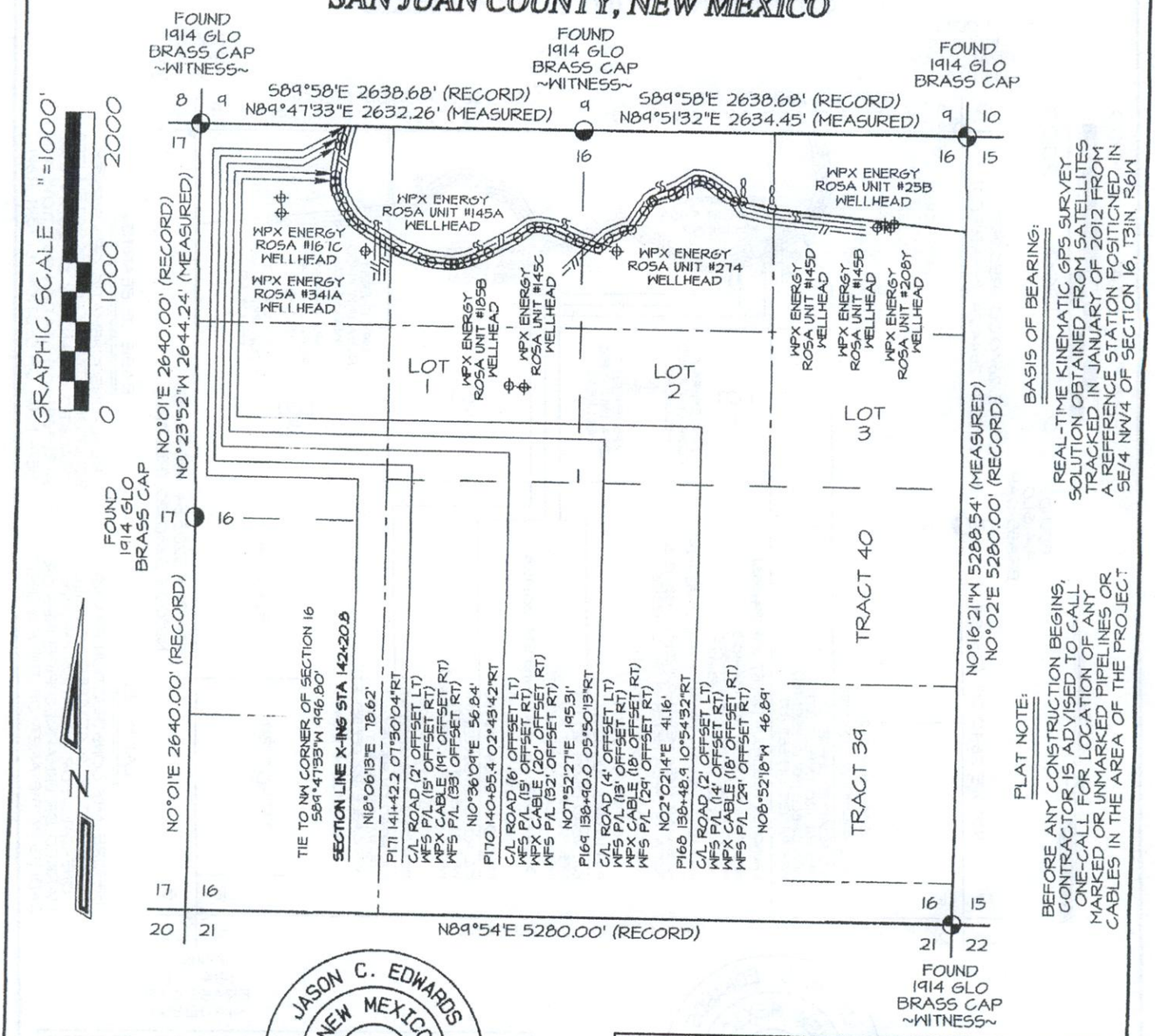
(505) 326-5650 (Fax)

SHEET 18 OF 35 | CHECKED BY: JCE
FILENAME: 3616P18 | DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE N/2 N/2 OF SECTION 16, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO



BASIS OF BEARING:

REAL-TIME KINEMATIC GPS SURVEY SOLUTION OBTAINED FROM SATELLITES TRACKED IN JANUARY OF 2012 FROM A REFERENCE STATION POSITIONED IN SE/4 NW/4 OF SECTION 16, T31N R6W

PLAT NOTE:

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JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Land Management	
102+88.5 TO 142+20.8	3932.3 FT / 238.3 RODS

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JASON C. EDWARDS Date: April 25, 2012

Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

Prepared for:
WPX ENERGY PRODUCTION
P.O. BOX #640
AZTEC, NM 87410

NCE SURVEYS, INC.

Land Surveyor:
Jason C. Edwards
Mailing Address:
Post Office Box 6612
Farmington, NM 87499
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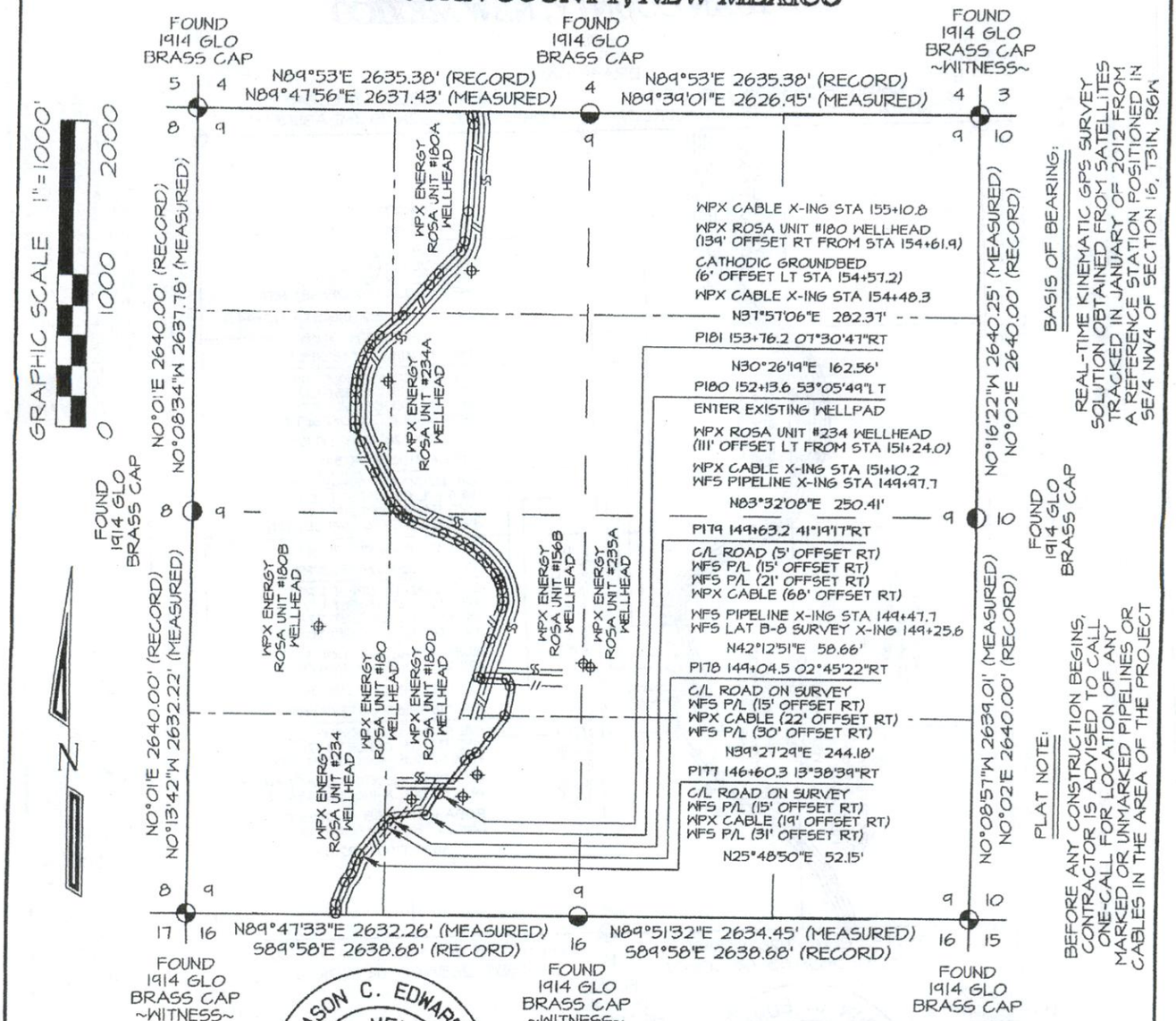
111 East Pinon Street
Farmington, NM 87402
(505) 325-2654 (Office)
(505) 326-5650 (Fax)

SHEET 15 OF 33 | CHECKED BY: JCE
FILENAME: 316165115 | DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING PROPOSED WATER-LINE SURVEY LOCATED IN THE W/2 OF SECTION 9, T31N, R6W, NMPM SAN JUAN COUNTY, NEW MEXICO



JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Land Management	
142+20.8 TO 209+59.3	6738.5 FT / 408.4 RODS

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JASON C. EDWARDS Date: April 25, 2012

Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

Prepared for:
WPX ENERGY PRODUCTION
P.O. BOX #640
AZTEC, NM 87410

N C E

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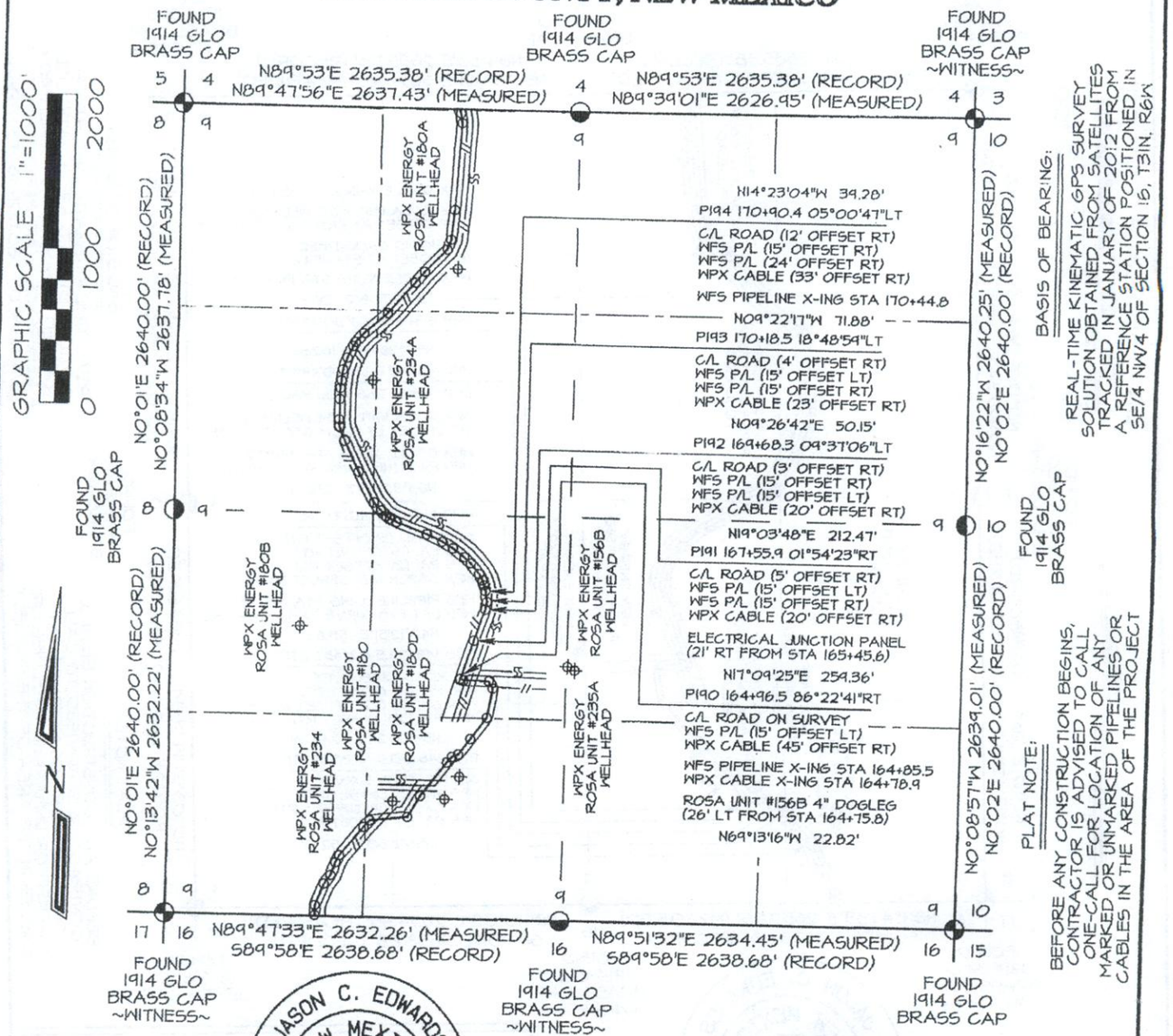
SURVEYS, INC.

CHECKED BY: JCE
DRAWN BY: SLE
SHEET 17 OF 33
FILENAME: 3169PG17

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE W/2 OF SECTION 9, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO



JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Land Management	
142+20.8 TO 209+59.3	6738.5 FT / 408.4 RODS

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JASON C. EDWARDS Date: April 25, 2012

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New Mexico L.S. #15269

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AZTEC, NM 87410

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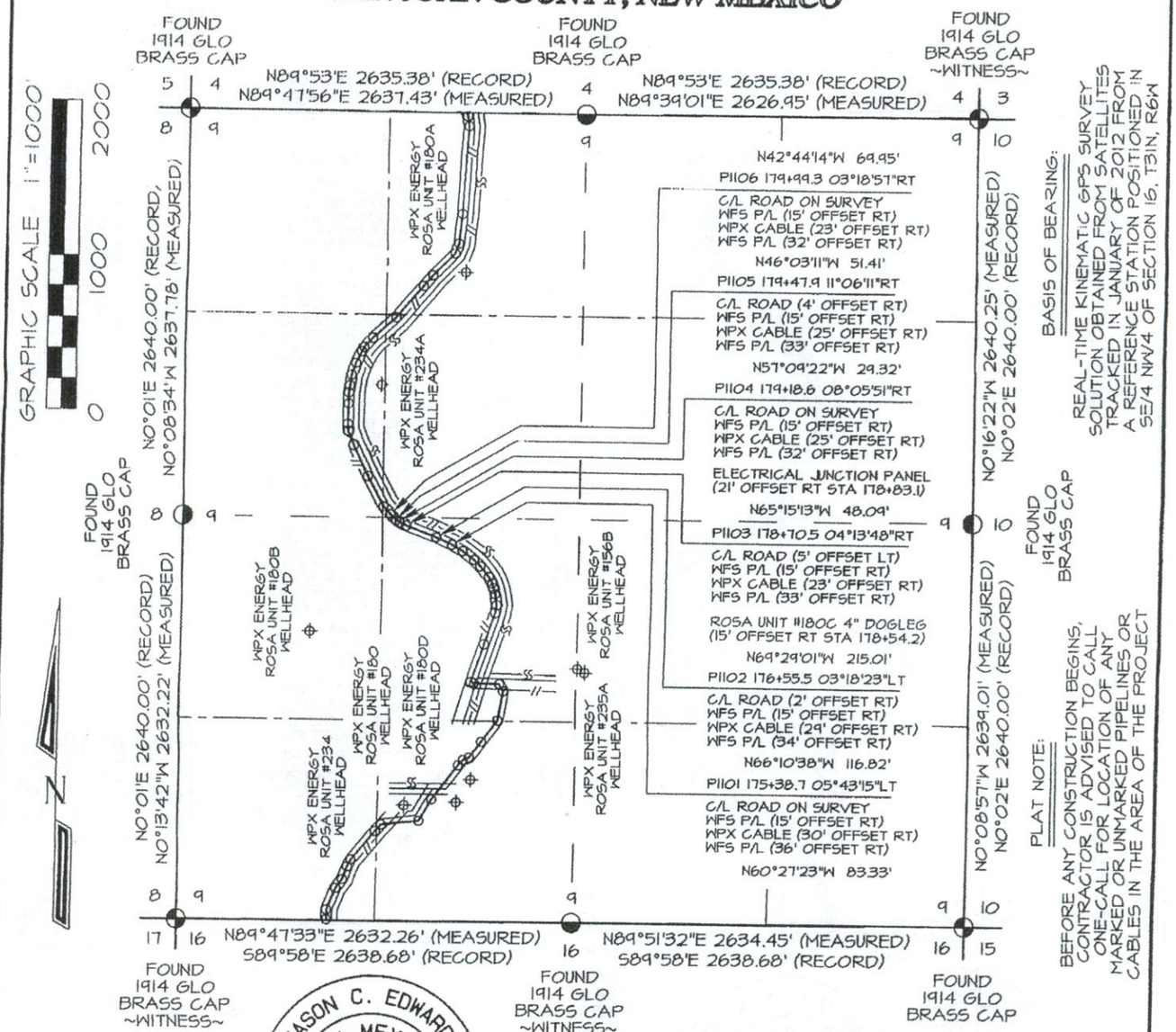
SURVEYS, INC.

CHECKED BY: JCE
DRAWN BY: SLE
SHEET 19 OF 39
FILENAME: 3169PG19

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE W/2 OF SECTION 9, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO



~ SURFACE OWNERSHIP ~ Bureau of Land Management	
142+20.8 TO 209+59.3	6738.5 FT / 408.4 RODS

JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

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New Mexico L.S. #15269

Prepared for:
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AZTEC, NM 87410

N C E

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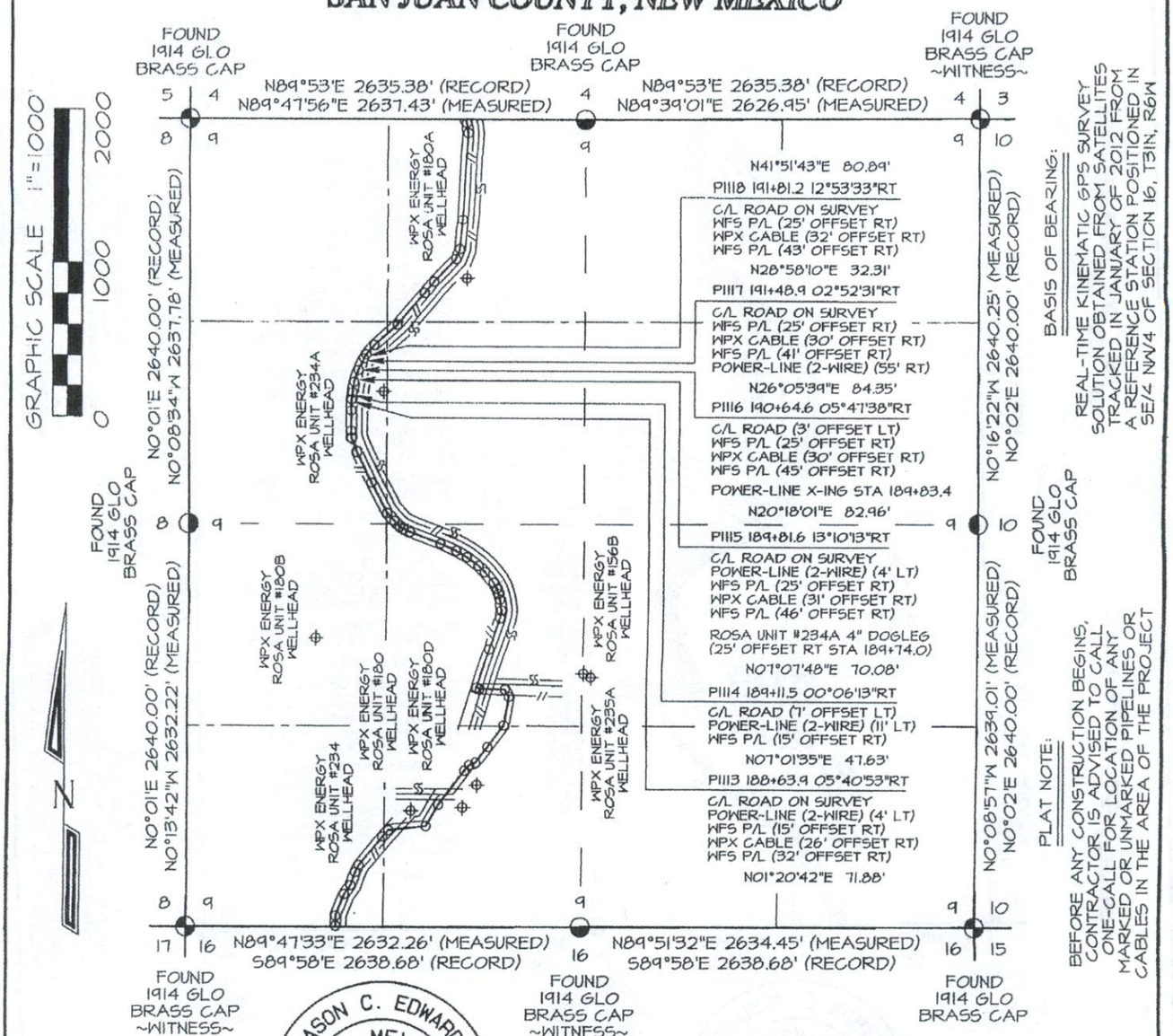
SURVEYS, INC.

SHEET 21 OF 33 | CHECKED BY: JCE
FILENAME: 3164P621 | DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE W/2 OF SECTION 9, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO



JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Land Management	
142+20.8 TO 209+59.3	6738.5 FT / 408.4 RODS

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JASON C. EDWARDS Date: April 25, 2012

Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

Prepared for:
WPX ENERGY PRODUCTION
P.O. BOX #640
AZTEC, NM 87410

N C E

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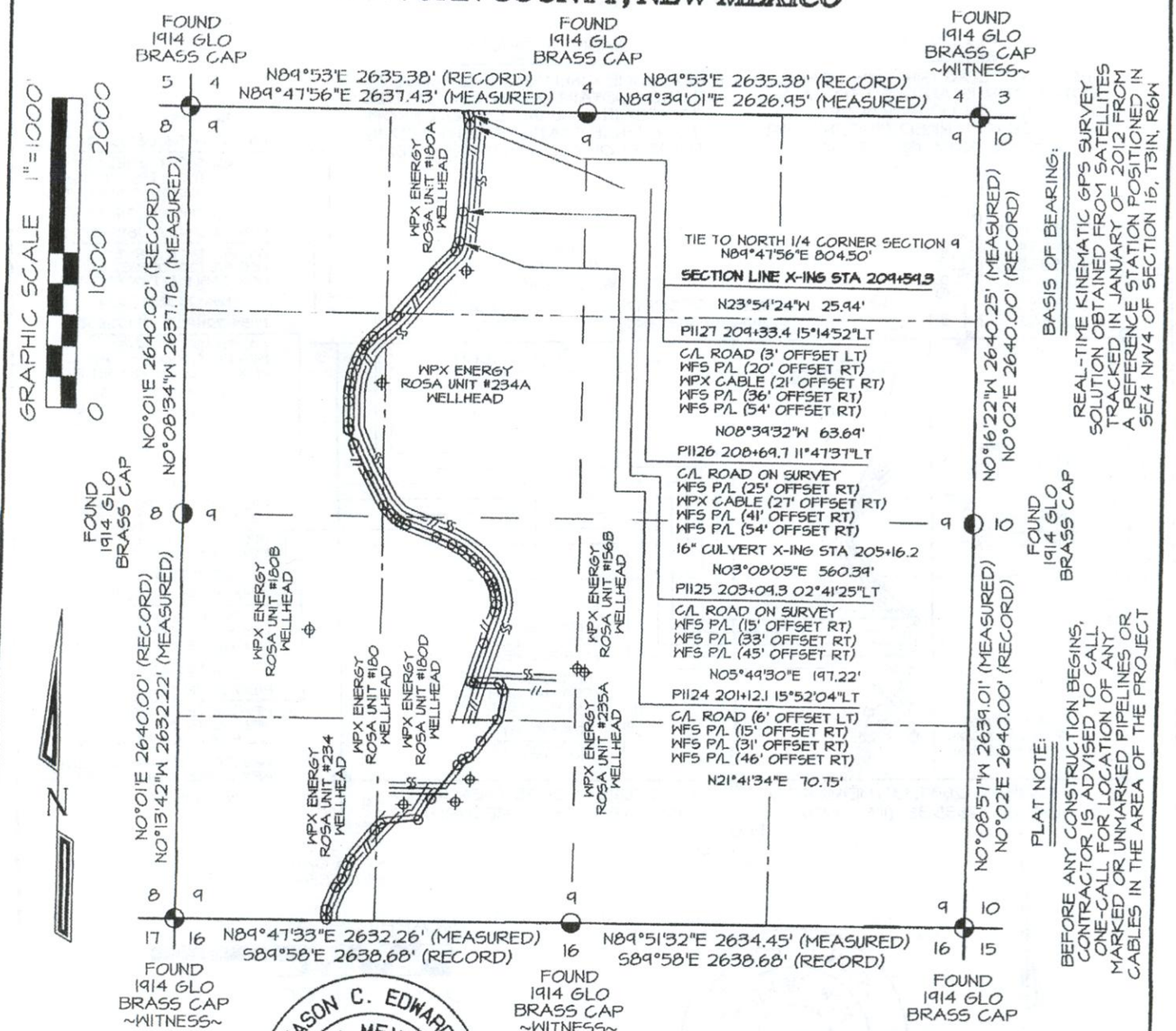
SURVEYS, INC.

SHEET 23 OF 33 | CHECKED BY: JCE
FILENAME: 3164P023 | DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE W/2 OF SECTION 9, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO



JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Land Management	
142+20.8 TO 209+59.3	6738.5 FT / 408.4 RODS

I, Jason C. Edwards, a registered Professional Surveyor under the laws of the State of New Mexico, hereby certify that this plat was prepared from field notes of an actual survey meeting the minimum requirements of the standards for easement surveys and is true and correct to the best of my knowledge and belief.

JASON C. EDWARDS Date: April 25, 2012

Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

Prepared for:
WPX ENERGY PRODUCTION
P.O. BOX #640
AZTEC, NM 87410

N C E

Land Surveyor:
Jason C. Edwards

Mailing Address:
Post Office Box 6612
Farmington, NM 87499

Business Address:
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Farmington, NM 87402
(505) 325-2654 (Office)
(505) 326-5650 (Fax)

SURVEYS, INC.

SHEET 25 OF 33 | CHECKED BY: JCE
FILENAME: 316PG25 | DRAWN BY: SLE

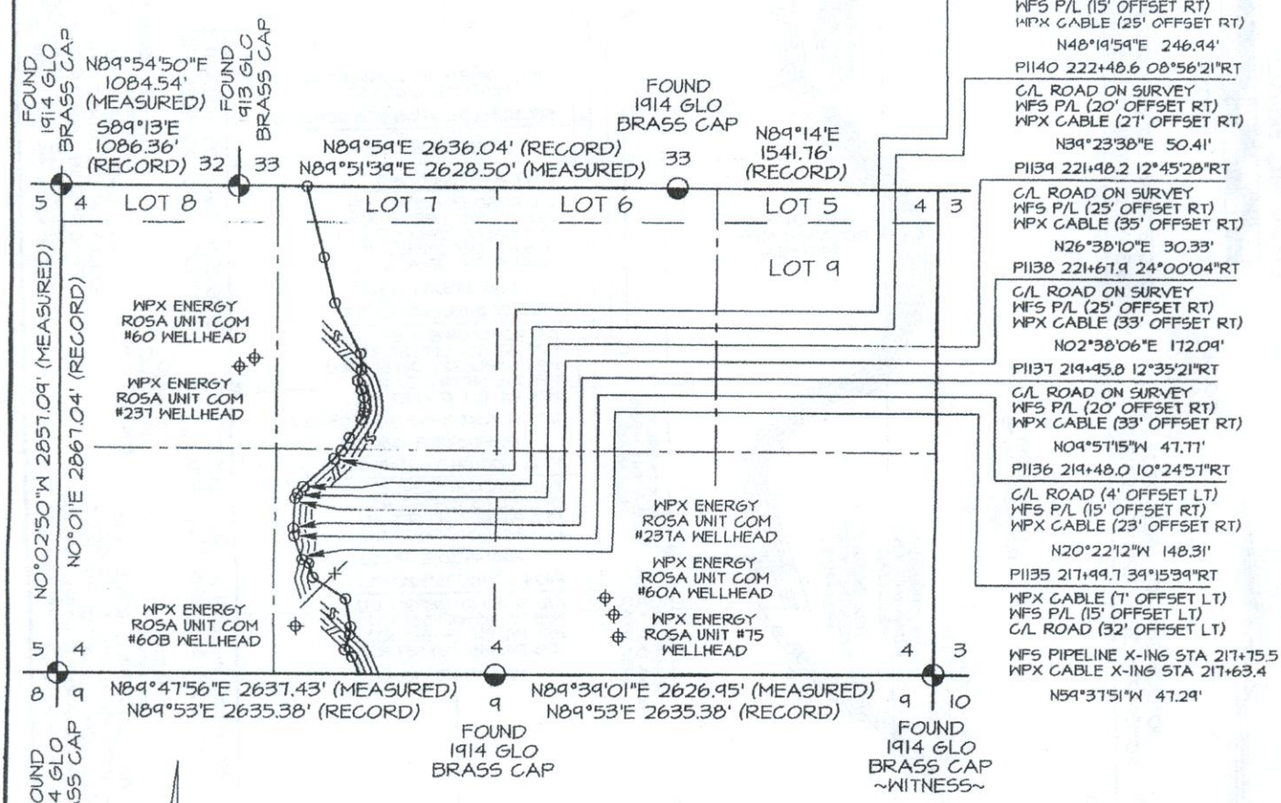
WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE
E/2 W/2 OF SECTION 4, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO

PLAT NOTE:

BEFORE ANY CONSTRUCTION BEGINS, CONTRACTOR IS ADVISED TO CALL ONE-CALL FOR LOCATION OF ANY MARKED OR UNMARKED PIPELINES OR CABLES IN THE AREA OF THE PROJECT

BASIS OF BEARING:

REAL-TIME KINEMATIC GPS SURVEY SOLUTION OBTAINED FROM SATELLITES TRACKED IN JANUARY OF 2012 FROM A REFERENCE STATION POSITIONED IN SE/4 NW/4 OF SECTION 16, T31N, R6W



JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Land Management	
209+59.3 TO 242+12.2	3252.9 FT / 197.1 RODS

I, Jason C. Edwards, a registered Professional Surveyor under the laws of the State of New Mexico, hereby certify that this plat was prepared from field notes of an actual survey meeting the minimum requirements of the standards for easement surveys and is true and correct to the best of my knowledge and belief.

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(505) 326-5650 (Fax)

SURVEYS, INC.

CHECKED BY: JCE
DRAWN BY: SLE
SHEET 27 OF 33
FILENAME: 3164P627

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE E/2 W/2 OF SECTION 4, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO

PLAT NOTE:

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BASIS OF BEARING:

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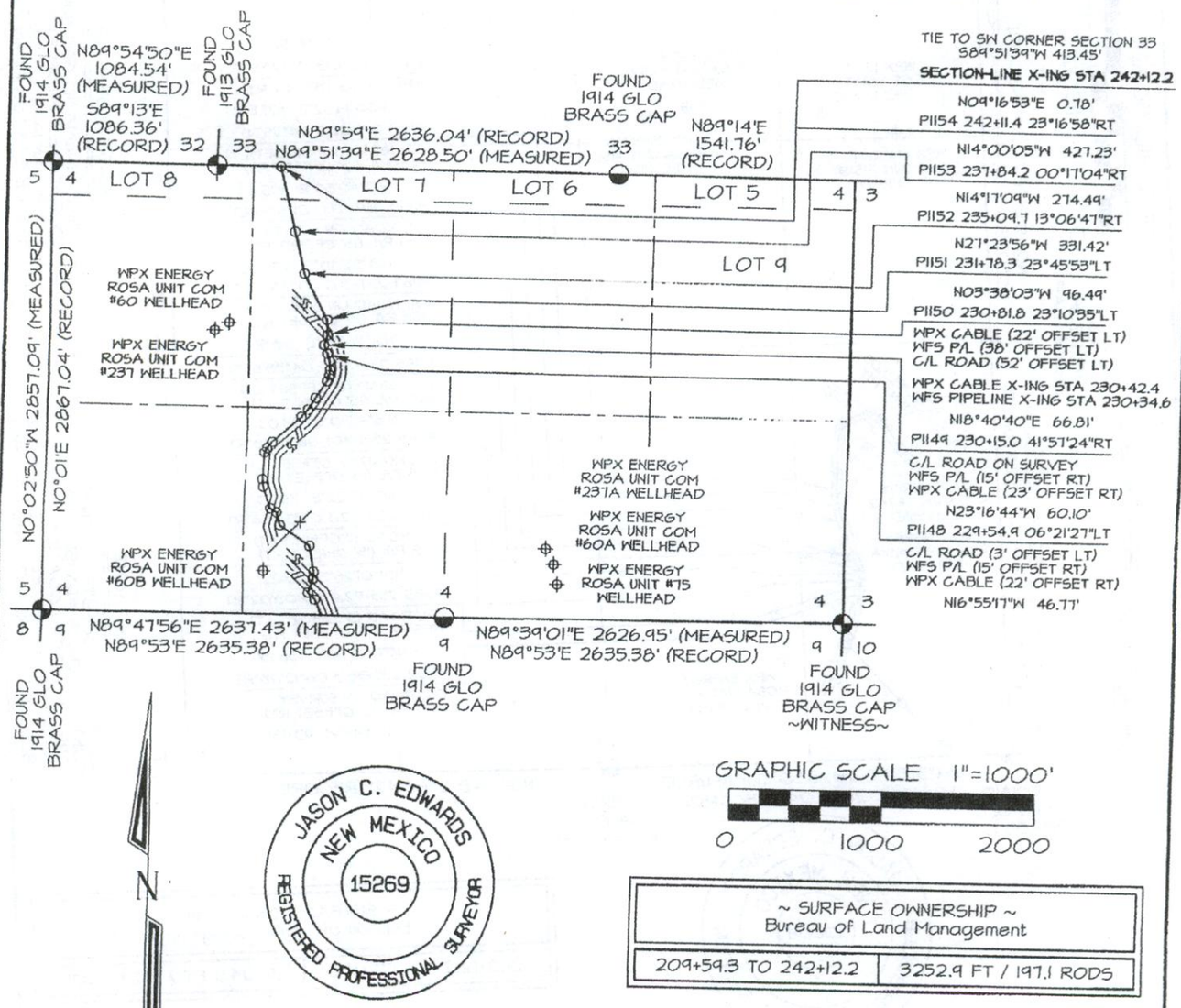

JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Land Management	
209+59.3 TO 242+12.2	3252.9 FT / 197.1 RODS

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JASON C. EDWARDS Date: April 25, 2012

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New Mexico L.S. #15269

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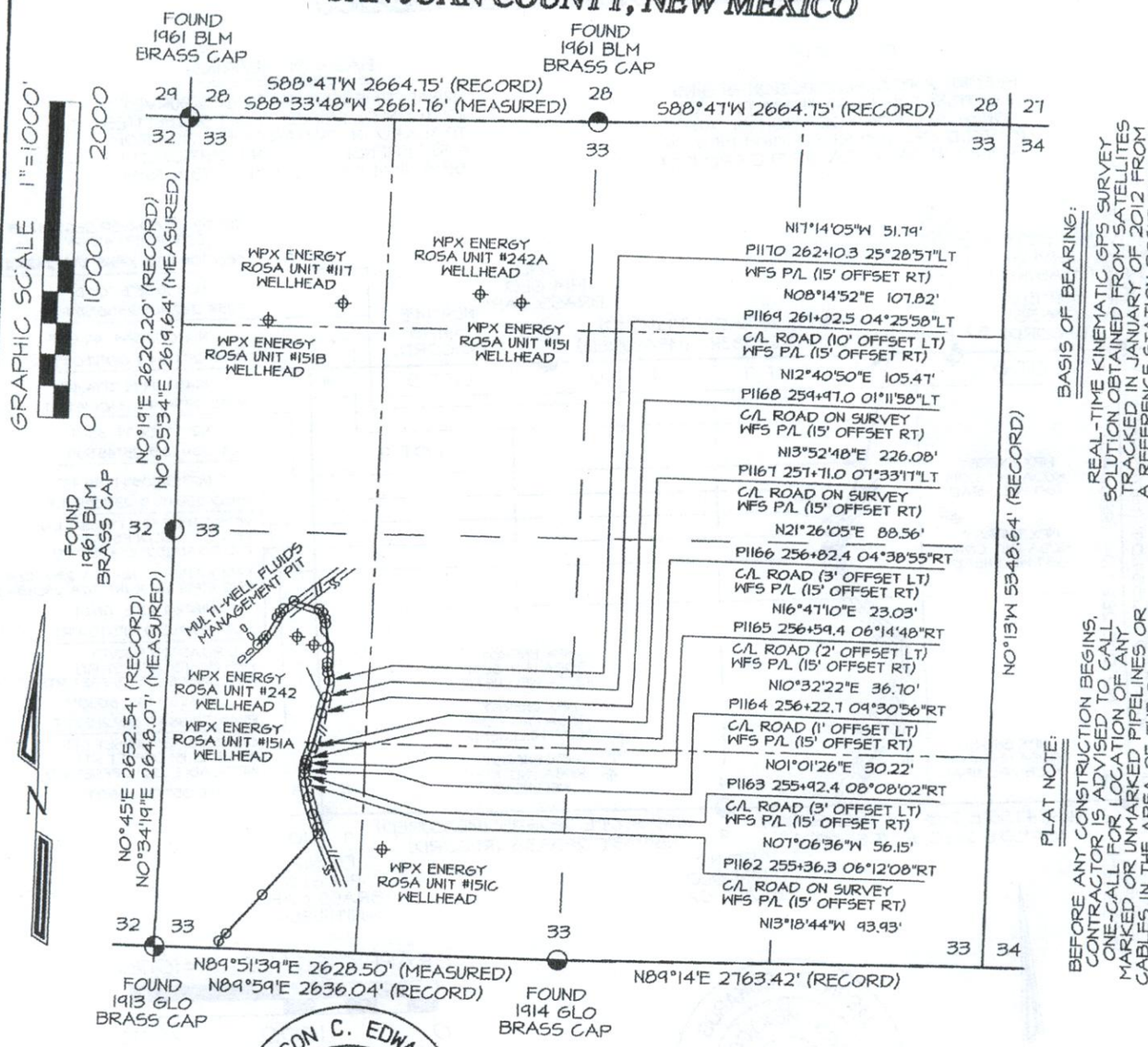
SURVEYS, INC.

SHEET 29 OF 33 | CHECKED BY: JCE
FILENAME: 3164P529 | DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE W/2 SW/4 OF SECTION 33, T32N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO



BASIS OF BEARING:
REAL-TIME KINEMATIC GPS SURVEY SOLUTION OBTAINED FROM SATELLITES TRACKED IN JANUARY OF 2012 FROM A REFERENCE STATION POSITIONED IN SE/4 NW/4 OF SECTION 16, T31N, R6W

PLAT NOTE:
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JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Land Management	
242+12.2 TO 272+16.5	3004.3 FT / 182.1 RODS

I, Jason C. Edwards, a registered Professional Surveyor under the laws of the State of New Mexico, hereby certify that this plat was prepared from field notes of an actual survey meeting the minimum requirements of the standards for easement surveys and is true and correct to the best of my knowledge and belief.

JASON C. EDWARDS Date: April 25, 2012
Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

Prepared for:
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P.O. BOX #640
AZTEC, NM 87410

N C E
SURVEYS, INC.

Land Surveyor:
Jason C. Edwards

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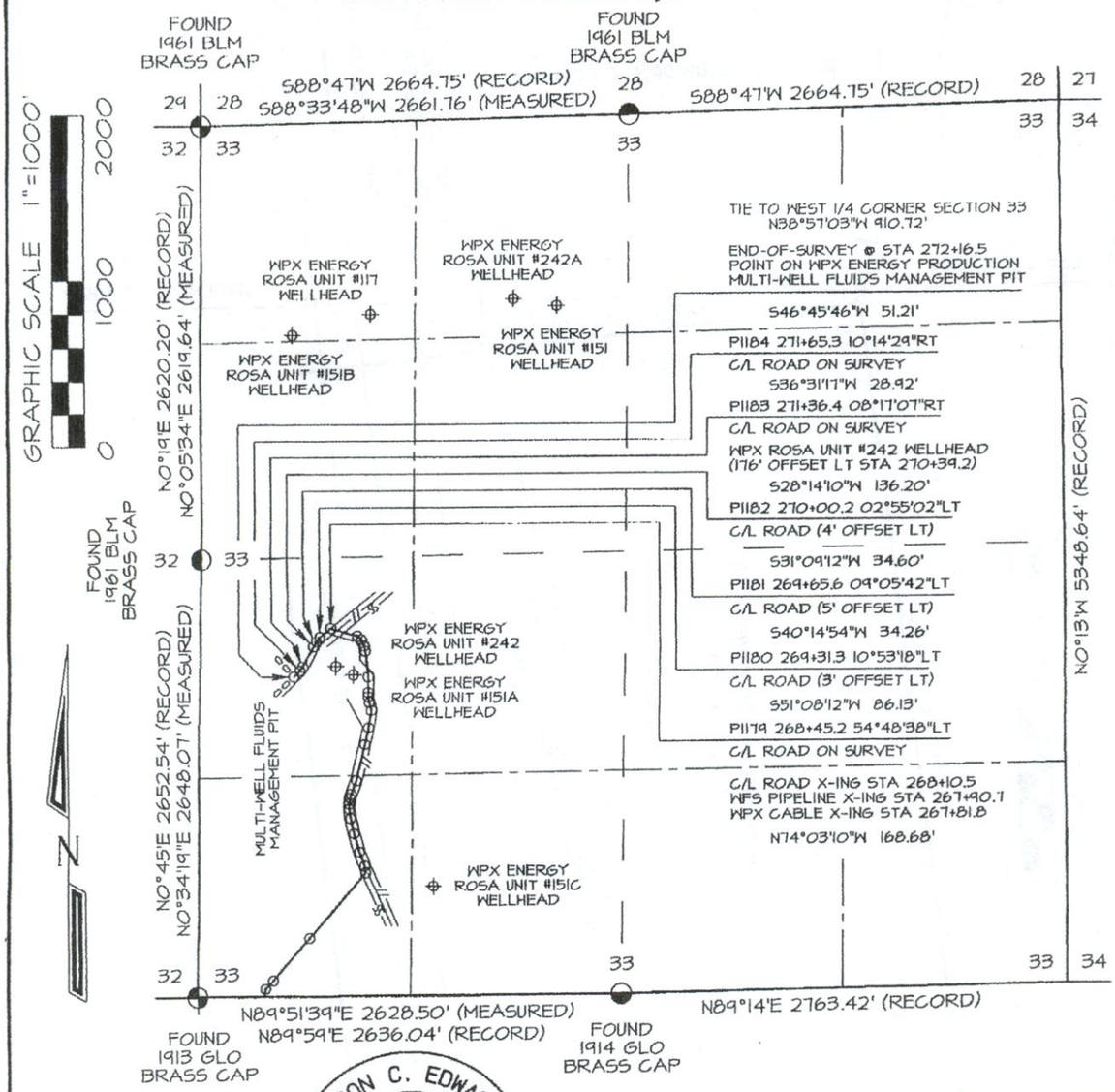
SHEET 31 OF 33 | CHECKED BY: JCE
FILENAME: 92633P31 | DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING PROPOSED WATER-LINE SURVEY LOCATED IN THE W/2 SW/4 OF SECTION 33, T32N, R6W, NMPM SAN JUAN COUNTY, NEW MEXICO



BASIS OF BEARING:
REAL-TIME KINEMATIC GPS SURVEY SOLUTION OBTAINED FROM SATELLITES TRACKED IN JANUARY OF 2012 FROM A REFERENCE STATION POSITIONED IN SE/4 NW/4 OF SECTION 16, T31N, R6W

PLAT NOTE:
BEFORE ANY CONSTRUCTION BEGINS, CONTRACTOR IS ADVISED TO CALL ONE-CALL FOR LOCATION OF ANY MARKED OR UNMARKED PIPELINES OR CABLES IN THE AREA OF THE PROJECT

JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Land Management	
242+12.2 TO 272+16.5	3004.3 FT / 182.1 RODS

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JASON C. EDWARDS Date: April 25, 2012

Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

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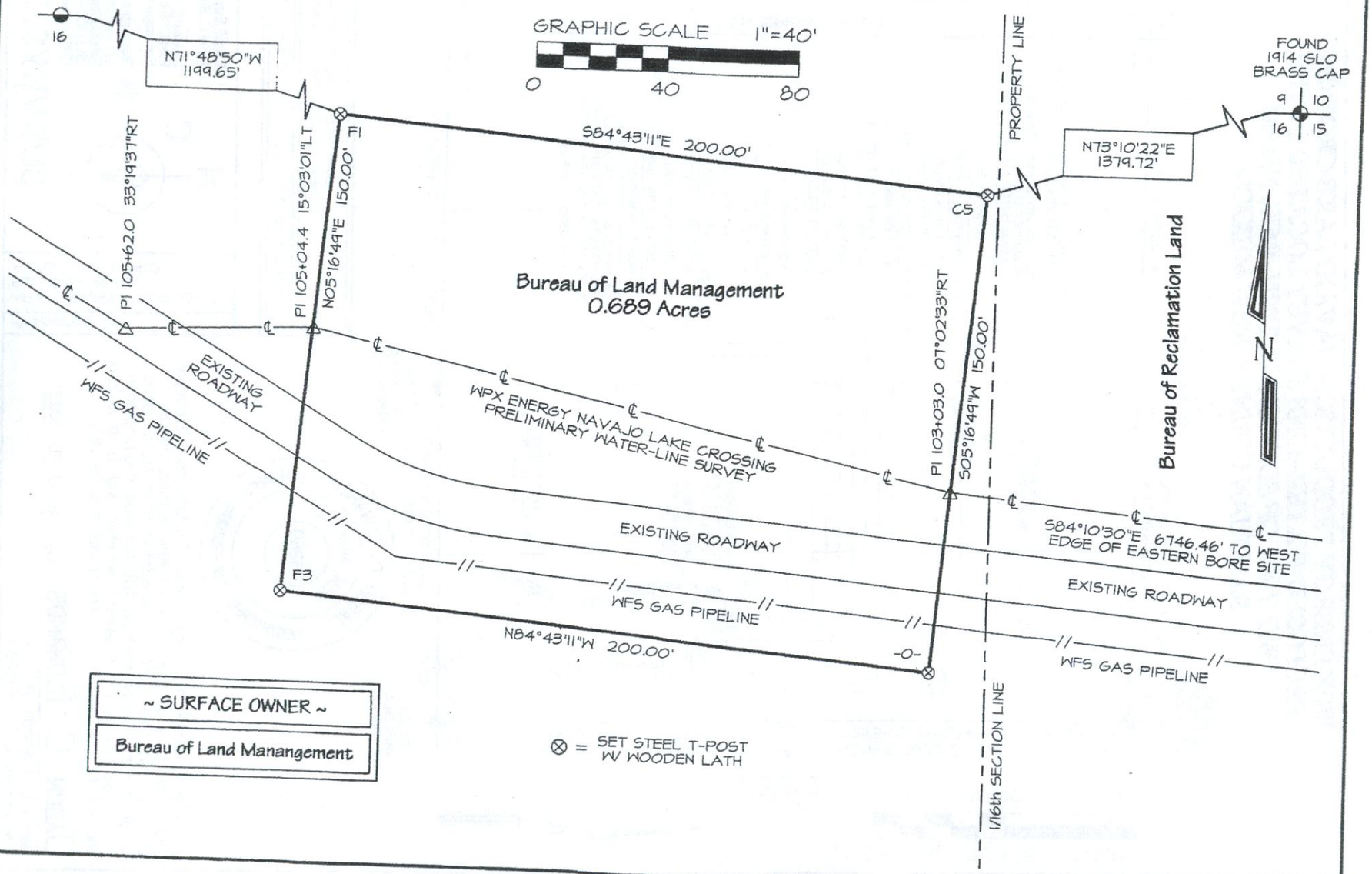
SURVEYS, INC.

CHECKED BY: JCE
DRAWN BY: SLE
SHEET 33 OF 33
FILENAME: 32699P33

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING WESTERN BORE SITE
LOCATED IN NW/4 NE/4 OF SECTION 16, T31N, R6W, N.M.P.M.
SAN JUAN COUNTY, NEW MEXICO GROUND ELEVATION: 6336'
LAT: 36.90557°N LONG: 107.46407°W DATUM: NAD1983



APPENDIX E

DESCRIPTION OF HORIZONTAL DIRECTIONAL DRILLING

INTRODUCTION

The following description for the horizontal directional drilling (HDD) construction process has been provided by J.D. Hair & Associates. The description is representative of the process that would be used under the proposed action.

The components of an HDD rig used for pipeline construction are similar to those of an oil well drilling rig, except the HDD rig is equipped with an inclined ramp as opposed to a vertical mast. HDD pilot hole operations are not unlike those involved in drilling a directional oil well. Drill pipe and downhole tools are generally interchangeable and drilling fluid is used throughout the construction process to transport material, such as drilled spoil, materials that reduce friction, and materials that stabilize the hole.

Installation of a pipeline by HDD is generally accomplished in three stages as illustrated in Figure 1. The first stage consists of directionally drilling a small diameter pilot hole along a directional path. The second stage, prereaming, involves enlarging this pilot hole to a diameter suitable for installation of the pipeline. The third stage consists of pulling the pipe back through the enlarged hole.

PILOT HOLE DIRECTIONAL DRILLING

Pilot hole directional control is achieved by using a non-rotating drill string with an asymmetrical leading edge. The asymmetry of the leading edge creates a steering bias while the non-rotating aspect of the drill string allows the steering bias to be held in a specific position while drilling the hole. If a change in direction is required for the path of the pilot hole, the drill string is rolled so that the direction of bias is the same as the desired change in direction. The direction of bias is referred to as the tool face. Straight progress of the pilot hole may be achieved by drilling with a series of offsetting tool face positions. Leading edge asymmetry can be accomplished by several methods. This is illustrated schematically in Figure 2.

It is common in soft soils to achieve drilling progress by hydraulic cutting with a jet nozzle. In this case, the direction of flow from the nozzle can be offset from the central axis of the drill string; thereby, creating a steering bias. This steering bias may be accomplished by blocking selected nozzles on a standard roller cone bit or by custom fabricating a jet deflection bit. If hard spots are encountered during the HDD process, the drill string may be rotated to drill without directional control until the hard spot has been penetrated.

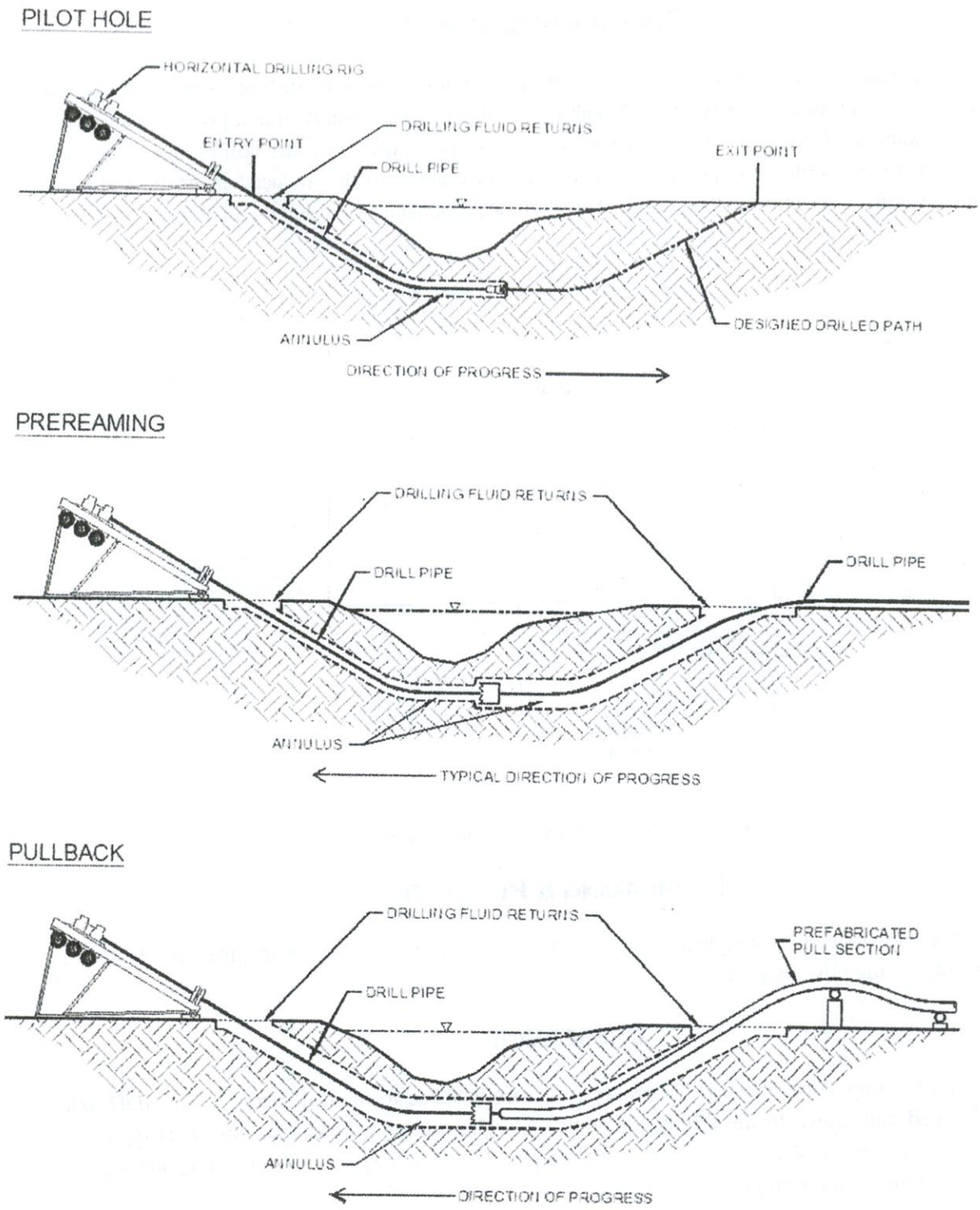


Figure 1. The HDD process.

SURFACE MONITORING

The pilot hole path may also be tracked using a surface monitoring system. Surface monitoring systems determine the location of the survey probe downhole by taking measurements from a grid or point on the surface. An example of this is the TruTracker System. This system uses a surface coil of known location to induce a magnetic field. The probe senses its location relative to this induced magnetic field and communicates this information to the surface. This is shown schematically in Figure 3 below.

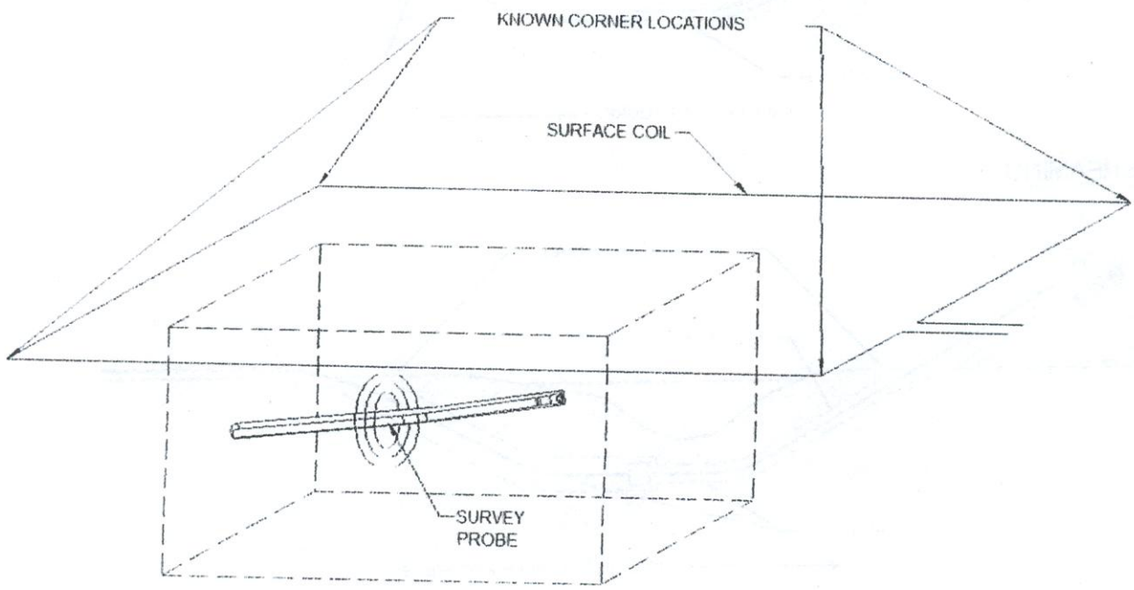


Figure 3. TruTracker surface monitoring system.

PREREAMING & PULLBACK

Enlarging the pilot hole is accomplished using either prereaming passes prior to pipe installation or simultaneously during pipe installation.

PREREAMING

During the prereaming stage of the HDD process, reamers attached to the drill string at the HDD exit point are rotated and drawn to the drilling rig; thus, enlarging the pilot hole. Reaming tools typically consist of a circular array of cutters and drilling fluid jets. Most contractors will opt to preream a pilot hole before attempting to install pipe.

It is also possible to ream the pilot hole from the HDD entry point. In this case, reamers fitted into the drill string at the drill rig are rotated and thrust away from the rig; thereby, enlarging the pilot hole.

APPENDIX F

BIOLOGICAL SURVEY REPORTS

BIOLOGICAL SURVEY REPORT

WPX ENERGY

ROSA UNITS 03, 04, 05, AND 06, AND MULTI-WELL FLUIDS MANAGEMENT PIT

Photograph 1: Proposed Rosa Unit 04 well pad looking west.

This report describes the potential for U.S. Fish and Wildlife Service (USFWS) and Bureau of Land Management (BLM) listed threatened, endangered, candidate, and other designated species to occur in the project and action areas. The BLM defines the action area as the area that may be directly or indirectly impacted by the proposed action. This report is prepared in accordance with the BLM's biological survey guidelines and is intended to provide the agency with information to make determinations of effect on species with special conservation status.

PROJECT DESCRIPTION

WPX Energy is proposing to develop the Rosa Units 03, 04, 05, and 06 natural gas well pads and a multi-well fluids management pit (remote fracturing pad) within the Middle Mesa portion of the Rosa Unit in San Juan County, New Mexico. The development would be in accordance with the terms and conditions of the December 1, 2011, Decision Notice for the Middle Mesa Plan of Development. Plats of the proposed wells and fluids management pit are provided as Attachment A. The project would be developed entirely on public lands with mineral resources administered by the BLM Farmington Field Office (FFO). A project area map showing the location of the proposed action on the Bancos Mesa, New Mexico U.S. Geological Survey (USGS) 7.5-minute topographic map is provided as Attachment B.

WPX has submitted Applications for Permit to Drill (APDs) to develop at least one well per well pad as part of the proposed action. Multiple wells are anticipated to be drilled from each well pad. Subsequent APDs would be submitted to the BLM for any additional wells drilled from the four well pads. These

On-Site Methods: Pedestrian surveys of the proposed well pads and multi-well fluids management pit were conducted by Ecosphere on April 12, 2011. The proposed well pads and management pit were surveyed again on September 22 and October 12, 2011. During all surveys, transects spaced approximately 20 feet apart were surveyed over the entire proposed disturbance areas. During surveys in September, the weather was sunny and warm with temperatures ranging from 80 to 85° F. The October surveys were conducted with temperatures in the high 70s and clear skies. All plant and wildlife species and signs of wildlife observed were recorded, and digital photos were taken. Binoculars were used to survey for raptors, potential nesting habitat, and whitewash. The habitat was evaluated for all USFWS and BLM species with special conservation status that have the potential to occur in the project area or action area (Tables 2 and 3).

ACTION AREA

Action Area: The action area consists of the proposed well pads and multi-well fluids management pit and surrounding terrain within a 1/3-mile radius.

Physical Description: The proposed action would be located on the southeast portion of Middle Mesa within the Rosa Unit. The locations of the proposed wells are west of Navajo Reservoir east of Cottonwood Canyon. The terrain within this general area is characterized as eroded sandstone mesa tops intertwined with sandstone terraced cliffs and buttes. Steep terraced sandstone cliffs line the edge of the Navajo Lake, while milder sloping terraced cliffs slope into Cottonwood Canyon. Elevation within the area ranges between 6,400 to 6,600 feet.

As proposed, drill pad 03 would be co-located with the existing Rosa Unit #60 well. The mesa rim dropping down into Cottonwood Canyon is located approximately 50 feet from the proposed southwest pad corner. Slopes are mild and range between 0 and 3 degrees to the southeast, with the greater slope created by a drainage berm along the north side of the well pad. A sandstone knob, approximately 100 feet in height, with a small band of sandstone ledges 5 feet high circling it, is located approximately 950 feet east of the proposed pad. Navajo Lake is approximately 2,500 feet east of the proposed well pad but is not within line of site.

The proposed pad 04 would be located on a narrow mesa approximately 1,300 feet south of pad 03. An existing road bisects the pad from north to south. The pad would be co-located with the recently developed Rosa Unit Com #60B. The south edge of the well pad contains massive sandstone outcrops and boulders, and would be located about 25 feet from the rim of Cottonwood Canyon. Slopes within the well pad range up to 6 degrees. The recontoured sides of the existing well pad have slightly steeper slopes at 2 to 3 degrees with the northeast corner outside of the existing disturbance sloping between 5 and 6 degrees. Navajo Lake is approximately 3,000 feet east of the project area and is not visible from the proposed location.

Rosa Unit 05 would be located 870 feet south of pad 04 and would be twinned with the existing Rosa Unit #180A. As proposed, the southeast edge of the well pad would be located at the base of a low sandstone hill. An existing road runs along the proposed western well pad boundary. Navajo Lake is approximately 3,600 feet east of the project area and is not within line of sight. The majority of the pad would be located on flat terrain associated with the existing well pad; however, the existing pad cut is

Approximately 1 acre of Rosa Unit 03 would be located on bare ground associated with the existing well pad and access road. Of the remaining acreage, approximately 1.56 acres would be located within a reclaimed area, dominated by crested wheatgrass and scattered big sagebrush. The remaining area, which is mainly located on the corners and along the southern edge of the project area, is undisturbed and consists of piñon-juniper woodland with a sagebrush dominated understory.

The proposed Rosa Unit 04 well pad is characterized by approximately 3 acres of bare ground associated with a recently developed well pad. The eastern half contains about 1 acre of previously chained woodland, which is now dominated by big sagebrush with approximately 12 to 15 immature juniper trees reestablishing in the midsection. The western well pad boundary and construction zone would be located within undisturbed piñon-juniper woodland.

An estimated 1.5 acres of Rosa Unit 05 contains reclaimed vegetation dominated by crested wheatgrass with scattered rubber rabbitbrush and big sagebrush. The northern portion of the drill pad would be located within an area that was historically chained and has revegetated into desert scrub. This area does contain approximately 35 scattered piñon and juniper trees. The southeastern and southwestern well pad perimeters fall within undisturbed piñon-juniper woodland and contain approximately 15 trees.

The southwest edge of the multi-well fluids management pit would be located along an existing access road and pipeline ROW. This accounts for approximately 0.3 acre of previous disturbance within the proposed location. The remainder of the pad would be located within undisturbed piñon-juniper/desert scrub interface. There are approximately 150 to 200 mixed age piñon-juniper trees within the boundaries of the proposed pad.

Well pad 06 would be located on previous disturbance associated with a recently drilled well. The south corner and a small strip along the eastern edge of the project area, approximately 1 acre, would be located within undisturbed piñon-juniper woodland containing approximately 100 trees. The remainder of the proposed well pad lies within a reclaimed area. The areas adjacent to the existing well pad east, south, and southwest have been reclaimed, and vegetation cover within these areas was visually estimated between 65 and 70 percent.

One BLM/FFO listed invasive and non-native plant species, musk thistle (*Carduus nutans*), was observed at Rosa Units 05 and 06 during the field surveys. On the Rosa Unit 05, musk thistle was observed along the existing road. The edge of the proposed Rosa Unit 06 well pad supported scattered musk thistle.

Wildlife and sign identified throughout the project area included mule deer (*Odocoileus hemionus*) and black-tailed jackrabbit (*Lepus californicus*). For a complete list, see Attachment C. No prairie dog burrows were recorded within the boundaries of any of the locations. According to the BLM/FFO, there are no recorded historic or currently active raptor nests within 10 miles of the project area. However, there are three recorded historic or currently active golden eagle (*Aquila chrysaetos*) nests and three American peregrine falcon (*Falco peregrinus anatum*) nests within 15 miles of the project area (BLM 2011, unpublished data). There are 37 BLM/FFO Bald Eagle (*Haliaeetus leucocephalus*) Areas of Critical Environmental Concern (ACEC) within an 11-mile radius of the proposed project.

Specially Designated Areas: The proposed project lies within the 46,052-acre Middle Mesa Wildlife Area Specially Designated Area.

Species	Status	Habitat Associations	Potential to Occur in the Project or Action Area
Razorback sucker (*Xyrauchen texanus*)	E	Medium to large rivers with silty to rocky substrates. Prefers strong currents and deep pools.	No perennial water sources occur in the action area. Not known to occur in Navajo Reservoir.
PLANTS			
Knowlton's cactus (*Pediocactus knowltonii*)	E	Alluvial deposits that form rolling, gravelly hills in piñon-juniper and sagebrush communities (6,200-6,400 ft). A type locality of the Los Piños River area.	No suitable habitat occurs in the project or action area. No rolling gravelly hills or river terraces occur in the project or action area.
Mancos milkvetch (*Astragalus humillimus*)	E	Cracks of Point Lookout Sandstone of the Mesa Verde series (5,000-6,000 ft).	Project and action area do not contain appropriate geologic substrate for this species.
Mesa Verde cactus (*Sclerocactus mesae-verdae*)	T	Highly alkaline soils in sparse shale or adobe clay badlands of the Mancos and Fruitland Formations (4,000-5,550 ft).	Project and action area do not contain appropriate geologic substrate for this species.

Source: USFWS 2012

BLM Special Management Species: Of the 10 species warranted for special management consideration by the BLM/FFO (BLM 2008), golden eagle, American peregrine falcon, prairie falcon, and bald eagle (*Haliaeetus leucocephalus*) have the potential to occur within the project area. Species listed by the BLM/FFO and their potential to occur in the project or action area are summarized in Table 3. None of these BLM special management species were observed during the field survey, and their potential to occur is based on evaluation of the proposed project area and action area habitats and the known habitat associations of the listed species.

Table 3: BLM/FFO species with special management status and their potential to occur in the project and action areas based upon habitat associations.

Species	Habitat Associations	Potential to Occur in the Project or Action Area
BIRDS		
American peregrine falcon (*Falco peregrinus anatum*)	**Rugged terrain with rocky cliffs and canyons (30-1,000+ ft high), adjacent to rivers, lakes, or streams. Urban areas with towers and buildings also inhabited.**	**Incidental occurrence of the species within the project area is a possibility.**

DISCUSSION

Navajo Lake, located east and southeast of the project area, provides perching and foraging opportunities for bald eagle; however, this species is not known to nest in San Juan County New Mexico (BLM 2003). Bald eagles are common winter residents in the area. Because of the proposed project's proximity to Navajo Lake and designated ACEC units, bald eagles are likely to occur in the area between November and March.

No documented prairie falcon nests are located on Middle Mesa or the surrounding vicinity; however, large cliff faces on the southern end of Middle Mesa and the proximity of the proposed project area to Navajo Reservoir afford the opportunity for yet undocumented territories. Therefore, prairie falcon could incidentally occur in the project area.

The open scrubland throughout the proposed project and action area is excellent foraging habitat for golden eagles and prairie falcons. The proposed project area does not contain suitable nesting substrate for these raptor species. According to the BLM/FFO, there are three recorded historic or currently active golden eagle nests and three American peregrine falcon nests within 15 miles of the project area (BLM 2011, unpublished data). Average hunting territory size for golden eagles was found to be 19 to 59 square miles in California and 25 to 35 square miles in Utah (Weidensaul 1996). Estimated home range during nesting of American peregrine falcons in Enderson and Craig, Colorado, was found to be between 138 to 582 square miles (White et al. 2002). Given the distance of known territories and suitable nesting habitat from the proposed location and the possibility of yet undocumented territories, these raptor species may forage in the proximity or fly through the proposed action area.

Direct and indirect impacts to golden eagles, bald eagles, American peregrine falcons, and prairie falcons are expected to be low to moderate in the short term and low in the long term due to the utilization of existing disturbance and the consolidation of multiple wells on single well pads. There would be no removal or modification of potential nesting habitat for these species. Direct impacts include disturbance and modification of a maximum of 29 acres of disturbed and undisturbed potential foraging habitat. The number of piñon and juniper trees removed by the proposed project would be approximately 325 to 330, resulting in a long-term loss of perching habitat. Impacts from habitat modification and removal would be low and long term.

During construction, drilling, and completion activities, increased human and vehicular activity may cause raptors to avoid the well pads where these activities are occurring. These impacts would be low to moderate and short term. Indirect impacts could include a change in prey species composition for raptors from the disturbance and modification of vegetation. These impacts would be low and short to long term.

Removal of piñon-juniper woodland and understory vegetation would result in a loss of habitat for a variety of birds protected under the Migratory Bird Treaty Act (MBTA). Direct impacts to these species are expected to be greater if construction occurs during the breeding season from April to August when nest destruction is possible. Additionally, noise and human disturbance may cause some nest abandonment in adjacent areas. No nests were identified in the proposed project area during the biological surveys; however, detailed nest surveys were not conducted during the survey. Direct impacts would

LITERATURE CITED AND REFERENCES

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_____. 2002. Southwestern willow flycatcher recovery plan. U.S. Fish and Wildlife Service, Albuquerque, NM.

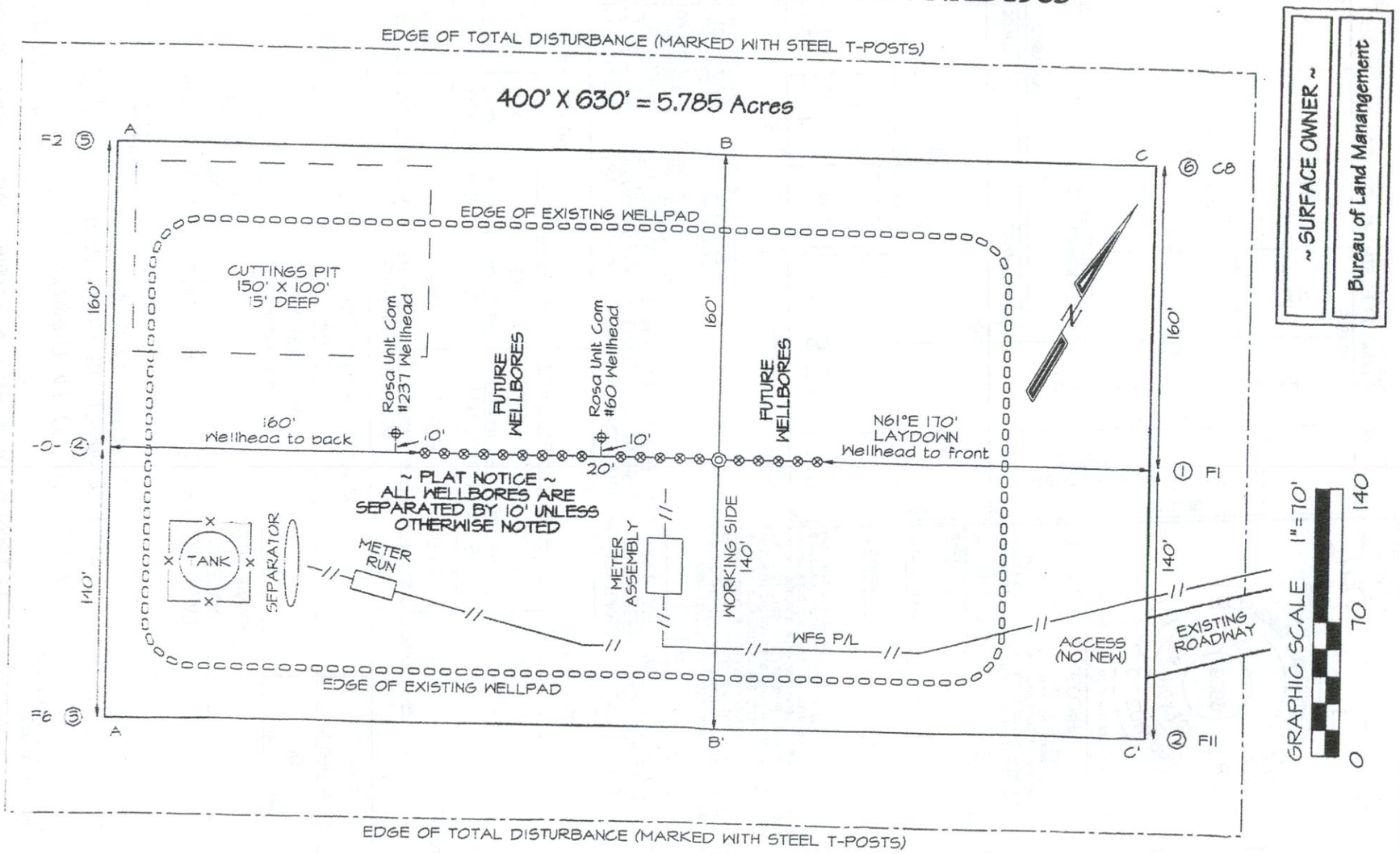
_____. 1998. Black-footed ferret (*Mustela nigripes*) fact sheet. U.S. Fish and Wildlife Service. Available at http://endangered.fws.gov/i/A07.html.

_____. 1995. Recovery plan for the Mexican spotted owl. Volume I. U.S. Fish and Wildlife Service, Albuquerque, NM.

Weidensaul, Scott. 1996. The Raptor Almanac. The Lyons Press, Hong Kong, China.

ATTACHMENT A. PROJECT PLATS

WILLIAMS PRODUCTION COMPANY ROSA UNIT 03 #007H
1869' FSL & 1238' FWL, SECTION 4, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO ELEVATION: 6492'
LAT: 36.92645°N LONG: 107.47293°W DATUM: NAD1983



~ SURFACE OWNER ~

Bureau of Land Management

Steel T-Posts have been set to define the Edge of Disturbance limits which are 50' offset from the edge of the staked wellpad.

District I
1625 N. French Drive, Hobbs, NM 88240
Phone: (575) 393-6161 Fax: (575) 393-0720
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Phone: (575) 748-1283 Fax: (575) 748-9720
District III
1000 Rio Brazos Road, Aztec, NM 87410
Phone: (505) 334-6178 Fax: (505) 334-6170
District IV
1220 S. St. Francis Drive, Santa Fe, NM 87505
Phone: (505) 476-3460 Fax: (505) 476-3462

State of New Mexico
Energy, Minerals & Natural Resources Department

OIL CONSERVATION DIVISION
1220 South St. Francis Drive
Santa Fe, NM 87505

Form C-102
Revised August 1, 2011

Submit one copy to
Appropriate District Office

☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

[1] API Number	[2] Pool Code	[3] Pool Name
	97232	BASIN MANCOS

[4] Property Code	[5] Property Name	[6] Well Number
	ROSA UNIT 04	001H

[7] OGRID No.	[8] Operator Name	[9] Elevation
120782	WILLIAMS PRODUCTION COMPANY	6421'

[10] Surface Location

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
N	4	31N	6W		290	SOUTH	1621	WEST	SAN JUAN

[11] Bottom Hole Location If Different From Surface

UL or lot no	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
C	10	31N	6W		502	NORTH	2353	WEST	SAN JUAN

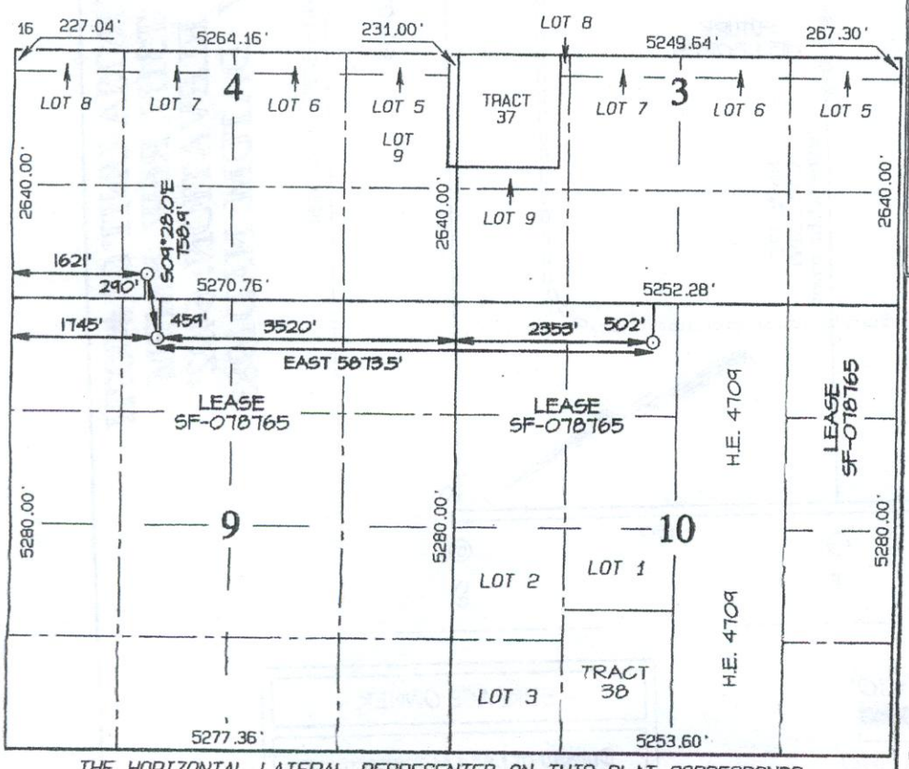
[12] Dedicated Acres	[13] Joint or Infill	[14] Consolidation Code	[15] Order No.
54,209.49 Acres			R-13068

SURFACE LOCATION
290 FSL 1621 FWL
SEC 4, T31N, R6W
LAT: 36.92210 °N
LONG: 107.47104 °W
DATUM: NAD1927
LAT: 36.92211 °N
LONG: 107.47164 °W
DATUM: NAD1983

POINT-OF-ENTRY
459 FNL 1745 FWL
SEC 9, T31N, R6W
LAT: 36.92005 °N
LONG: 107.47062 °W
DATUM: NAD1927
LAT: 36.92005 °N
LONG: 107.47122 °W
DATUM: NAD1983

END-OF-LATERAL
502 FNL 2353 FWL
SEC 10, T31N, R6W
LAT: 36.91998 °N
LONG: 107.45053 °W
DATUM: NAD1927
LAT: 36.91999 °N
LONG: 107.45113 °W
DATUM: NAD1983

NO ALLOWABLE WILL BE ASSIGNED TO THIS COMPLETION UNTIL ALL INTERESTS HAVE BEEN CONSOLIDATED OR A NON-STANDARD UNIT HAS BEEN APPROVED BY THE DIVISION



THE HORIZONTAL LATERAL REPRESENTED ON THIS PLAT CORRESPONDS TO THE OLIVE SEGMENT WHICH VARIES IN VERTICAL DEPTH.

[17] OPERATOR CERTIFICATION

I hereby certify that the information contained herein is true and complete to the best of my knowledge and belief, and that this organization either owns a working interest or unleased mineral interest in the land including the proposed bottom-hole location or has a right to drill this well at this location pursuant to a contract with an owner of such a mineral or working interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore entered by the division.

Signature Date

Printed Name

E-mail Address

[18] SURVEYOR CERTIFICATION

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my belief.

Survey Date: DECEMBER 15, 2011

Signature and Seal of Professional Surveyor

JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

JASON C. EDWARDS

Certificate Number 15269

District I
1625 N. French Drive, Hobbs, NM 88240
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State of New Mexico
Energy, Minerals & Natural Resources Department

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Santa Fe, NM 87505

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Revised August 1, 2011

Submit one copy to Appropriate District Office

☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

[1] API Number	[2] Pool Code	[3] Pool Name
	97232	BASIN MANCOS

[4] Property Code	[5] Property Name	[6] Well Number
	ROSA UNIT 04	005H

[7] OGRID No.	[8] Operator Name	[9] Elevation
120782	WPX ENERGY PRODUCTION, LLC	6421'

[10] Surface Location

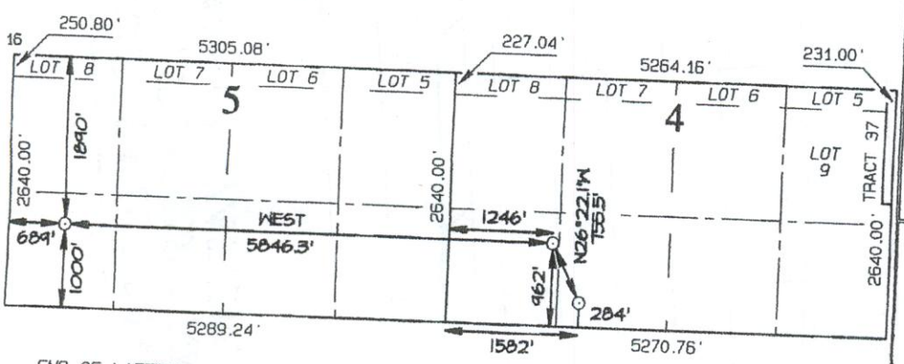
UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
N	4	31N	6W		284	SOUTH	1582	WEST	SAN JUAN

[11] Bottom Hole Location If Different From Surface

UL or lot no	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
M	5	31N	6W		1000	SOUTH	689	WEST	SAN JUAN

[12] Dedicated Acres	[13] Joint or Infill	[14] Consolidation Code	[15] Order No.
54,209.49 Acres			R-13068

NO ALLOWABLE WILL BE ASSIGNED TO THIS COMPLETION UNTIL ALL INTERESTS HAVE BEEN CONSOLIDATED OR A NON-STANDARD UNIT HAS BEEN APPROVED BY THE DIVISION



END OF LATERAL
1000' FSL 689' FWL
SECTION 5, T31N, R6W
LAT: 36.92401 'N
LONG: 107.49231 'W
DATUM: NAD1927

LAT: 36.92402 'N
LONG: 107.49292 'W
DATUM: NAD1983

POINT OF ENTRY
962' FSL 1246' FWL
SECTION 4, T31N, R6W
LAT: 36.92395 'N
LONG: 107.47231 'W
DATUM: NAD1927

LAT: 36.92396 'N
LONG: 107.47292 'W
DATUM: NAD1983

SURFACE LOCATION
284' FSL 1582' FWL
SECTION 4, T31N, R6W
LAT: 36.92209 'N
LONG: 107.47117 'W
DATUM: NAD1927

LAT: 36.92210 'N
LONG: 107.47178 'W
DATUM: NAD1983

THE HORIZONTAL LATERAL REPRESENTED ON THIS PLAT CORRESPONDS TO THE OLIVE SEGMENT WHICH VARIES IN VERTICAL DEPTH.

[17] OPERATOR CERTIFICATION

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Signature Date

Printed Name

E-mail Address

[18] SURVEYOR CERTIFICATION

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my belief.

Survey Date: JANUARY 13, 2012

Signature and Seal of Professional Surveyor

JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

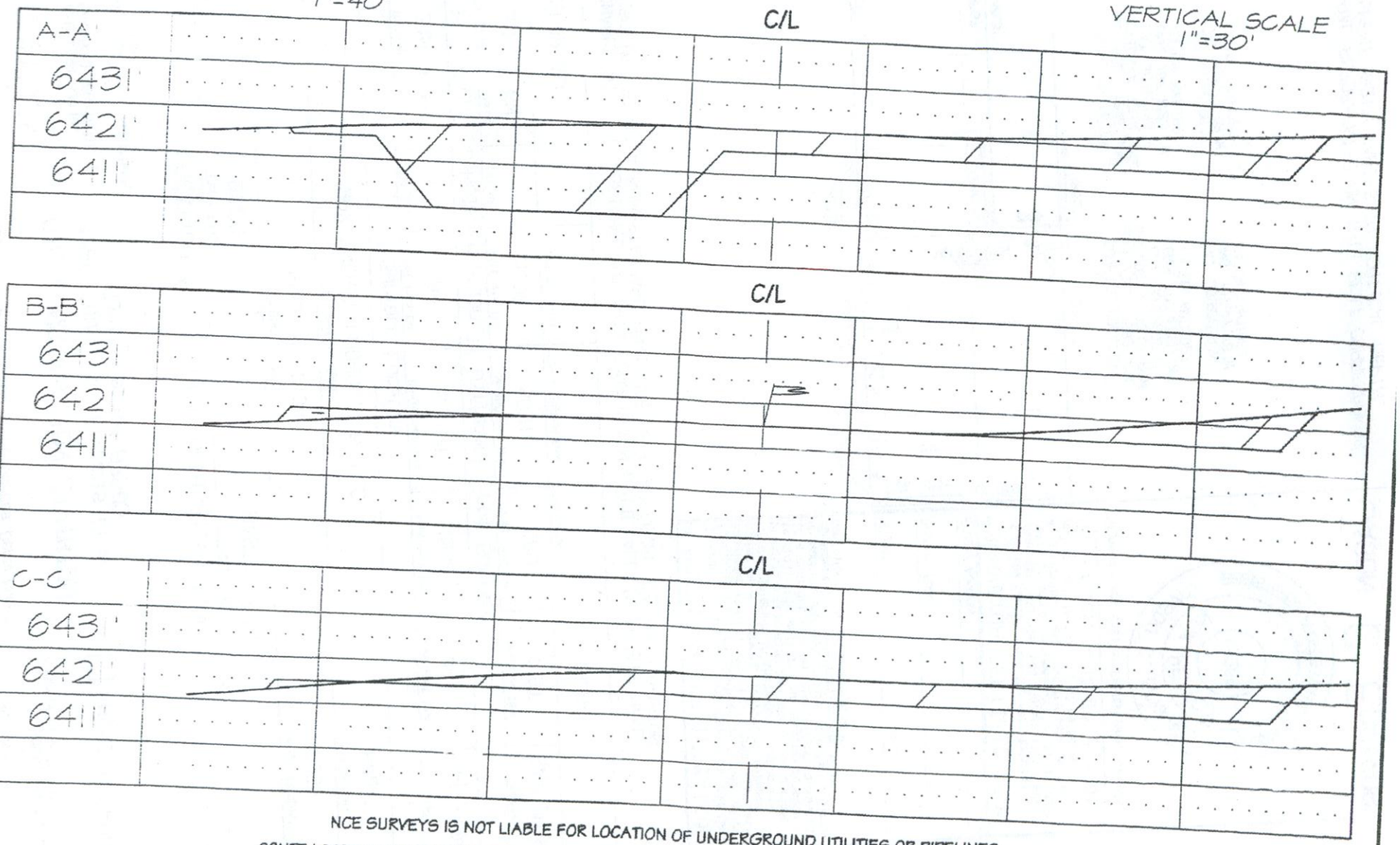
JASON C. EDWARDS

Certificate No.

WPX ENERGY PRODUCTION, LLC ROSA UNIT 04 #005H
284' FSL & 1582' FWL, SECTION 4, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO ELEVATION: 6421'

HORIZONTAL SCALE
1"=40'

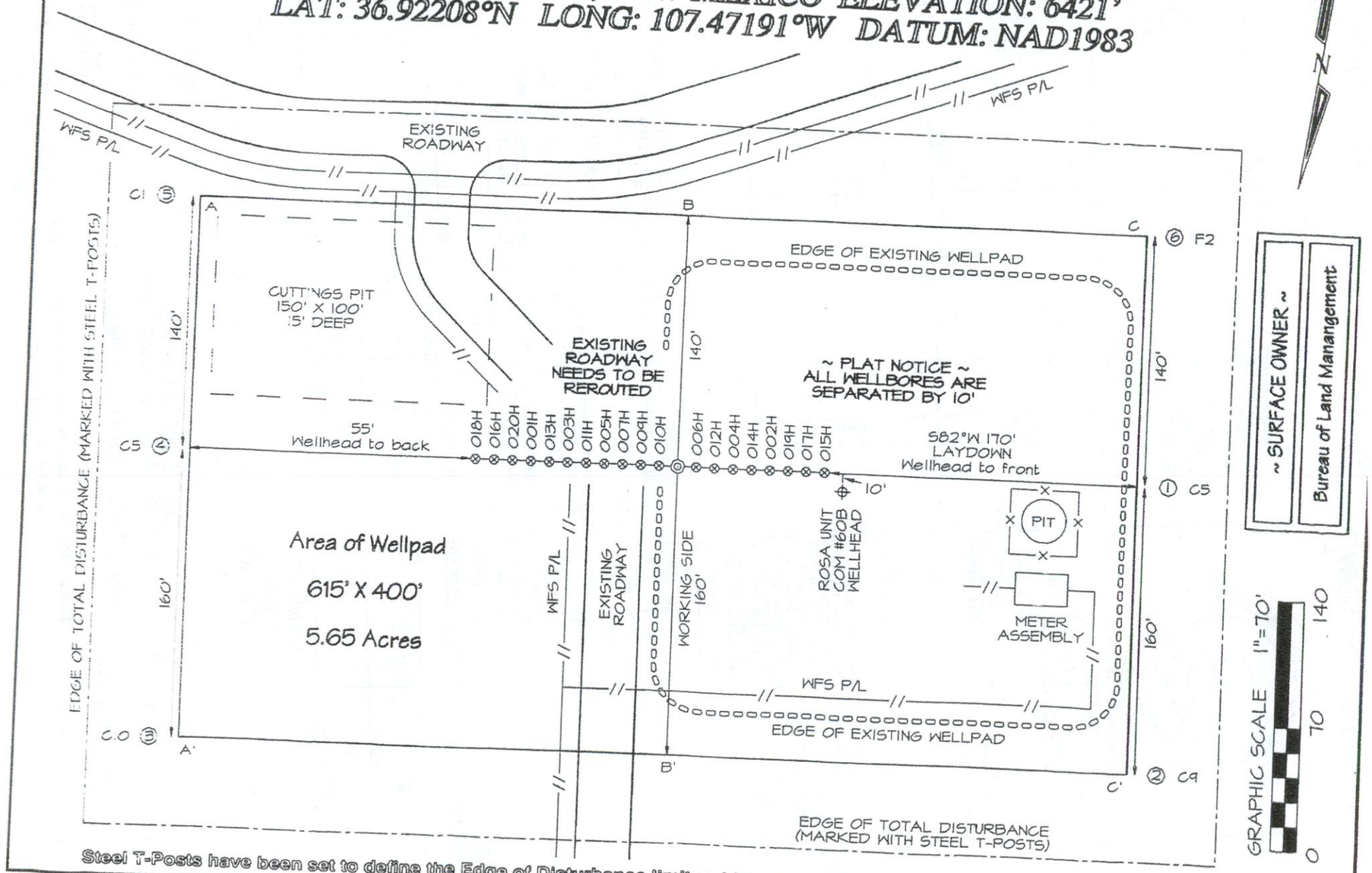
VERTICAL SCALE
1"=30'



NCE SURVEYS IS NOT LIABLE FOR LOCATION OF UNDERGROUND UTILITIES OR PIPELINES.

CONTRACTOR SHOULD CONTACT ONE-CALL FOR LOCATION OF ANY MARKED OR UNMARKED UNDERGROUND UTILITIES OR PIPELINES ON WELLPAD AND/OR ACCESS ROAD AT LEAST TWO WORKING DAYS PRIOR TO CONSTRUCTION.

WPX ENERGY PRODUCTION, LLC ROSA UNIT 04 #008H
279' FSL & 1542' FWL, SECTION 4, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO ELEVATION: 6421'
LAT: 36.92208°N LONG: 107.47191°W DATUM: NAD1983



Steel T-Posts have been set to define the Edge of Disturbance limits which are 50' offset from the edge of the staked wellpad.

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☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

[1] API Number	[2] Pool Code	[3] Pool Name
	97232	BASIN MANCOS

[4] Property Code	[5] Property Name	[6] Well Number
	ROSA UNIT 05	014H

[7] OGRID No.	[8] Operator Name	[9] Elevation
120782	WILLIAMS PRODUCTION COMPANY	6429'

[10] Surface Location

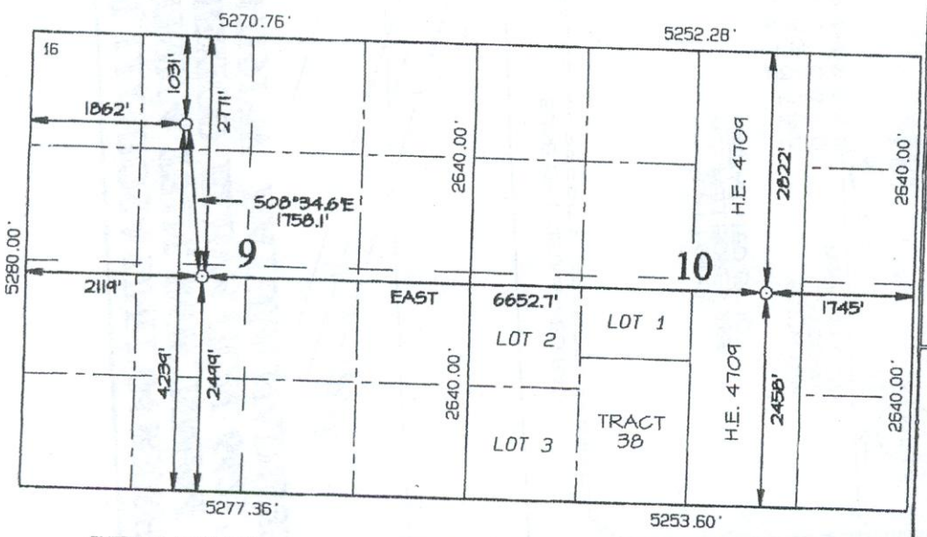
UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
C	9	31N	6W		1031	NORTH	1862	WEST	SAN JUAN

[11] Bottom Hole Location If Different From Surface

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
J	10	31N	6W		2458	SOUTH	1745	EAST	SAN JUAN

[12] Dedicated Acres	[13] Joint or Infill	[14] Consolidation Code	[15] Order No
54,209.49 ACRES			R-13068

NO ALLOWABLE WILL BE ASSIGNED TO THIS COMPLETION UNTIL ALL INTERESTS HAVE BEEN CONSOLIDATED OR A NON-STANDARD UNIT HAS BEEN APPROVED BY THE DIVISION



SURFACE LOCATION
1031' FNL 1862' FWL
SECTION 9, T31N, R6W
LAT: 36.91848 'N
LONG: 107.47022 'W
DATUM: NAD1927

LAT: 36.91848 'N
LONG: 107.47082 'W
DATUM: NAD1983

POINT OF ENTRY
2499' FSL 2119' FWL
SECTION 9, T31N, R6W
LAT: 36.91370 'N
LONG: 107.46935 'W
DATUM: NAD1927

LAT: 36.91370 'N
LONG: 107.46995 'W
DATUM: NAD1983

END OF LATERAL
2458' FSL 1745' FEL
SECTION 10, T31N, R6W
LAT: 36.91363 'N
LONG: 107.44659 'W
DATUM: NAD1927

LAT: 36.91363 'N
LONG: 107.44719 'W
DATUM: NAD1983

THE HORIZONTAL LATERAL REPRESENTED ON THIS PLAT CORRESPONDS TO THE BLACK SEGMENT WHICH WAS

[17] OPERATOR CERTIFICATION

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Signature Date

Printed Name

E-mail Address

[18] SURVEYOR CERTIFICATION

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my belief.

Survey Date: JANUARY 13, 2012

Signature and Seal of Professional Surveyor

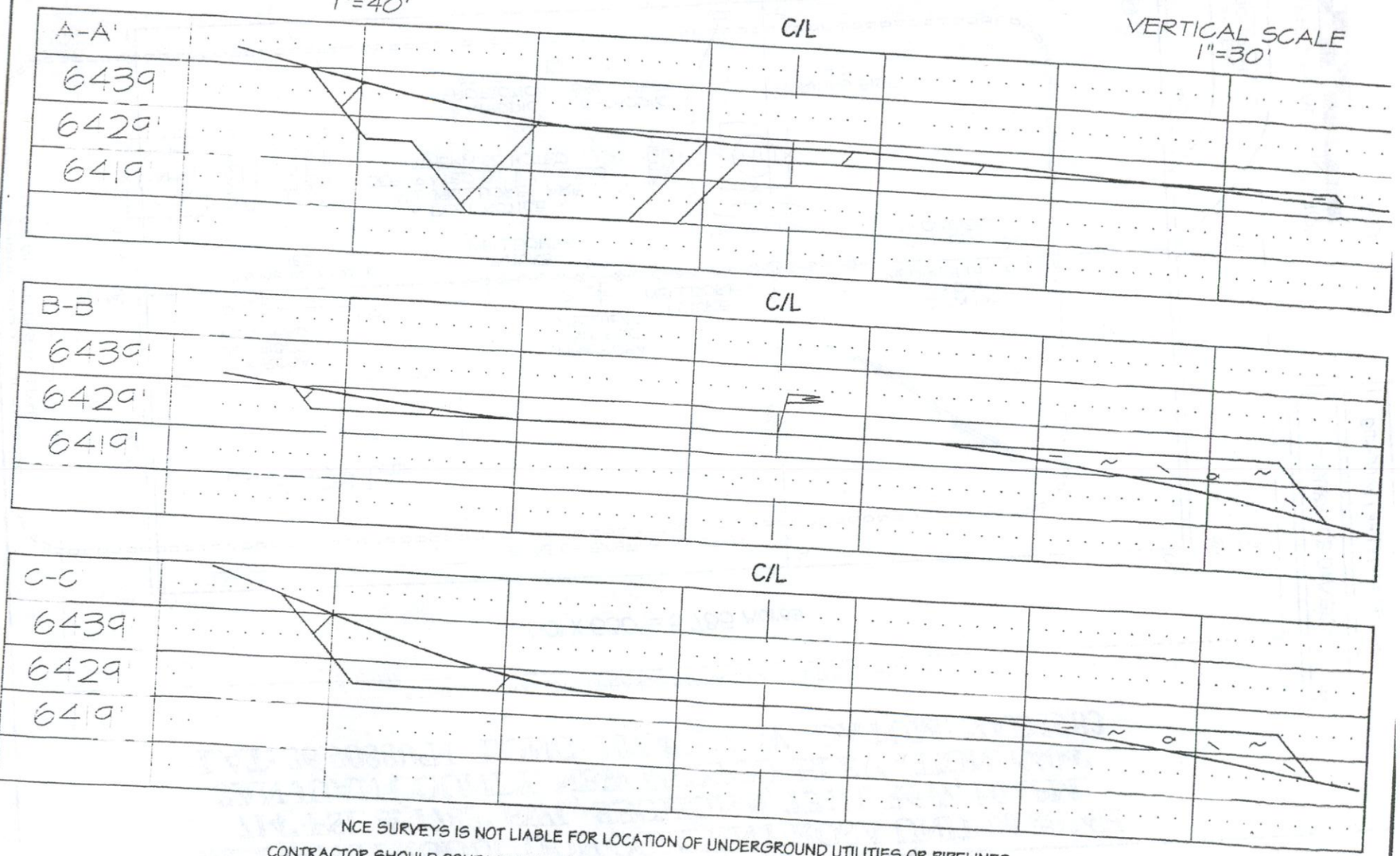
JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

JASON C. EDWARDS

WILLIAMS PRODUCTION COMPANY ROSA UNIT 05 #014H
1031' FNL & 1862' FWL, SECTION 9, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO ELEVATION: 6429'

HORIZONTAL SCALE
1"=40'

VERTICAL SCALE
1"=30'



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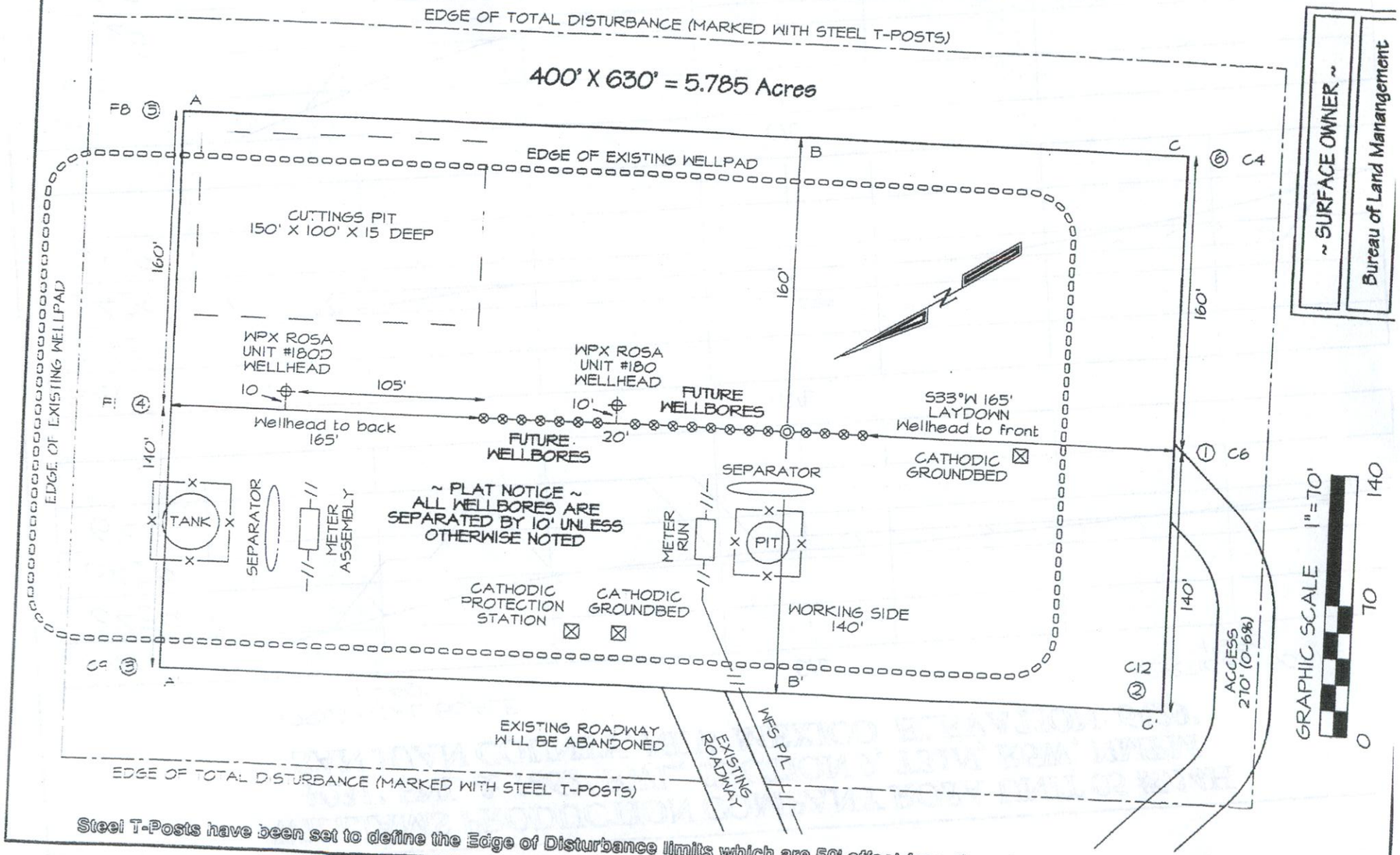
WILLIAMS PRODUCTION COMPANY ROSA UNIT 06 #014H
714' FSL & 1783' FWL, SECTION 9, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO ELEVATION: 6404'
LAT: 36.90880°N LONG: 107.47110°W DATUM: NAD1983



Steel T-Posts have been set to define the Edge of Disturbance limits which are 50' offset from the edge of the staked wellpad.

ATTACHMENT B. PROJECT AREA MAP

ATTACHMENT C. PLANTS AND WILDLIFE FOUND IN THE PROJECT AREA

Forbs

Arabis perennans	Rockcress
Artemisia frigida	Sage
Astragalus sp.	Astragalus
Calochortus nuttallii	Sego lily
Carduus nutans	Musk thistle
Castellija chromosa	Indian paintbrush
Cirsium neomexicana	Native thistle
Crepis occidentalis	Hawksbeard
Cryptantha sp.	Cryptantha
Cymopterus purpureus	Spring parsley
Eriogonum alatum	Winged buckwheat
Eriogonum jamesi	Wild buckwheat
Eriogonum racemosum	Redroot buckwheat
Erodium cicutarium	Filare
Gilia aggregata	Gilia
Heterotheca villosa	Goldenaster
Hymenopappus filifolius	Hymenopappus
Leptodactylon pungens	Spiny gilia
Machaerantha canescens	Purple aster
Melilotus officinalis	Yellow sweet clover
Orobanche fasciculata	Clustered broomrape
Penstemon angustifolius	Penstemon
Penstemon linarioides	Penstemon
Phlox longifolia	Phlox
Salsola iberica	Russian thistle, tumbleweed
Sanguisorba minor	Burnet
Schoencrambe linifolia	Schoencrambe
Senecio multicapitatus	Groundsel
Sisymbrium altissimum	Tumble mustard
Sphaeralcea coccinea	Globe mallow
Townsendia incana	Hoary Townsend daisy
Tragopogon dubius	Goatsbeard
Verbena bracteata	Prostrate vervain

Grasses

Agropyron cristatum	Crested wheatgrass
Achnatherum hymenoides	Indian ricegrass
Bouteloua gracilis	Blue grama
Bromus tectorum	Cheatgrass
Bromus inermis	Smooth brome
Poa fendleriana	Muttongrass

ADDENDUM TO

BIOLOGICAL SURVEY REPORT

WPX ENERGY PRODUCTION, LLC

MIDDLE MESA WATER MANAGEMENT SYSTEM PROJECT

Photo 1: Northeast corner looking south into project area.

INTRODUCTION

This Biological Survey Report (BSR) addendum was prepared for the WPX Energy Production, LLC (WPX) proposed Middle Mesa Water Management System Project. This addendum discusses the biological survey of the water line eastern segment and the eastern bore site of the proposed project.

Pedestrian surveys of the project area were conducted by Ecosphere Environmental Services (Ecosphere) on June 5, 2011. During the survey, transects spaced approximately 20 feet apart were surveyed over the entire proposed disturbance areas. All plant and wildlife species and signs of wildlife observed were recorded, and digital photos were taken. Binoculars were used to survey for raptors, potential nesting habitat, and whitewash. The habitat was evaluated for all U.S. Fish and Wildlife Service (USFWS) and Bureau of Land Management (BLM) species with special conservation status that have the potential to occur in the project area or action area. The action area is defined as a 1/3-mile radius around the proposed project area.

moderate and short term. Indirect impacts could include a change in prey species composition for raptors from the disturbance and modification of vegetation. These impacts would be low and short to long term.

BIOLOGICAL SURVEY REPORT

for

WPX Energy Production, LLC
Middle Mesa Water Management System Project

Prepared for:
Bureau of Land Management - Farmington Field Office

Prepared by:

NELSON CONSULTING INC

March 2012

BIOLOGICAL SURVEY REPORT
WPX ENERGY PRODUCTION, LLC
PROPOSED MIDDLE MESA WATER MANAGEMENT SYSTEM PROJECT

This report describes the potential for Federal and Bureau of Land Management (BLM) special status species to occur within the proposed project area. The BLM defines the proposed project area as any area that may be directly or indirectly impacted by the proposed project. This report is prepared in accordance with the BLM's biological survey guidelines (Kendall 2010) and is intended to provide the agency with information to make determinations of effect on species with special conservation status.

PROJECT DESCRIPTION

WPX Energy Production, LLC (WPX) is proposing to construct the Middle Mesa Water Management System (MMWMS), which would consist of a produced water pipeline, a fluid management pit, a realigned access road, and two bore stations. The purpose of the proposed project is to transfer produced water from the existing Liquid Gathering System (LGS) east of Navajo Reservoir to the North Multi-Well Fluid Management Pit (North Fluid Management Pit) on the west side of the Reservoir. The water would be stored in the North Fluid Management Pit for use in the drilling and completion of proposed horizontal Basin Mancos wells. The MMWMS Project would consist of three segments:

- The **Eastern Segment** would start at the existing LGS and extend westward for 3,407 feet to the proposed Eastern Station (Appendix A, Figures 2 and 3). This segment includes the produced water pipeline and the Eastern Station.
- The **Horizontal Directional Drill (HDD) Under Navajo Reservoir Segment** would involve the installation of a 7,027-foot-long produced water pipeline under Navajo Reservoir, utilizing HDD technology. The drill would enter at the proposed Eastern Station on the eastern side of the Navajo Reservoir and exit at the proposed Western Station on the western side of Navajo Reservoir (Appendix A, Figures 2 and 3).
- The **Western Segment** would begin at the proposed Western Station and would extend westward and northward for 16,726 feet to the proposed North Fluid Management Pit (Appendix A, Figures 2 and 3). A portion of this segment would require an existing access road to be realigned. The Western Segment includes the produced water pipeline, Western Station, realigned access road, and North Fluid Management Pit.

Location

The proposed project area is located in the San Juan Basin of northwestern New Mexico, approximately 15 miles southeast of the town of Ignacio, Colorado (Appendix A, Figure 1). The surface portions of the proposed project would primarily be constructed on BLM-FFO surface (21. 8 acres). Approximately 0.3 acre would be located on State of New Mexico surface. This portion is located within the westernmost corner of the North Fluid Management Pit. The Eastern and Western Segments would be separated by Navajo Reservoir. The San Juan/Rio Arriba County line is located in the middle of the Reservoir (see Appendix A, Maps).

The Eastern Segment is located approximately 0.7 mile north of the Laguna Seca Arm of Navajo Reservoir and approximately 1.5 miles south of the Bancos Canyon Arm. The Western Segment is located approximately 0.6 mile east of Cottonwood Canyon.

The proposed project would be within Sections 32 and 33, Township 32 North, Range 6 West and Sections 4, 9, 14, 15, and 16, Township 31 North, Range 6 West, New Mexico Principal Meridian (see Appendix B, Plats).

BLM Areas of Critical Environmental Concern (ACECs) and Specially Designated Areas (SDAs)

Eastern Station

A 100.0-foot-by-125.0-foot (0.3-acre) pad would be constructed to allow for equipment operation associated with drilling under the reservoir (Appendix A, Figures 2 and 3). An existing roadway crosses the proposed station and would account for less than 0.1 acre of existing disturbance (Appendix B, Plats); new disturbance would therefore be approximately 0.2 acre. After the HDD has been completed, a transfer pump, pigging system, automatic emergency shut-off system, and capstone generator would remain as permanent facilities. After reclamation, the Eastern Station would be reduced to approximately 125.0 feet by 75.0 feet (0.2 acre).

Western Station

A 150.0-foot-by-200.0-foot (0.7-acre) pad would be constructed. The pad would serve the same purpose as the Eastern Station and would contain the same equipment (Appendix A, Figures 2 and 3). An existing roadway crosses the proposed station and would account for 0.1 acre of existing disturbance (Appendix B, Plats); new disturbance would therefore be approximately 0.6 acre. After reclamation, the Western Station would be reduced to approximately 125.0 feet by 75.0-feet (0.2 acre).

North Fluid Management Pit

The proposed pipeline would terminate at the proposed North Fluid Management Pit (Appendix A, Figures 2 and 3). The pit would be 300.0 feet by 450.0 feet by 30.0 feet deep. Total pit volume would be 65 acre feet with a usable storage volume of 56 acre feet (Appendix B, Plats). The pad on which the pit would be located would be 350.0 feet by 500.0 feet, plus a 50.0-foot-wide construction zone; total disturbance would be 6.2 acres. The southern construction zone would overlap an existing road, which would account for 0.4 acre of existing disturbance. Approximately 1.6 acres of proposed disturbance would be reclaimed.

METHODOLOGY

Off-Site Methods

Prior to conducting fieldwork, Nelson Consulting, Inc. (NCI) obtained physical and biological information about the proposed project area.

Table 2: Data Sources

Resource	Data Source
Soil	U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx & Soil Survey of San Juan County, New Mexico, Eastern Part & Soil Survey of Rio Arriba County, New Mexico: Parts of Rio Arriba and Sandoval Counties
Geology	U.S. Geological Survey New Mexico Geologic Map Data (http://tin.er.usgs.gov/geology/state/state.php?state=NM)
SDAs & ACECs, Raptor Nests, & Plant SMS Potential Habitat "Zone" Locations	BLM-FFO Shapefiles
Federally Listed Threatened & Endangered Species	U.S. Fish and Wildlife Service Southwest Region (http://www.fws.gov/southwest/es/NewMexico/SBC_intro.cfm)
BLM-FFO SMS	BLM-FFO Threatened and Endangered Species Biologist
Vegetation Community (Eastern Segment)	2011 Rio Arriba County digital orthography photos

swell potential of low, runoff classification of medium, and high susceptibility to wind erosion. Vessilla soils are typically found along break landforms (1- to 30-percent slopes) and within blue grama, piñon pine, one-seed juniper, and Gambel oak ecological sites. A typical soil profile for this soil is sandy loam from 0 to 15 inches and bedrock from 15 to 60 inches (NRCS 2008).

The parent material of Menefee soils primarily consists of colluvium over residuum weathered from shale. This soil is considered a well-drained soil, with a depth class of shallow and slowest permeability classification of slow (< 0.1 to 0.2 inches per hour). Available water capacity for Menefee soils is very low (approximately 2.0 inches). This soil type has a shrink swell potential of moderate, runoff classification of high, and susceptibility to wind erosion. Menefee soils are typically found along break landforms (2- to 30-percent slopes) and within blue grama, piñon pine, one-seed juniper, and Gambel oak ecological sites. A typical soil profile for this soil is clay loam from 0 to 10 inches and bedrock from 10 to 60 inches (NRCS 2008).

The parent material of Orlie soils primarily consists of slope alluvium derived from sandstone and shale. This soil is considered a well-drained soil, with a depth class of very deep and slowest permeability classification of moderately slow (0.2 to 0.6 inches per hour). Available water capacity for Orlie soils is high (approximately 10.9 inches). This soil type has a shrink swell potential of moderate, runoff classification of medium, and slight susceptibility to wind erosion. Orlie soils are typically found along summit and mesa landforms (1- to 8-percent slopes) and within loamy ecological sites. A typical soil profile for this soil is silt loam from 0 to 4 inches, clay loam from 4 to 60 inches (NRCS 2008).

Orlie fine sandy loam (1- to 8-percent slopes)

Approximately 80 percent of Orlie fine sandy loam (1- to 8-percent slopes) is composed of Orlie and similar soils and 20 percent is made up of minor soil components. The parent material of this soil primarily consists of fan alluvium and/or slope alluvium derived from sandstone and shale. Orlie fine sandy loam soils are considered a well-drained soil, with a depth class of very deep and slowest permeability classification of moderately slow (0.2 to 0.6 inches per hour). Available water capacity for this soil is high (approximately 10.7 inches). This soil type has a shrink swell potential of moderate, runoff classification of medium, and high susceptibility to wind erosion. A typical soil profile for this soil is fine sandy loam from 0 to 3 inches, clay loam from 3 to 13 inches, and sandy clay loam from 13 to 60 inches (NRCS 2008).

Orlie fine sandy loam (1- to 8-percent slopes) is typically found along mesa and fan remnant landforms and within loamy ecological sites. The potential plant community for this soil complex is usually comprised of western wheatgrass, Indian ricegrass, needleandthread, galleta, big sagebrush, and fourwing saltbush (NRCS 2008).

Western Segment

The NRCS has mapped two soil units in the Western Segment of the proposed project area: Penistaja-Buckle association (gently sloping) and Rock outcrop-Travessilla-Weska complex (extremely steep slopes) (NRCS 2009). Complete soil information is available in the NRCS's *Soil Survey of San Juan County, New Mexico: Eastern Part* (2009).

Penistaja-Buckle association (gently sloping)

water table being more than 80 inches and depth to restrictive layer (lithic bedrock) ranging from 5 to 20 inches. Available water capacity for this soil map unit is very low (approximately 1.2 inches). A typical soil profile for Travessilla soils is sandy loam from 0 to 9 inches and bedrock from 9 to 20 inches (NRCS 2009).

The parent material of Weska soils primarily consists of residuum weathered from shale. This soil is considered a well-drained soil, with the depth to water table being more than 80 inches and depth to restrictive layer (paralithic bedrock) ranging from 5 to 20 inches. Available water capacity for this soil map unit is very low (approximately 1.4 inches). A typical soil profile for Weska soils is silty clay loam from 0 to 1 inch, clay loam from 1 to 7 inches, and bedrock from 7 to 20 inches (NRCS 2009).

Biological Description of Area

Conditions

Weather conditions during the biological survey were cold (11 to 33° F) with partly cloudy to overcast skies.

Habitat & Vegetation

Habitat within the proposed project area is predominately piñon-juniper woodland; sagebrush openings are present near the northern end of the Western Segment and at the eastern end of the Eastern Segment. Dominant species within the piñon-juniper woodland habitat are Utah juniper, one-seed juniper, crested wheatgrass (*Agropyron cristatum*), blue grama, big sagebrush, and broom snakeweed (*Gutierrezia sarothrae*). Dominant species within the sagebrush habitat are big sagebrush, crested wheatgrass, blue grama, and broom snakeweed. Please refer to Appendix D for a complete list of flora species observed. There are approximately 150 piñon pine and juniper trees, combined, that would be removed as a result of the proposed project (Western Segment only); of these, approximately 40 percent are mature, 45 percent are young, and 15 percent are standing dead. Ground cover (including litter and downed woody debris) within the undisturbed portions of the proposed project area was estimated at 60 to 90 percent. However, ground cover was difficult to estimate given the amount of snow cover present during the survey (5- to 80-percent snow cover).

Terrestrial Wildlife

Elk *(Cervus elaphus)* scat, mule deer (*Odocoileus hemionus*) tracks and scat, desert cottontail (*Sylvilagus audubonii*) tracks and scat, coyote (*Canis latrans*) tracks, and pocket gopher (*Thomomys* sp.) mounds were observed during the biological survey. No prairie dog (*Cynomys* spp.) colonies are recorded within the vicinity of the proposed project area; no sign of prairie dogs was observed.

Migratory Birds

During the biological survey, the following avian species were audibly or visually detected: common raven (*Corvus corax*), western scrub jay (*Aphelocoma californica*), dark-eyed junco (*Junco hymemalis*), and black-billed magpie (*Pica hudsonia*).

Raptor Nesting

According to the BLM-FFO's latest (2012) geographic information system raptor nest data, no raptor nests are located within one-third-mile of the proposed project area. The following table indicates the distance from the proposed project area to the nearest recorded raptor nests.

Table 3: Raptor Nesting Near Proposed Project Area

Species	Federal Status/ County	Occurrence Within BLM-FFO Region	Habitat	Potential to Occur in Proposed Project Area (PPA)
Mesa Verde cactus (*Sclerocactus mesae-verdae*)	Threatened - San Juan	All known BLM-FFO populations are within Hogback ACEC.[1]	Sparsely vegetated, low-rolling, clay hills in Mancos or Fruitland shale formations. Soils are highly alkaline, gypsiferous, and have shrink-swell potentials that make them harsh sites for plant growth. Elevation 4900 to 5500 feet.[4]	DOES NOT OCCUR: Mancos and Fruitland soils not identified within PPA.
FISH				
Colorado pikeminnow (*Ptychocheilus lucius*)	Endangered with Critical Habitat - San Juan	Designated critical habitat within portions of San Juan River, beginning in Farmington and continuing downstream.[1]	Portions of medium to large rivers.[2]	DOES NOT OCCUR: The HDD Segment would be installed approximately 50 feet under Navajo Reservoir and would not come in contact with waters of the reservoir. The Eastern and Western Segments do not come in direct contact with any perennial water sources.
Razorback sucker (*Xyrauchen texanus*)	Endangered with Critical Habitat - San Juan	Known to occur in portions of San Juan River. None known to occur in BLM-FFO.[1]	Portions of medium to large rivers and their impoundments.[2]	DOES NOT OCCUR: The HDD Segment would be installed approximately 50 feet under Navajo Reservoir and would not come in contact with waters of the reservoir. The Eastern and Western Segments do not come in direct contact with any perennial water sources.
Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*)	Candidate - Rio Arriba	Known to occur in Rio Grande headwaters.[2]	Small headwater streams.[2]	DOES NOT OCCUR: The HDD Segment would be installed approximately 50 feet under Navajo Reservoir and would not come

Species	Federal Status/ County	Occurrence Within BLM-FFO Region	Habitat	Potential to Occur in Proposed Project Area (PPA)
Interior least tern *(Sterna antillarum)*	Endangered - Rio Arriba	Few summer/breeding occurrences known in New Mexico; none known in BLM-FFO.[2]	Bare or sparsely vegetated sand or dried mudflats along coasts, rivers, or emergent wetlands.[2]	DOES NOT OCCUR: The HDD Segment would be installed approximately 50 feet under Navajo Reservoir and would not come in contact with waters of the reservoir. The Eastern and Western Segments do not come in direct contact with any water sources.
Mexican spotted owl *(Strix occidentalis lucida)*	Threatened with Critical Habitat - San Juan Rio Arriba	Year-round range.[4] Designated critical habitat is present within BLM-FFO Mexican Spotted Owl ACEC.[1]	Mixed conifer forests. Typically where unlogged, uneven-aged, closed-canopy forests occur in steep canyons.[2].	DOES NOT OCCUR: No complex forests or canyons within immediate vicinity of PPA.
Southwestern willow flycatcher *(Empidonax traillii extimus)*	Endangered with Critical Habitat - San Juan Rio Arriba	Summer/breeding & migration range. No breeding birds recorded within BLM-FFO. All designated potential habitat is protected and managed.[1]	Breeds in dense riparian habitat.[3]	DOES NOT OCCUR: No riparian areas within immediate vicinity of PPA.
Yellow-billed cuckoo *(Coccyzus americanus)*	Candidate - San Juan Rio Arriba	Possible rare summer/breeding occurrences.[4]	Prefers open woodlands with clearings and low, dense, scrubby vegetation. In the southwestern U.S., associated with riparian woodlands dominated by cottonwood or mesquite. In New Mexico, native or exotic species may be used.[3]	DOES NOT OCCUR: No cottonwood, riparian, or deciduous woodlands; moist thickets; orchards; or overgrown pastures within immediate vicinity of PPA.
MAMMALS				
Black-footed ferret *(Mustela nigripes)*	Endangered - San Juan Rio Arriba	Likely extirpated from BLM-FFO. No known occurrences.[2]	Open habitat, including grasslands, steppe, and shrub steppe. Closely associated with prairie dog colonies. At least 40 hectares of prairie dog colony required to support one ferret.[2]	DOES NOT OCCUR: No prairie dog colonies larger than 80 hectares are recorded or were observed within immediate vicinity of PPA.

Table 5: BLM-FFO Special Management Species (SMS)

Species	Occurrence Within BLM-FFO Region	Habitat	Potential to Occur in Proposed Projects Area (PPA)
American peregrine falcon (*Falco peregrinus anatum*)	Summer/ breeding range.[6] Known to nest in BLM-FFO.[1]	Rugged, semi-open to wooded areas in montane regions. Areas with rocky cliffs, outcrops, and canyons that are at least 30 feet high and often near water. In New Mexico, typically nests on cliff ledges.[4,7]	POSSIBLE: Semi-open piñon-juniper woodland is present within the PPA.
Bald eagle (*Haliaeetus leucocephalus*)	Winter range.[6] Known to migrate through and winter in BLM-FFO.[1]	Wintering areas are commonly associated with open water, though eagles may use habitat with little or no open water if other food resources (such as carrion) are readily available. Winter roost sites may be up to 20 miles from food resources.[3]	POSSIBLE: The PPA is approximately 0.2 mi from Navajo Reservoir at the closest point and approximately 1.0 mile at the most distant point. The easternmost end of the Western Segment is approximately 0.2 mile southwest of a bald eagle ACEC.
Burrowing owl (*Athene cunicularia*)	Summer/ breeding range.[6] Known to occur in BLM-FFO.[1]	Open grasslands and sometimes other open areas (such as vacant lots). Nests in abandoned burrows, such as those dug by prairie dogs.[3]	UNLIKELY: No open grasslands or other similarly open areas within PPA. No prairie dog colonies or other appropriate burrows within PPA.
Ferruginous hawk (*Buteo regalis*)	Year-round range.[4] Known to nest in BLM-FFO.[2]	Open areas with broad expanses of prairie grassland or shrub-steppe vegetation, areas with low to moderate agricultural coverage, transitional edges between grasslands and piñon-juniper woodlands, sagebrush shrublands, and desert scrub.[3,4] Nests in elevated locations on the ground (if in grasslands), in isolated tree stands, on rock outcrops/spires, or on utility poles.[4]	UNLIKELY: Open areas with broad expanses are absent from the PPA.
Golden eagle (*Aquila chrysaetos*)	Year-round range.[6] Known to nest in BLM-FFO.[2]	Open to semi-open country with elevated perches, including grasslands, prairies, tundra, open woodlands, shrublands, and barren areas. Prefers hilly or montane regions. Nests on rock ledges on cliffs or in large trees.[3,4,7]	POSSIBLE: Open piñon-juniper woodland is present within the PPA.
Mountain plover (*Charadrius montanus*)	Possible rare summer/ breeding occurrences.[6] Historic breeding records in BLM-FFO.[1]	Large, flat grasslands with sparse, short vegetation and bare ground. Also uses semi-desert scrub dominated by short saltbush and sagebrush. Often associated with prairie dog colonies. In New Mexico, nests are often in overgrazed grassland patches or on gravelly ground with very short cover and scattered shrubs interspersed with bare areas.[4]	DOES NOT OCCUR: Habitat within PPA does not include expanses of short-grassland-type vegetation or flat ground.

The proposed project area is approximately 0.2 mile from Navajo Reservoir at the closest point and approximately 1.0 mile at the most distant point. Navajo Reservoir provides prey species such as fish and waterfowl. The easternmost end of the Western Segment is approximately 0.2 mile southwest of a bald eagle ACEC (Appendix A, Figure 4). The proposed project area could potentially be used for carrion foraging. The piñon-juniper trees that would be removed as a result of the proposed project do not provide preferred roosting site characteristics. No bald eagles were observed during the January biological survey.

Golden eagle (*Aquila chrysaetos*)
Golden eagles may be found in the BLM-FFO region year-round. These raptors occur in open to semi-open country, including tundra, open wooded areas, grasslands, shrublands, or barren areas. They prefer hilly or mountainous areas with elevated perches (NMPIF 2007, NatureServe 2010, and Wheeler 2003). Golden eagles may also be found in areas with light agricultural use, but rarely inhabit rural areas. During the breeding season, these eagles are primarily found in areas with mountain cliffs or canyons (NMPIF 2007). Nesting habitat for this eagle species consists of embankments or cliffs and/or flat to moderate areas with scattered large trees (Wheeler 2003). Dense forests are avoided for nesting. In New Mexico, most nests are within steep-walled mountain canyons (NMPIF 2007). During the summer, golden eagles may be found above timberline. During the winter, they are typically found below timberline and may forage in moderate agricultural areas (Wheeler 2003).

The proposed project area could potentially provide foraging habitat for this species. No nesting sites are provided within the proposed project area. The nearest recorded golden eagle nest is approximately 13 miles west of the Western Segment of the proposed project area. No evidence of this species was observed during the biological survey.

DISCUSSION

USFWS Consultation
The proposed project would be in compliance with USFWS Threatened and Endangered Species management guidelines outlined in the September 2002 Biological Assessment (Consultation No. 2-22-01-I-389) conducted for the Farmington Resource Management Plan/Environmental Impact Statement (BLM 2003). No further consultation with the USFWS is required.

Migratory Bird Treaty Act (MBTA)
The Migratory Bird Treaty Act (MBTA) implements various treaties and conventions between the U.S. and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under the Act, taking, killing, or possessing migratory birds is unlawful. Executive Order 13186 (EO) was signed on January 10, 2001 directing executive departments and agencies of the federal government to take certain actions to further implement the MBTA. Section 3 of the EO directed each federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement, within two years, a Memorandum of Understanding (MOU) with the Fish and Wildlife Service (Service) that shall promote the conservation of migratory bird populations. Section 3(c) of the EO states that the MOU shall recognize that the agency may not be able to implement some elements of the MOU until such time as the agency has successfully included the elements in that agency's formal planning process (such as revision of agency land management plans), including public participation and NEPA analysis as appropriate.

CERTIFICATION

To the best knowledge of NCI, the proposed project, with the successful implementation of mitigation measures, would not violate any provisions of the Endangered Species Act of 1973, as amended. Conclusions are based on actual field examinations and are correct to the best of my knowledge.

Signature of Field Biologist: _____ **Date:** 03/23/12

Ms. Cindy Lawrence
Nelson Consulting, Inc.
835 East Second Avenue, Suite 250
Durango, Colorado
970-375-9703

APPENDIX A – Maps

Figure 2: Project Area Map
Middle Mesa Water Management System Project
WPX Energy Production, LLC
T32N, R6W, Sections 32, 33
T31N, R6W, Sections 4,9,14,15,16

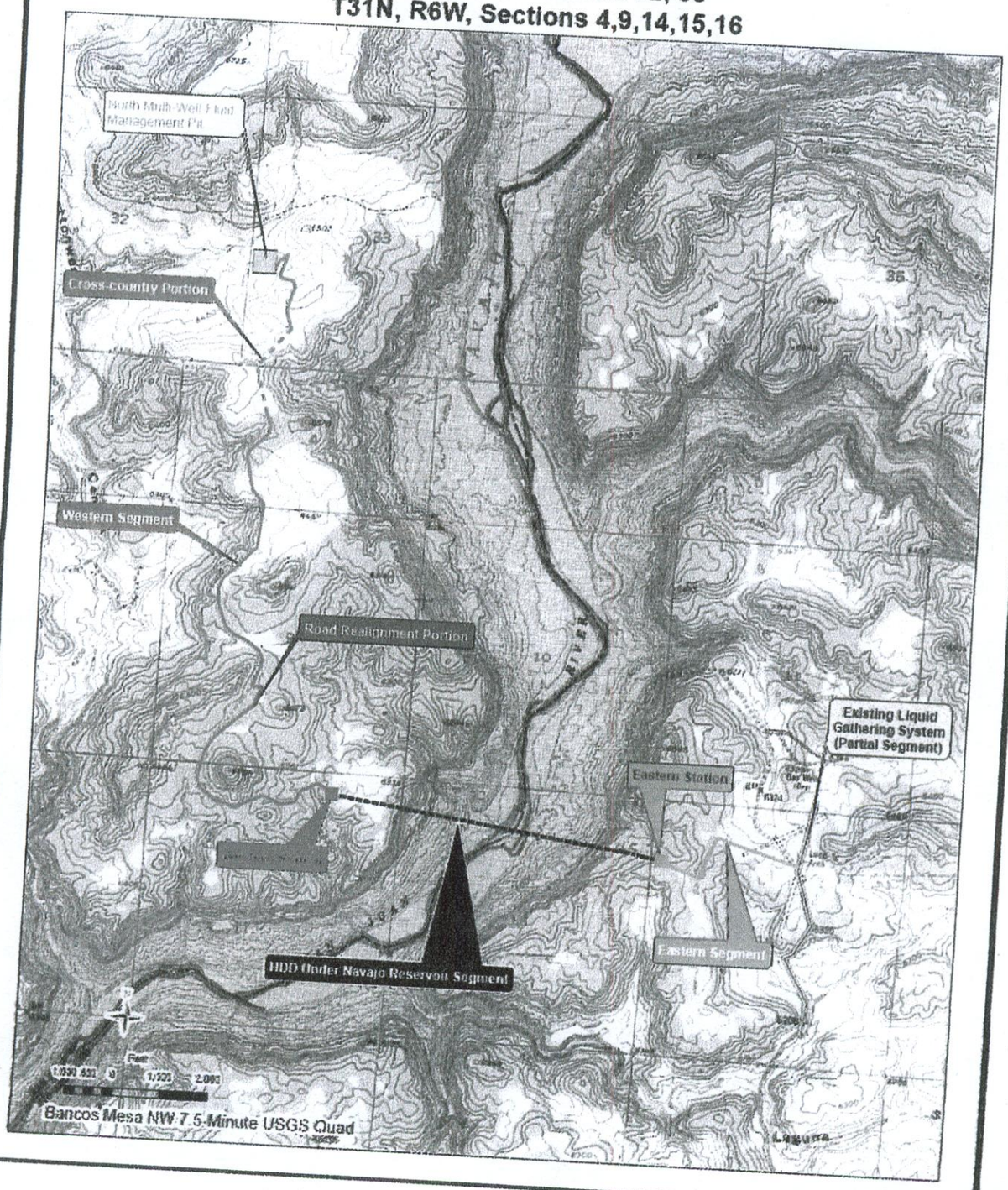
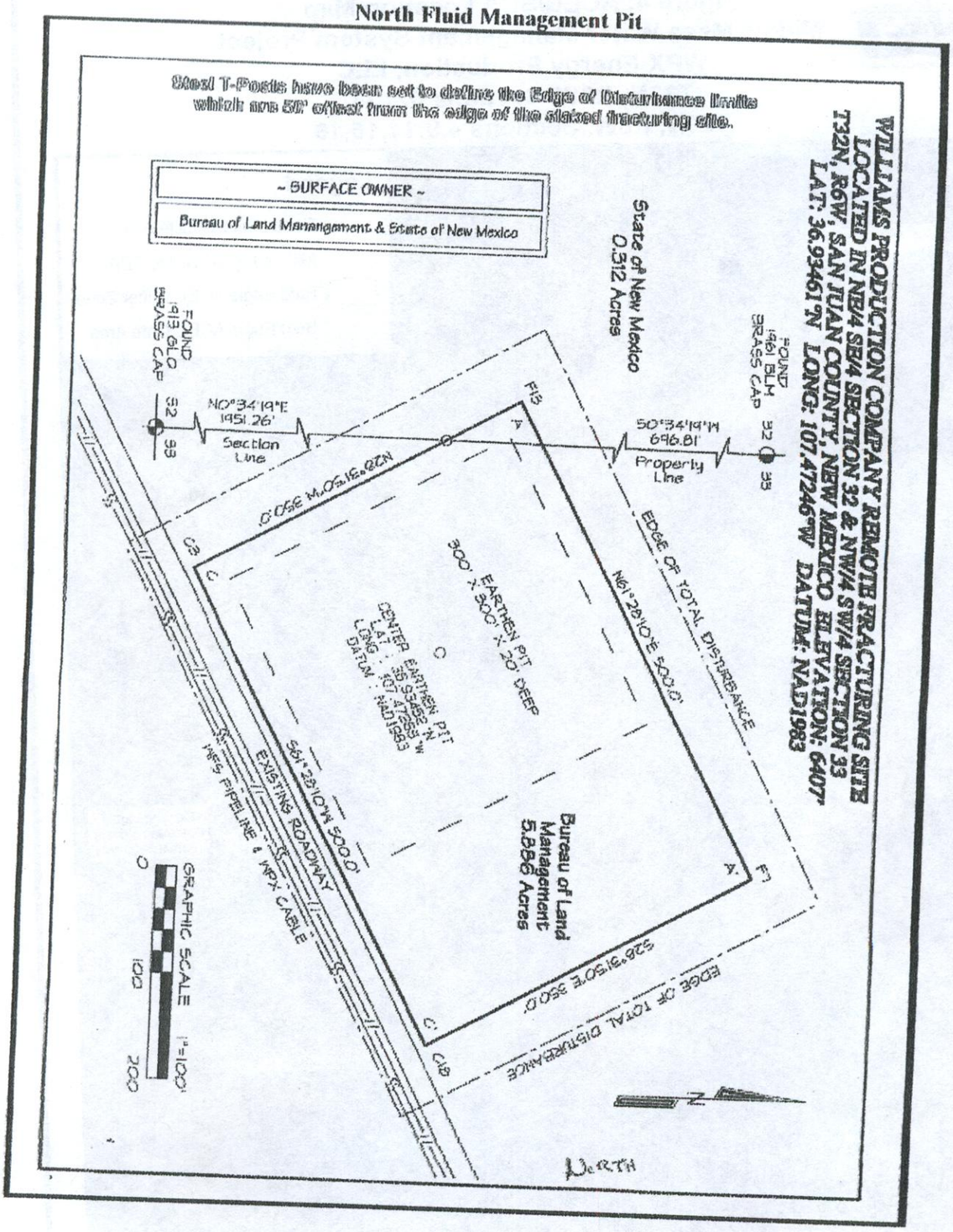
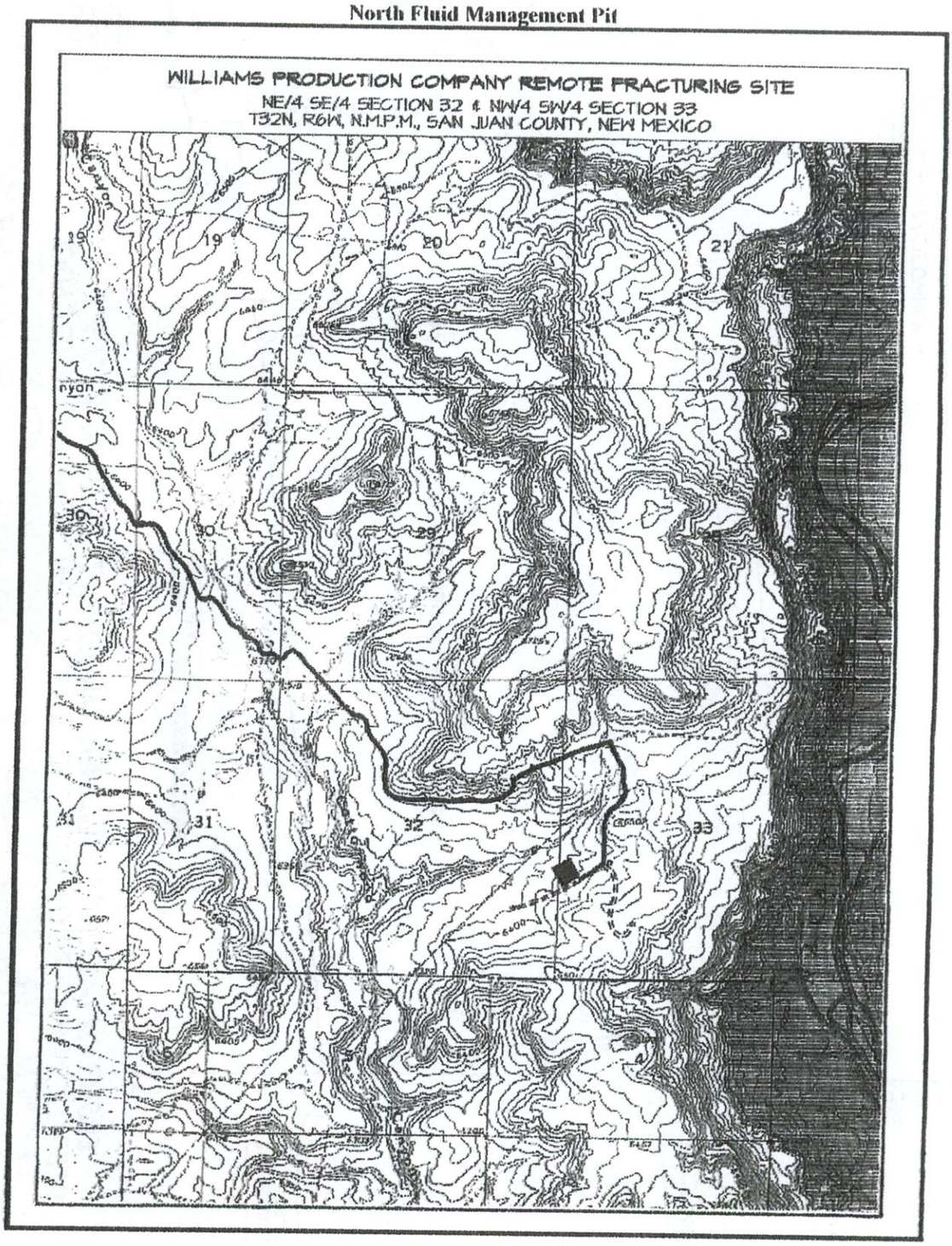


Figure 4: ACEC/SDA Location Map
Middle Mesa Water Management System Project
WPX Energy Production, LLC
T32N, R6W, Sections 32, 33
T31N, R6W, Sections 4,9,14,15,16

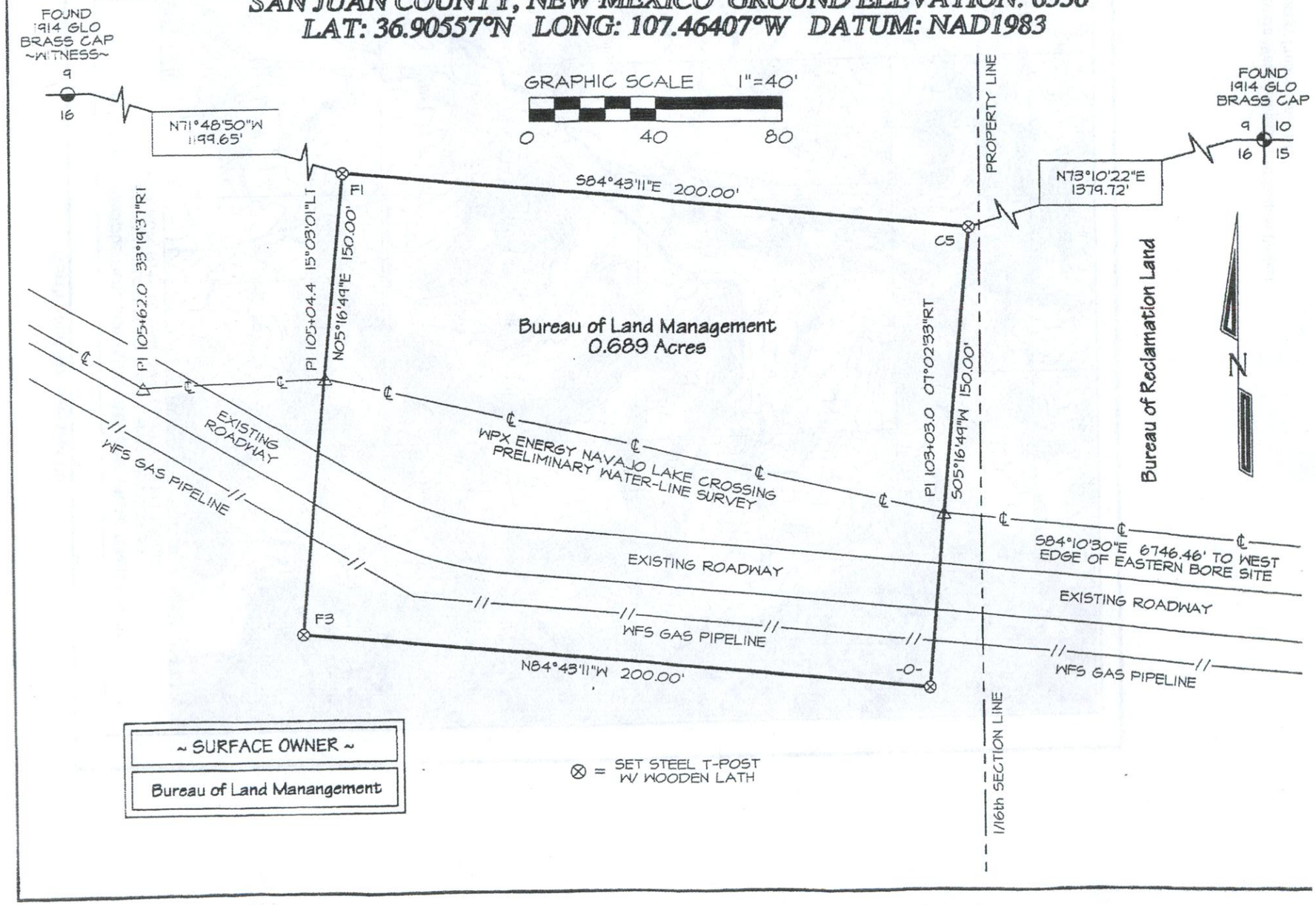
North Fluid Management Pit



North Fluid Management Pit

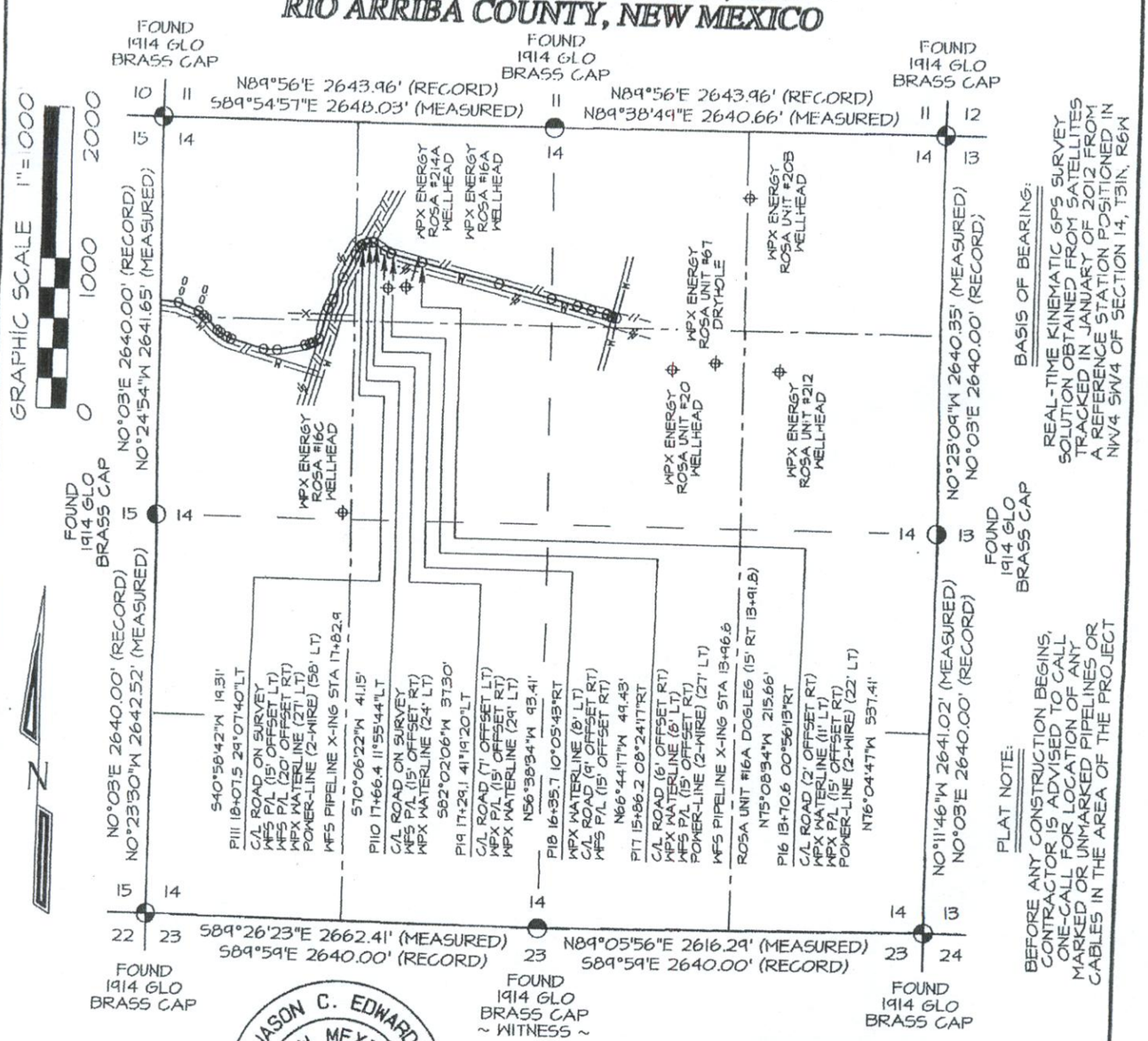


WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING WESTERN BORE SITE
LOCATED IN NW/4 NE/4 OF SECTION 16, T31N, R6W, N.M.P.M.
SAN JUAN COUNTY, NEW MEXICO GROUND ELEVATION: 6336'
LAT: 36.90557°N LONG: 107.46407°W DATUM: NAD1983



Eastern and Western Segment Plats

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE N/2 OF SECTION 14, T31N, R6W, NMPM
RIO ARRIBA COUNTY, NEW MEXICO



BASIS OF BEARING:
REAL-TIME KINEMATIC GPS SURVEY SOLUTION OBTAINED FROM SATELLITES TRACKED IN JANUARY OF 2012 FROM A REFERENCE STATION POSITIONED IN NW/4 SW/4 OF SECTION 14, T31N, R6W

PLAT NOTE:
BEFORE ANY CONSTRUCTION BEGINS, CONTRACTOR IS ADVISED TO CALL ONE-CALL FOR LOCATION OF ANY MARKED OR UNMARKED PIPELINES OR CABLES IN THE AREA OF THE PROJECT

JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Land Management	
0+00 TO 36+81.7	3681.7 FT / 223.1 RODS

I, Jason C. Edwards, a registered Professional Surveyor under the laws of the State of New Mexico, hereby certify that this plat was prepared from field notes of an actual survey meeting the minimum requirements of the standards for easement surveys and is true and correct to the best of my knowledge and belief.

JASON C. EDWARDS Date: April 25, 2012

Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

Prepared for:
WPX ENERGY PRODUCTION
P.O. BOX #640
AZTEC, NM 87410

N C E

Land Surveyor:
Jason C. Edwards
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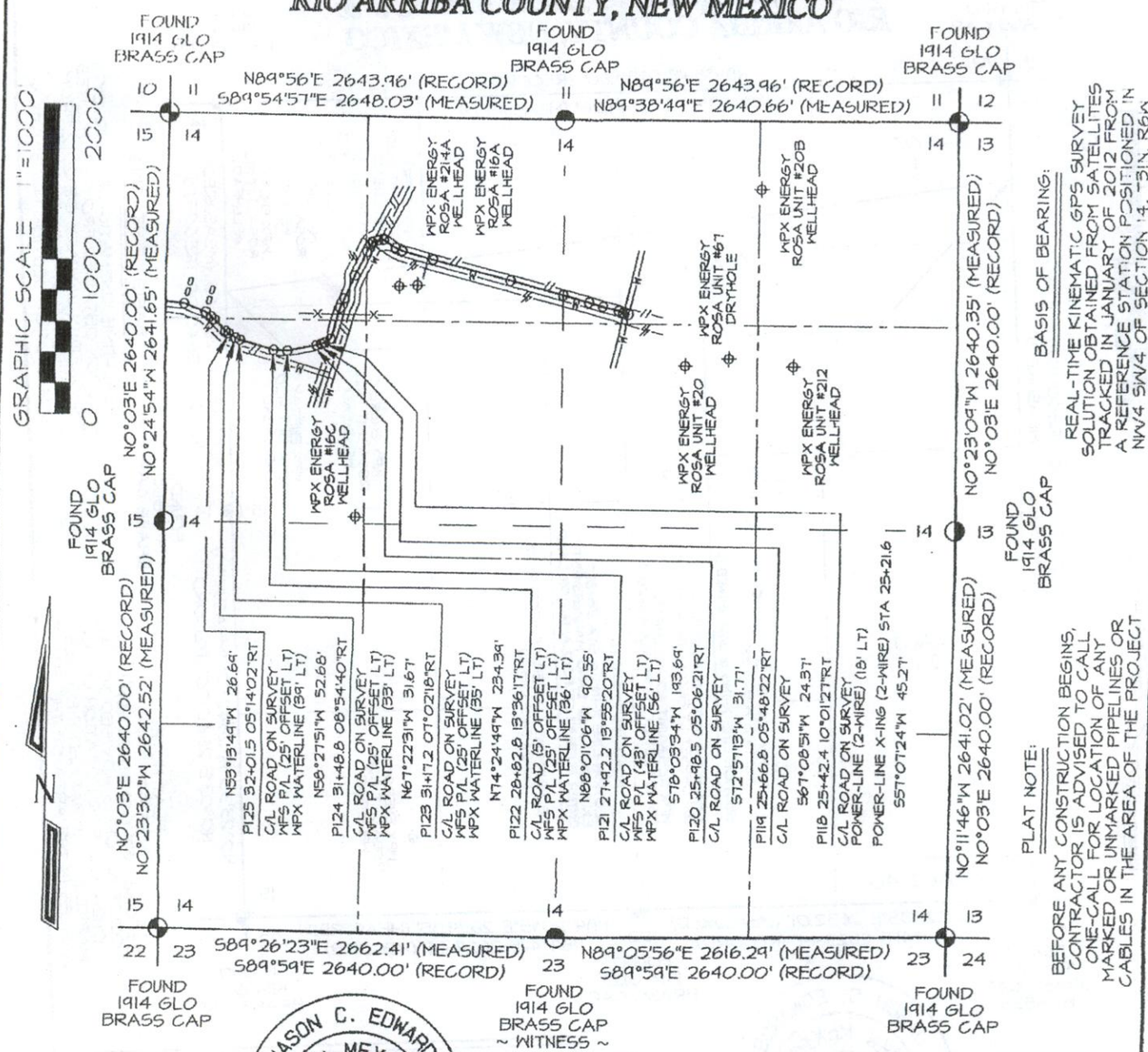
Post Office Box 6612
Farmington, NM 87499
Business Address:
111 East Pinon Street
Farmington, NM 87402
(505) 325-2654 (Office)
(505) 326-5650 (Fax)
SURVEYS INC

SHEET 2 OF 3D | CHECKED BY: JCE
NAME: 31614P52 | DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE
N/2 OF SECTION 14, T31N, R6W, NMPM
RIO ARRIBA COUNTY, NEW MEXICO



JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Land Management	
0+00 TO 36+81.7	3681.7 FT / 223.1 RODS

I, Jason C. Edwards, a registered Professional Surveyor under the laws of the State of New Mexico, hereby certify that this plat was prepared from field notes of an actual survey meeting the minimum requirements of the standards for easement surveys and is true and correct to the best of my knowledge and belief.

JASON C. EDWARDS Date: April 25, 2012

Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

Prepared for:
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AZTEC, NM 87410

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Land Surveyor:
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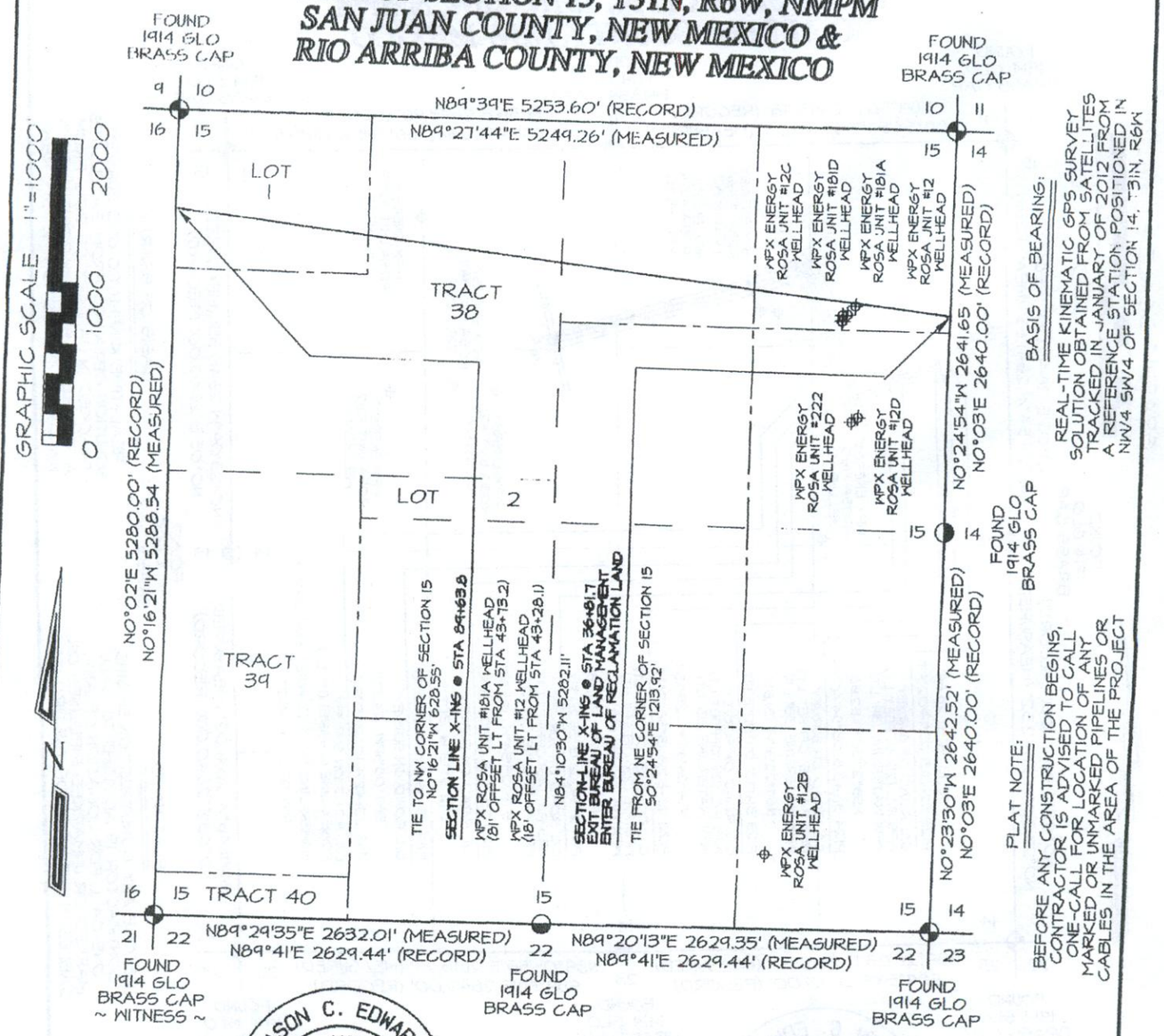
SHEET 4 OF 25 | CHECKED BY: JCE
FNAME: 31614PG4 | DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING PROPOSED WATER-LINE SURVEY LOCATED IN THE N/2 N/2 OF SECTION 15, T31N, R6W, NMPM SAN JUAN COUNTY, NEW MEXICO & RIO ARRIBA COUNTY, NEW MEXICO



JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Reclamation Land	
36+81.7 TO 89+63.8	5282.1 FT / 320.1 RODS

I, Jason C. Edwards, a registered Professional Surveyor under the laws of the State of New Mexico, hereby certify that this plat was prepared from field notes of an actual survey meeting the minimum requirements of the standards for easement surveys and is true and correct to the best of my knowledge and belief.

JASON C. EDWARDS Date: April 25, 2012

Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

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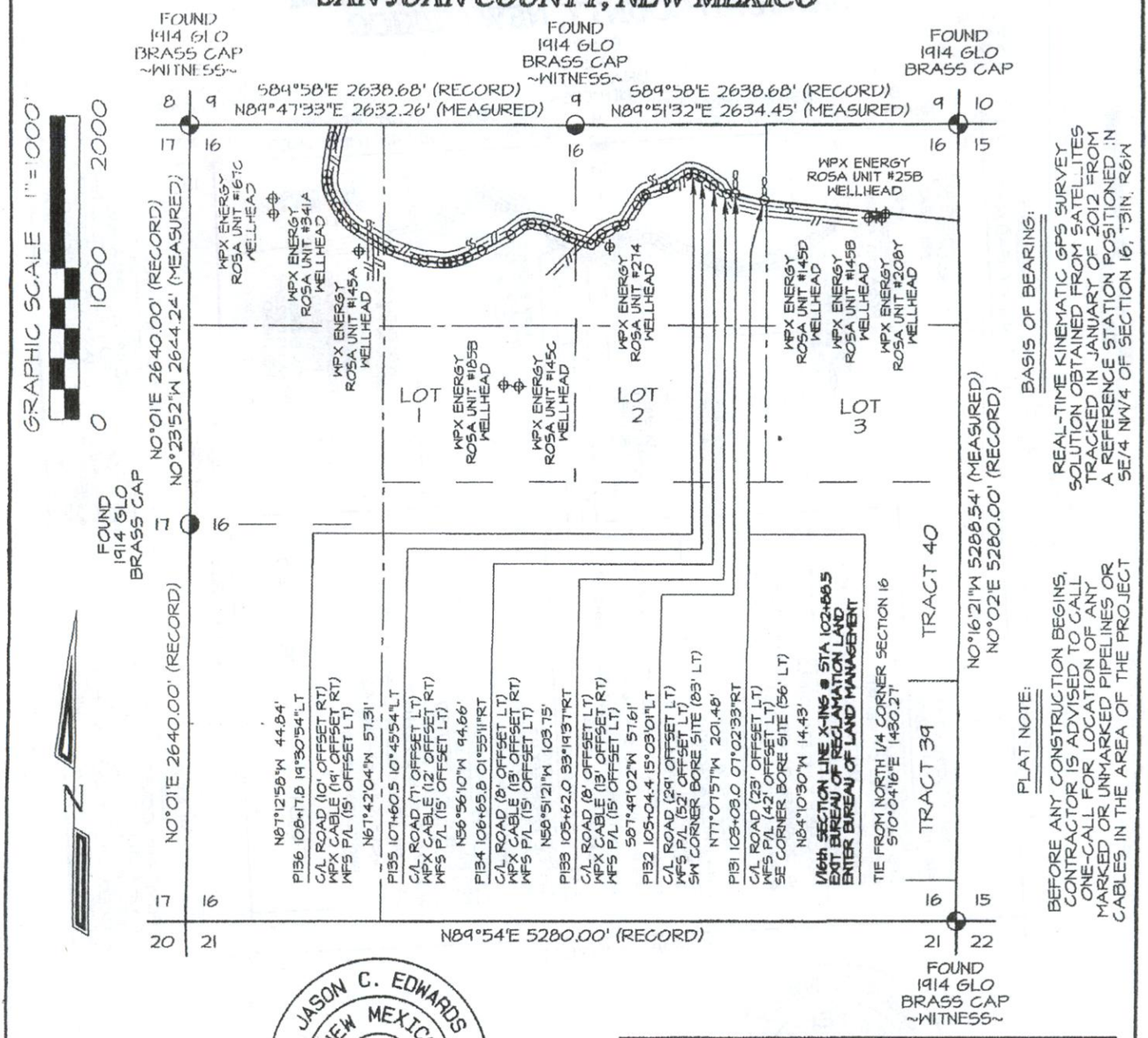
(505) 326-5650 (Fax)
SURVEYS, INC.

SHEET 6 OF 33
JN-WPL: 316129-66
CHECKED BY: JCE
DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE
N/2 N/2 OF SECTION 16, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO



JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Land Management	
102+88.5 TO 142+20.8	3932.3 FT / 238.3 RODS

I, Jason C. Edwards, a registered Professional Surveyor under the laws of the State of New Mexico, hereby certify that this plat was prepared from field notes of an actual survey meeting the minimum requirements of the standards for easement surveys and is true and correct to the best of my knowledge and belief.

JASON C. EDWARDS Date: April 25, 2012

Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

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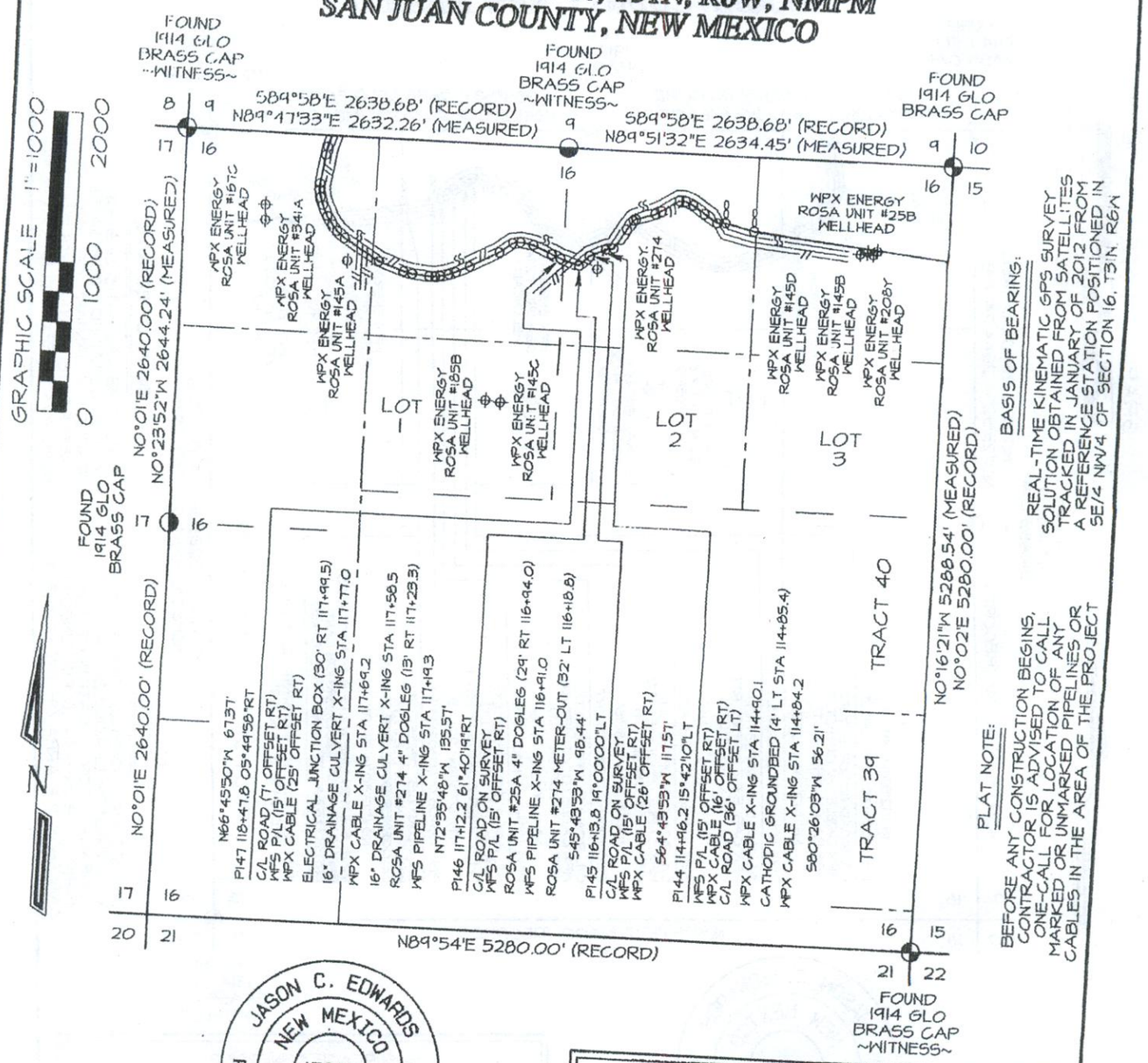
(505) 326-5650 (Fax)

SURVEYS, INC.

SHEET 2 OF 23 | CHECKED BY: JCE
FILENAME: 31616PC00 | DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE
N/2 N/2 OF SECTION 16, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO



JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Land Management	
102+88.5 TO 142+20.8	3932.3 FT / 238.3 RODS

I, Jason C. Edwards, a registered Professional Surveyor under the laws of the State of New Mexico, hereby certify that this plat was prepared from field notes of an actual survey meeting the minimum requirements of the standards for easement surveys and is true and correct to the best of my knowledge and belief.

JASON C. EDWARDS Date: April 25, 2012

Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

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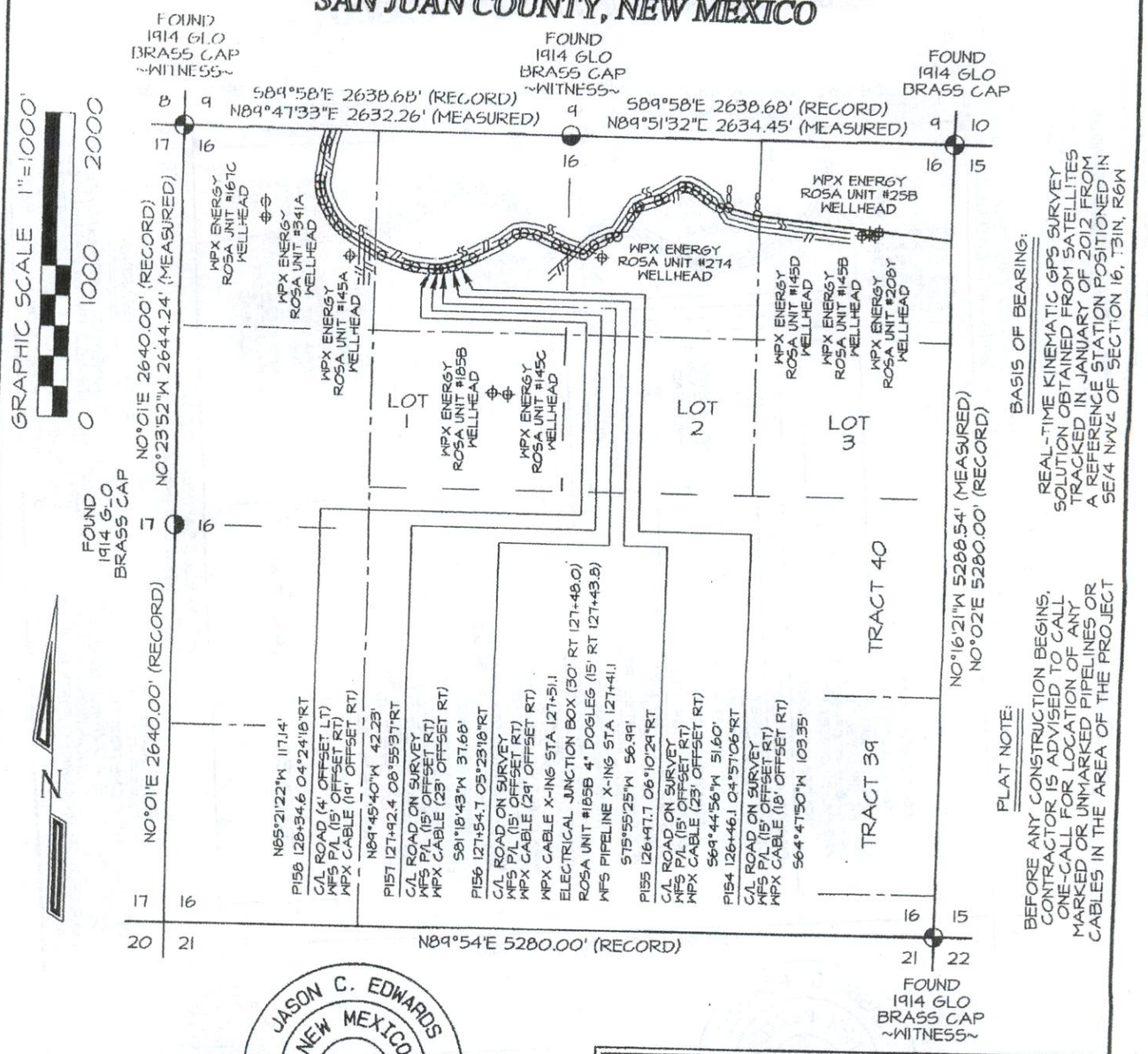
(505) 326-5650 (Fax)

SURVEYS INC

SHT. 10 OF 35 | CHECKED BY: JCE
APNO. 916GPIO | DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE N/2 N/2 OF SECTION 16, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO



BASIS OF BEARING:
REAL-TIME KINEMATIC GPS SURVEY SOLUTION OBTAINED FROM SATELLITES TRACKED IN JANUARY OF 2012 FROM A REFERENCE STATION POSITIONED IN SE/4 NW/4 OF SECTION 16, T31N, R6W

PLAT NOTE:
BEFORE ANY CONSTRUCTION BEGINS, CONTRACTOR IS ADVISED TO CALL ONE-CALL FOR LOCATION OF ANY MARKED OR UNMARKED PIPELINES OR CABLES IN THE AREA OF THE PROJECT

JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Land Management	
102+88.5 TO 142+20.8	3932.3 FT / 238.3 RODS

I, Jason C. Edwards, a registered Professional Surveyor under the laws of the State of New Mexico, hereby certify that this plat was prepared from field notes of an actual survey meeting the minimum requirements of the standards for easement surveys and is true and correct to the best of my knowledge and belief.

JASON C. EDWARDS Date: April 25, 2012

Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

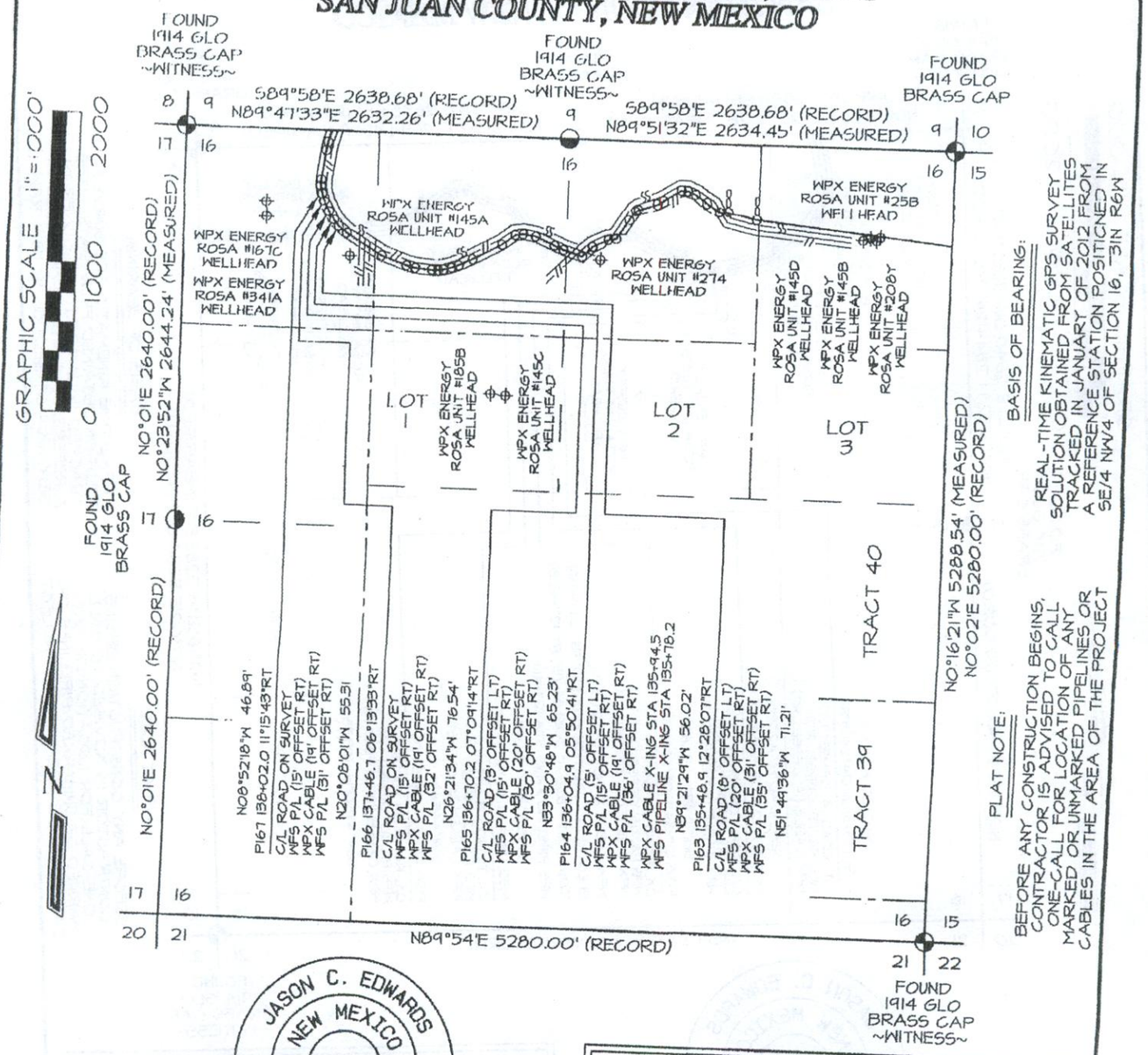
Prepared for:
WPX ENERGY PRODUCTION
P.O. BOX #640
AZTEC, NM 87410

N C E

Land Surveyor:
Jason C. Edwards
Mailing Address:
Post Office Box 6612
Farmington, NM 87499
Business Address:
111 East Pinon Street
Farmington, NM 87402
(505) 325-2654 (Office)
(505) 326-5650 (Fax)
SURVEYS, INC

SHEET 12 OF 99 | CHECKED BY: JCE
FNAME: 3161612 | DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE N/2 N/2 OF SECTION 16, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO



JASON C. EDWARDS
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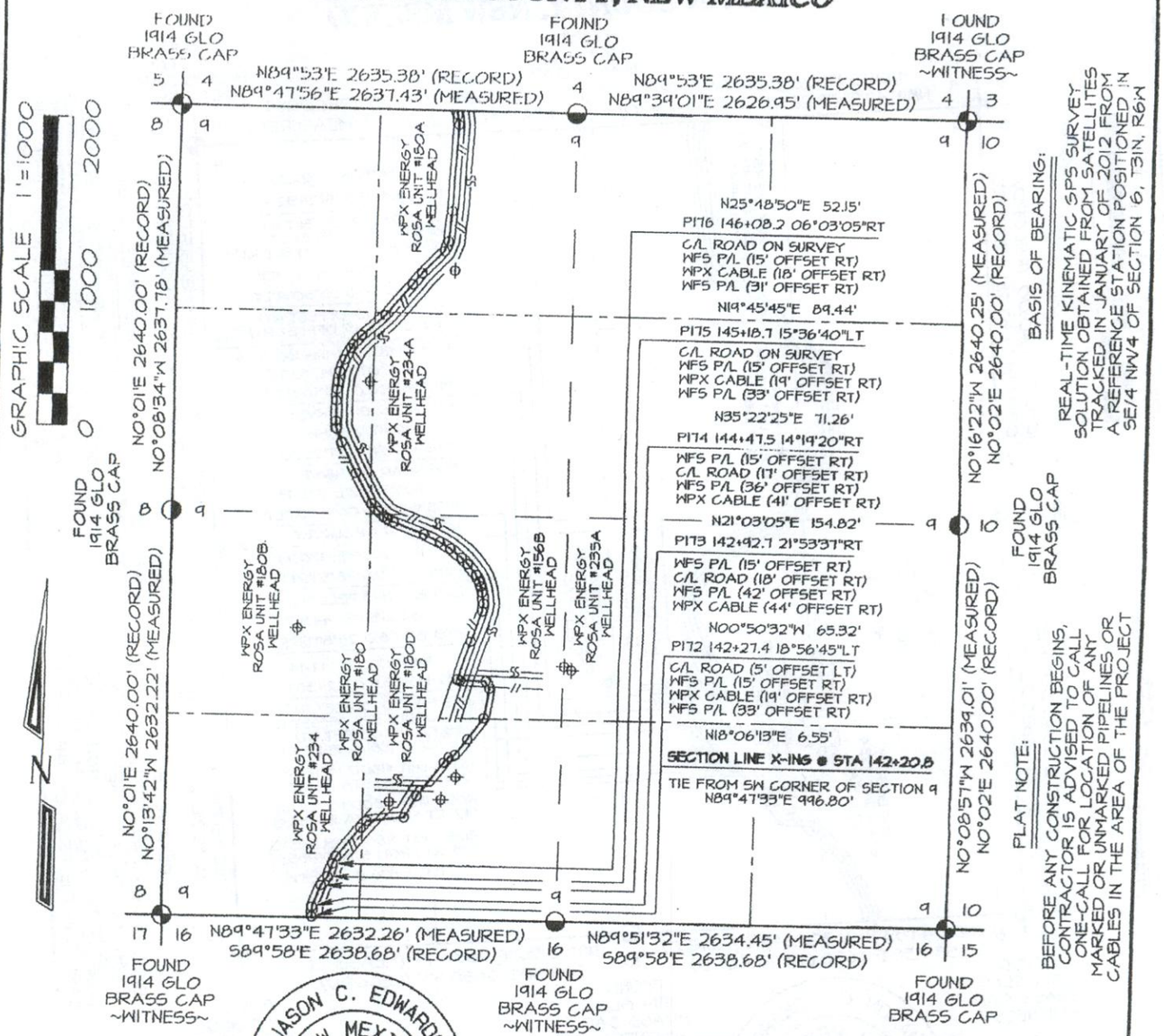
SURVEYS INC

SHEET 14 OF 35 | CHECKED BY: JCE
DATE: 3/16/14 | DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE W/2 OF SECTION 9, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO



BASIS OF BEARING:
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15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Land Management	
142+20.8 TO 209+59.3	6738.5 FT / 408.4 RODS

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AZTEC, NM 87410

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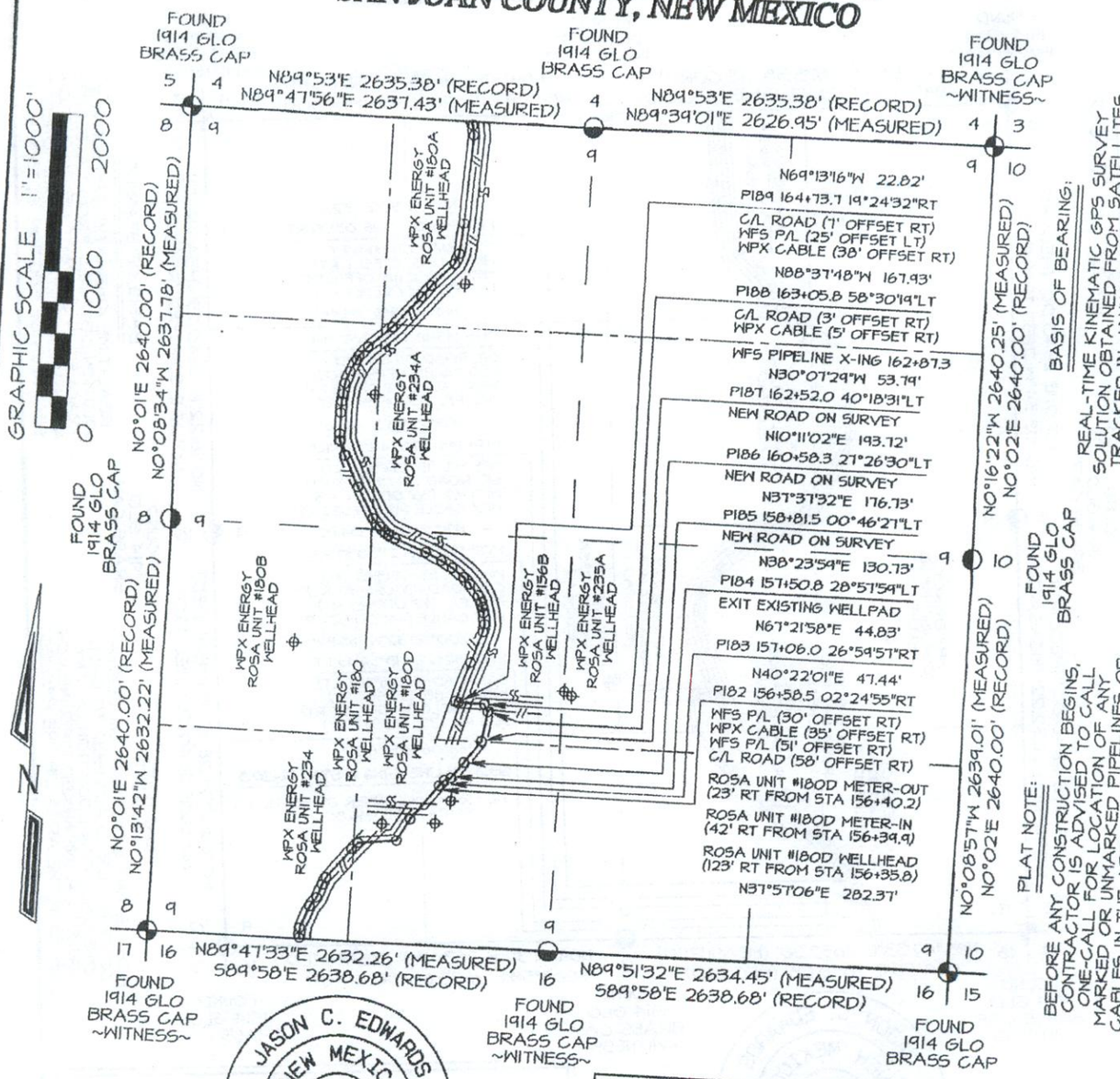
SURVEYS, INC.

SHEET 16 OF 33 | CHECKED BY: JCE
FILENAME: 316-PT016 | DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE
W/2 OF SECTION 9, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO



JASON C. EDWARDS
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JASON C. EDWARDS

Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

Date: April 25, 2012

Prepared for:
WPX ENERGY PRODUCTION
P.O. BOX #640
AZTEC, NM 87410

N C E SURVEYS INC

Land Surveyor:
Jason C. Edwards

Mailing Address:
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Farmington, NM 87499

Business Address:
111 East Pinon Street
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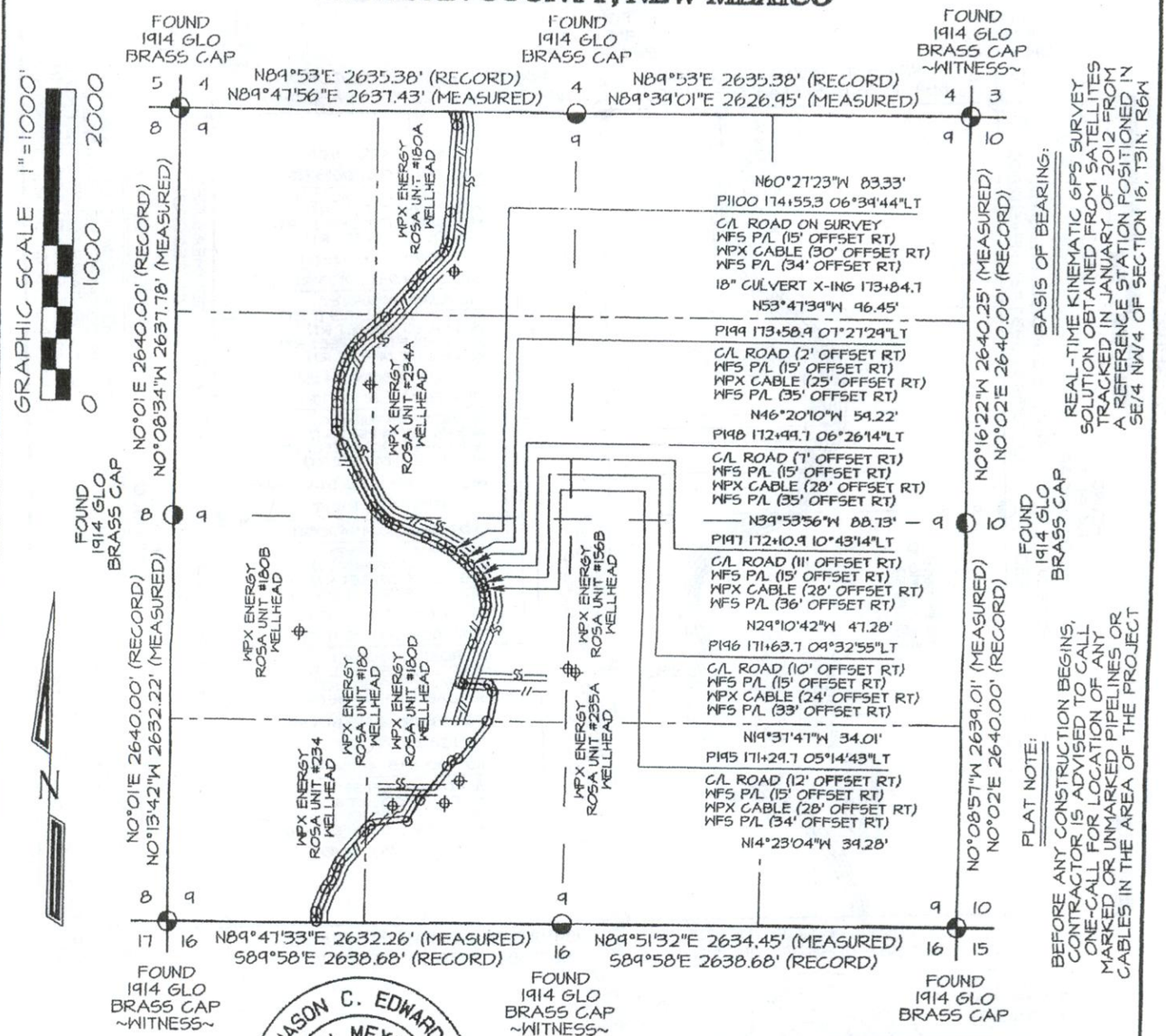
(505) 325-2654 (Office)
(505) 326-5650 (Fax)

SHT. 1 OF 2 | CHECKED BY: JCE
DATE: 3/26/2012 | DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING PROPOSED WATER-LINE SURVEY LOCATED IN THE W/2 OF SECTION 9, T31N, R6W, NMPM SAN JUAN COUNTY, NEW MEXICO



JASON C. EDWARDS
NEW MEXICO
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JASON C. EDWARDS Date: April 25, 2012

Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

Prepared for:
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P.O. BOX #640
AZTEC, NM 87410

N C E

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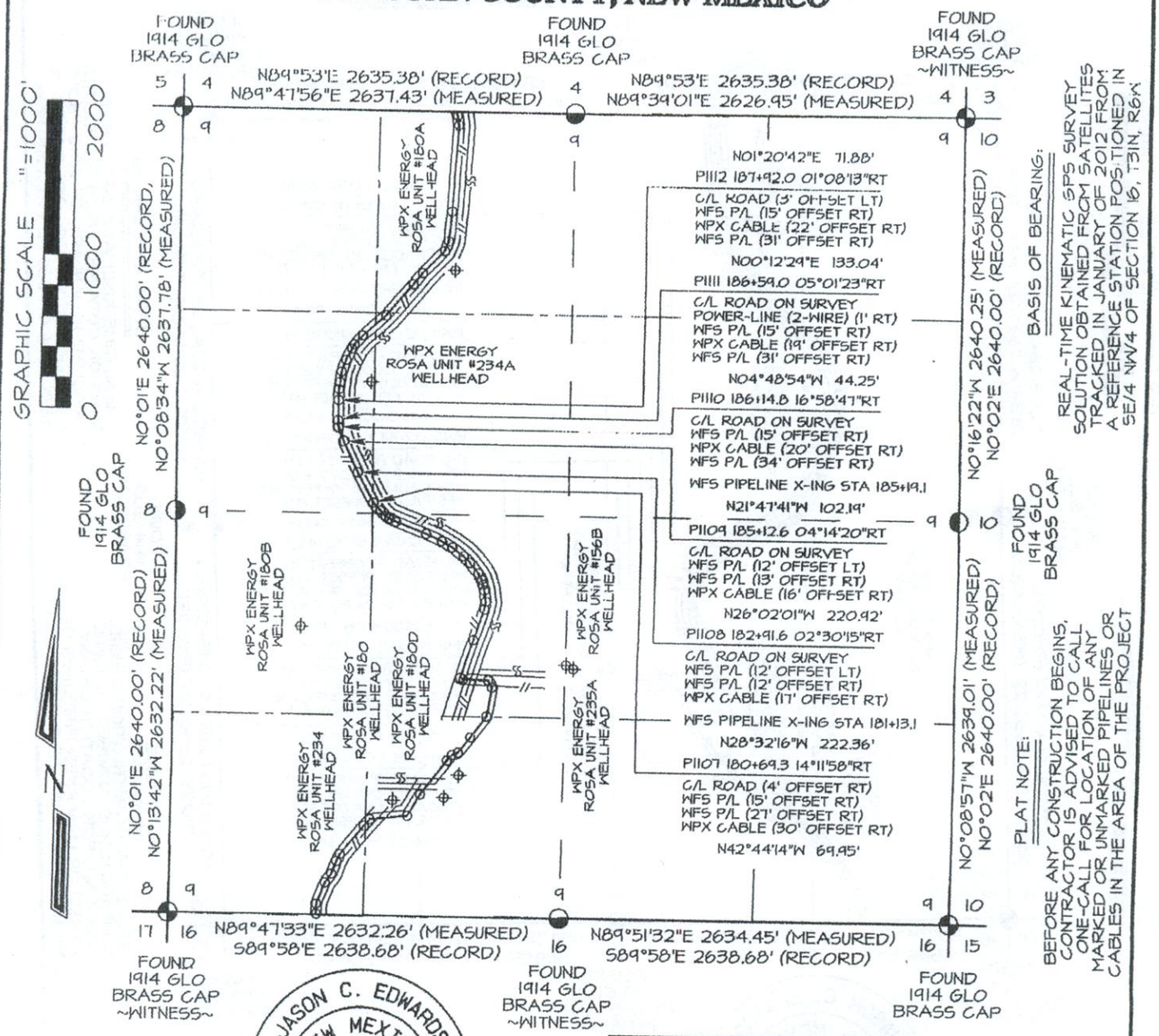
(505) 326-5650 (Fax)
SURVEYS, INC.

SHEET 20 OF 39 | CHECKED BY: JCE
FILENAME: 3164PS20 | DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE W/2 OF SECTION 9, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO



JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Land Management	
142+20.8 TO 209+59.3	6738.5 FT / 408.4 RODS

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JASON C. EDWARDS Date: April 25, 2012

Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

Prepared for:
WPX ENERGY PRODUCTION
P.O. BOX #640
AZTEC, NM 87410

N C E

Land Surveyor:
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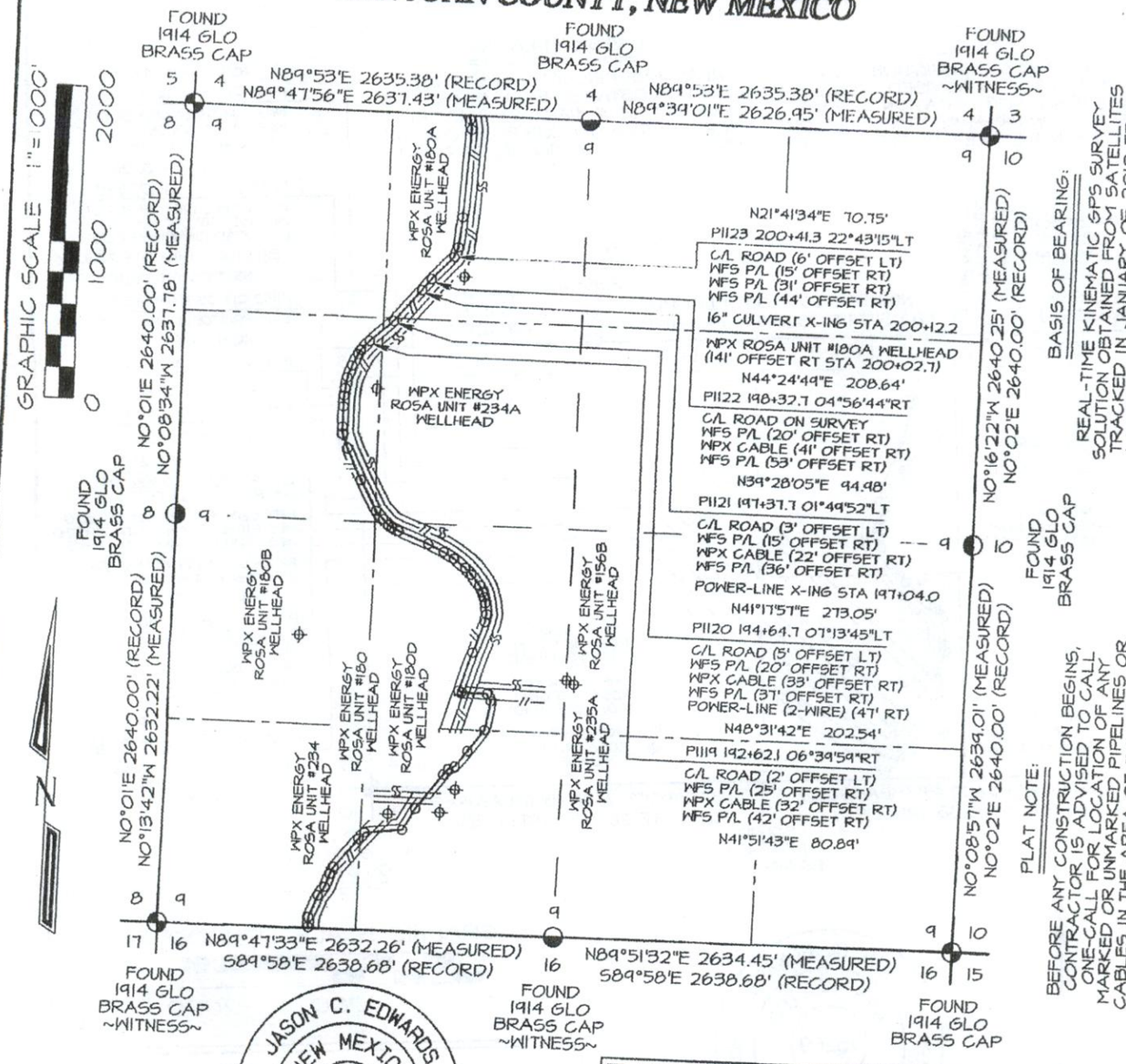
(505) 325-2654 (Office)
(505) 326-5650 (Fax)
SURVEYS, INC.

SHEET 22 OF 30 | CHECKED BY: JCE
FILENAME: 316PR22 | DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE W/2 OF SECTION 9, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO



JASON C. EDWARDS
NEW MEXICO
15269
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~ SURFACE OWNERSHIP ~ Bureau of Land Management	
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JASON C. EDWARDS Date: April 25, 2012

Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

Prepared for:
WPX ENERGY PRODUCTION
P.O. BOX #640
AZTEC, NM 87410

N C E

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(505) 325-2654 (Office)
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SURVEYS INC

CHECKED BY: JCE
DRAWN BY: SLE
PT. 24 OF 39
AMEL 9164F0524

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE
E/2 W/2 OF SECTION 4, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO

PLAT NOTE:

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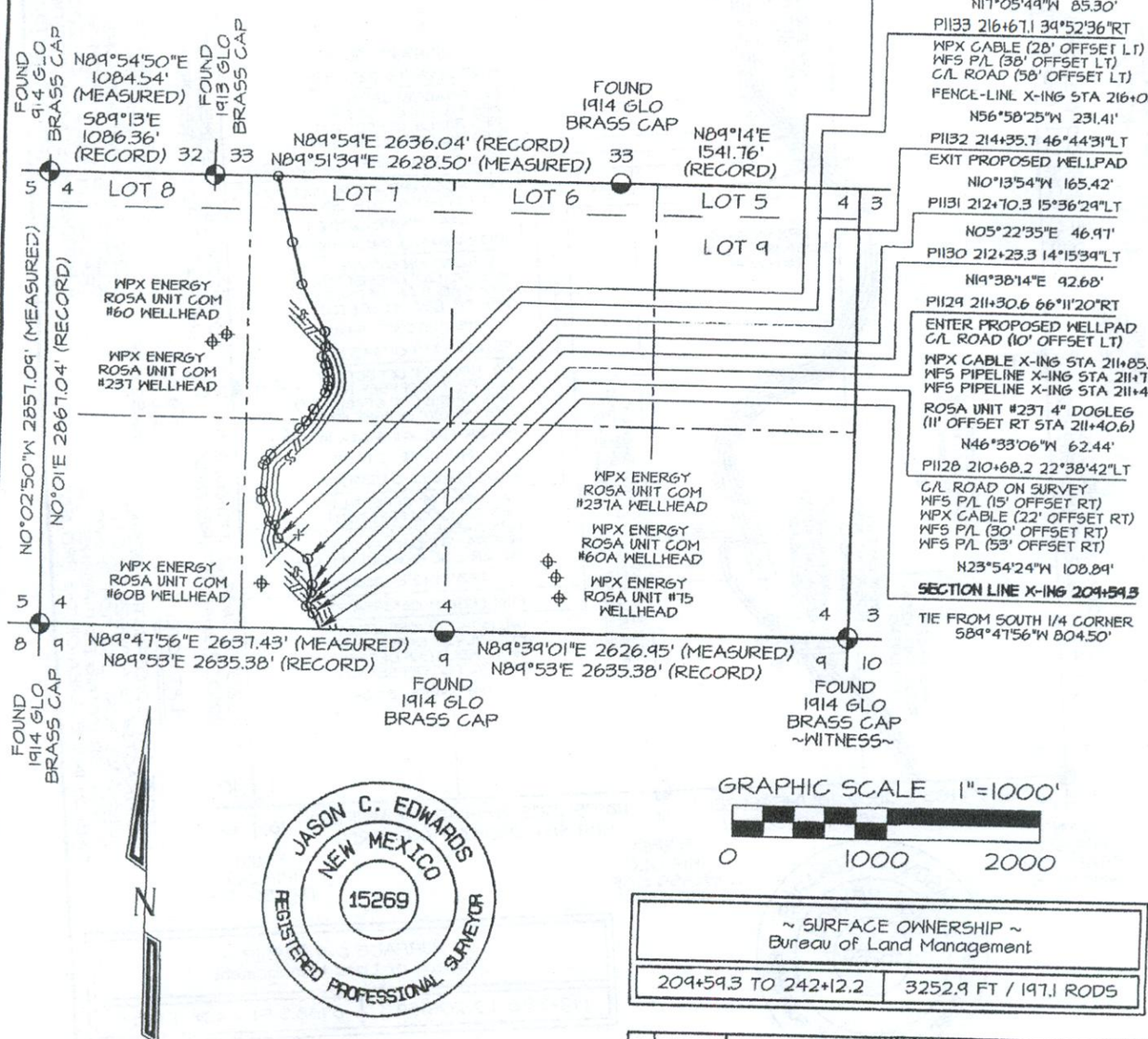
BASIS OF BEARING:

REAL-TIME KINEMATIC GPS SURVEY SOLUTION OBTAINED FROM SATELLITES TRACKED IN JANUARY OF 2012 FROM A REFERENCE STATION POSITIONED IN SE/4 NW/4 OF SECTION 16, T31N, R6W



JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Land Management	
204+54.3 TO 242+12.2	3252.9 FT / 197.1 RODS

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Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

Prepared for:
WPX ENERGY PRODUCTION
P.O. BOX #640
AZTEC, NM 87410

N C E SURVEYS, INC.

Land Surveyor:
Jason C. Edwards

Mailing Address:
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111 East Pinon Street
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(505) 325-2654 (Office)
(505) 326-5650 (Fax)

SHEET 26 OF 35 | CHECKED BY: JCE
FILENAME: 316-4P0.26 | DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE E/2 W/2 OF SECTION 4, T31N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO

PLAT NOTE:

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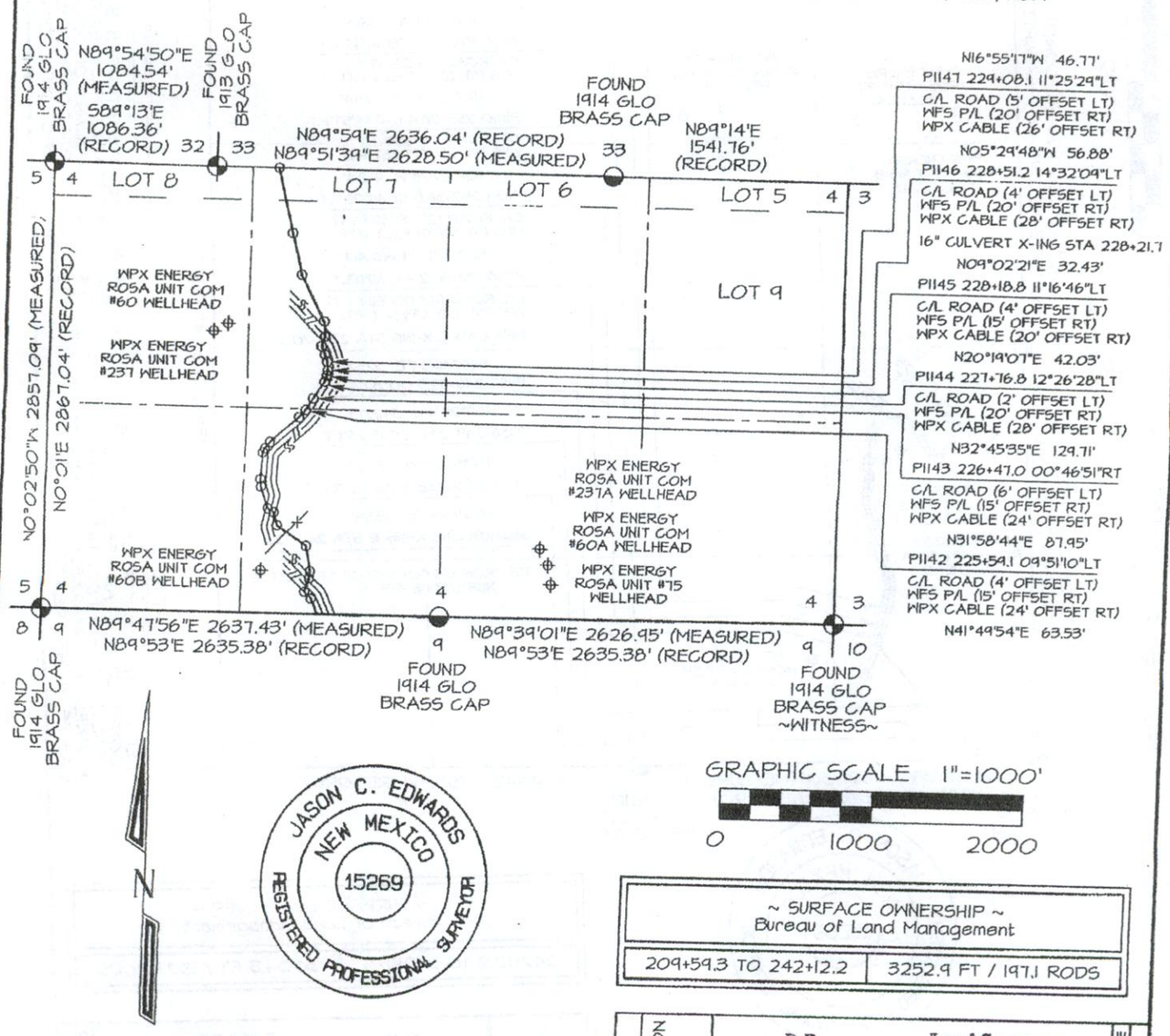
REAL-TIME KINEMATIC GPS SURVEY SOLUTION OBTAINED FROM SATELLITES TRACKED IN JANUARY OF 2012 FROM A REFERENCE STATION POSITIONED IN SE/4 NW/4 OF SECTION 16, T31N, R6W



~ SURFACE OWNERSHIP ~ Bureau of Land Management	
209+59.3 TO 242+12.2	3252.9 FT / 197.1 RODS

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New Mexico L.S. #15269

Prepared for:
WPX ENERGY PRODUCTION
P.O. BOX #640
AZTEC, NM 87410

N C E

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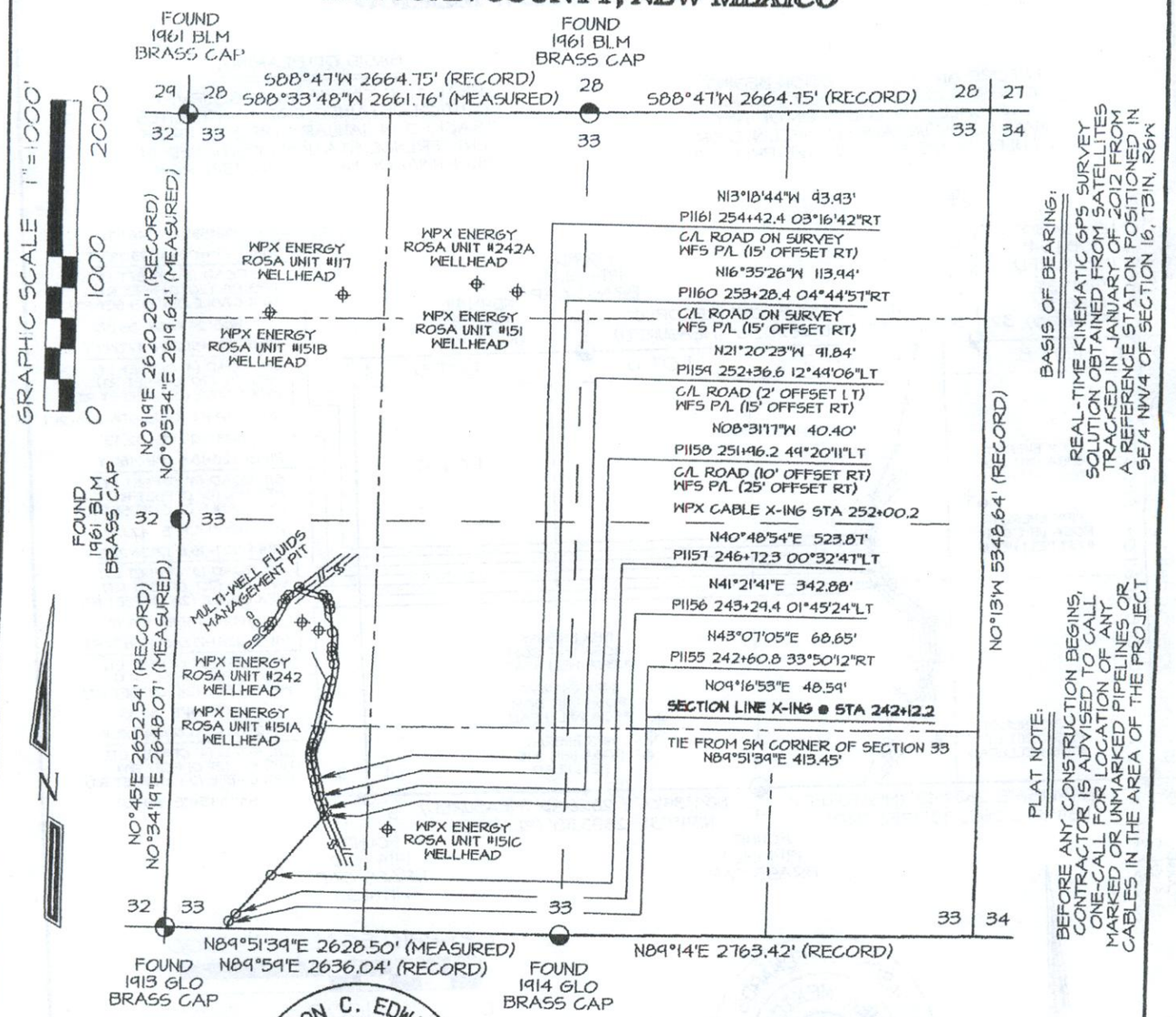
(505) 326-5650 (Fax)

SURVEYS, INC.

SHEET 2b OF 3b | CHECKED BY: JCE
FILENAME: 3164FG2b | DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE
W/2 SW/4 OF SECTION 33, T32N, R6W, NMPM
SAN JUAN COUNTY, NEW MEXICO



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JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Bureau of Land Management	
242+12.2 TO 272+16.5	3004.3 FT / 182.1 RODS

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JASON C. EDWARDS Date: April 25, 2012

Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

Prepared for:
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AZTEC, NM 87410

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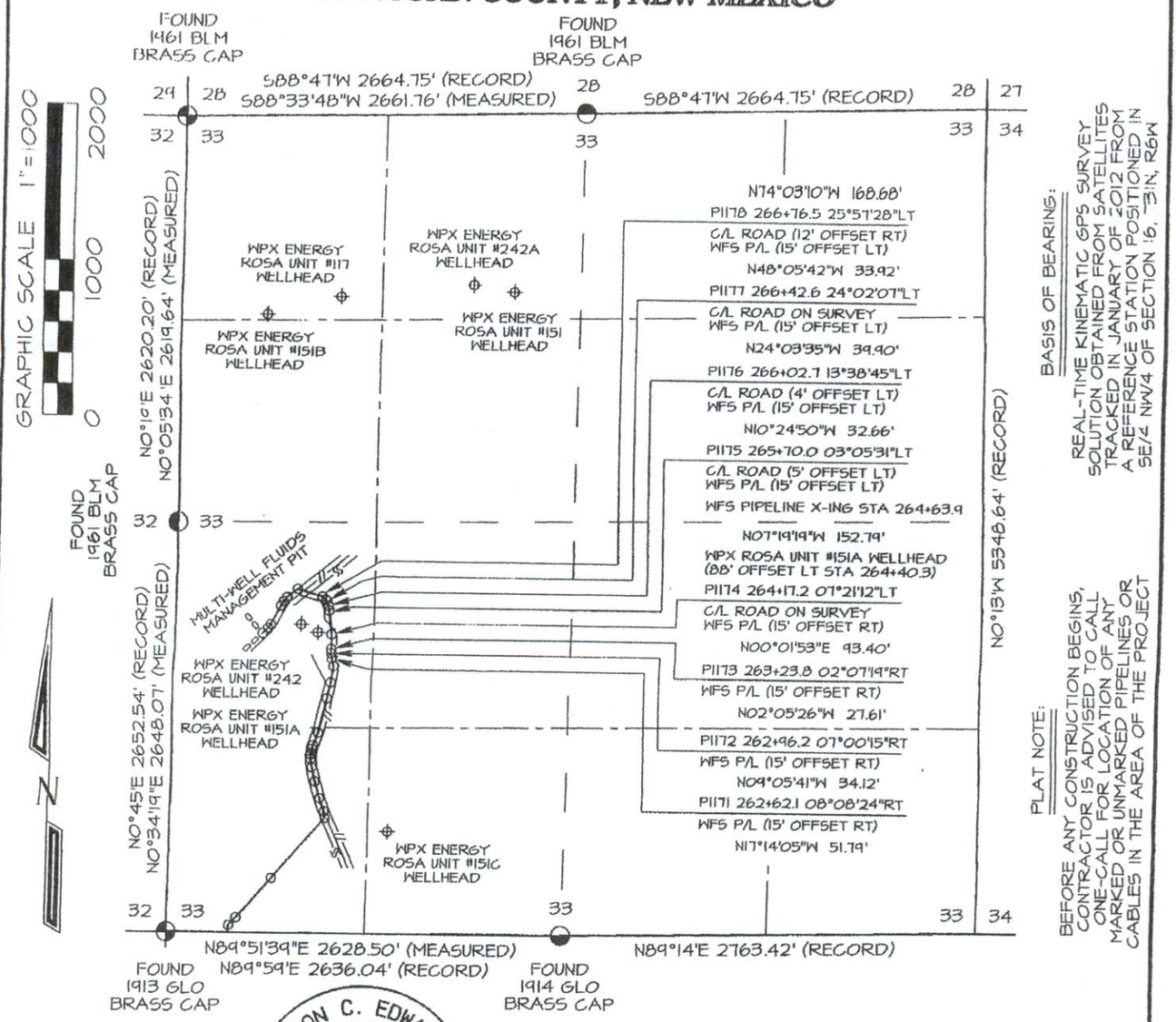
SURVEYS, INC.

SHEET 30 OF 33
FILENAME: 52693PB0
CHECKED BY: JCE
DRAWN BY: SLE

WPX ENERGY PRODUCTION NAVAJO LAKE CROSSING
PROPOSED WATER-LINE SURVEY LOCATED IN THE W/2 SW/4 OF SECTION 33, T32N, R6W, NMPM SAN JUAN COUNTY, NEW MEXICO



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Prepared for:
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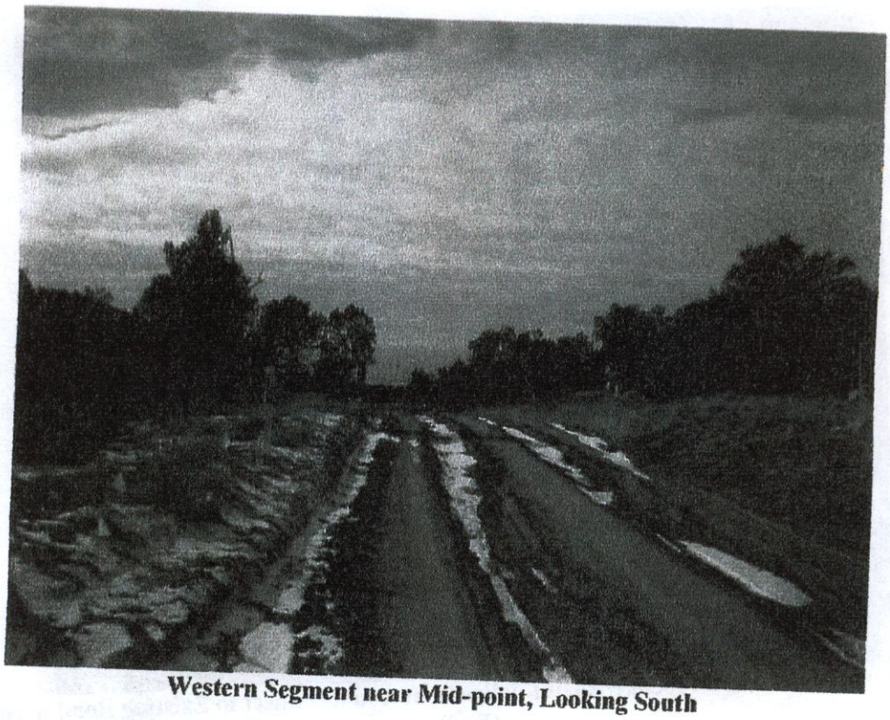
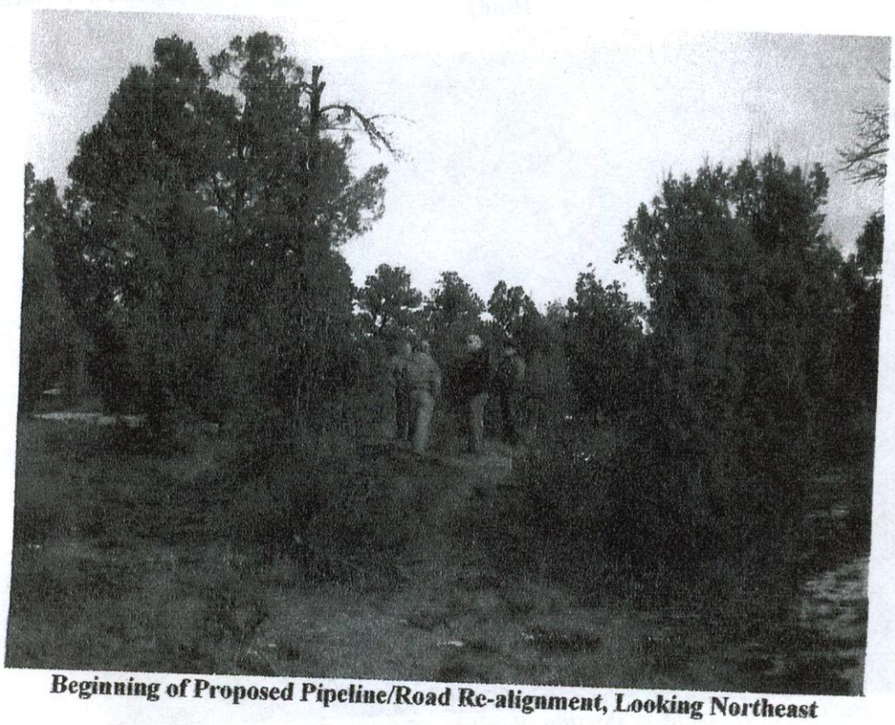
SURVEYS, INC.

SHEET 2 OF 3 | CHECKED BY: JCE
FILENAME: 3285PT2 | DRAWN BY: SLE

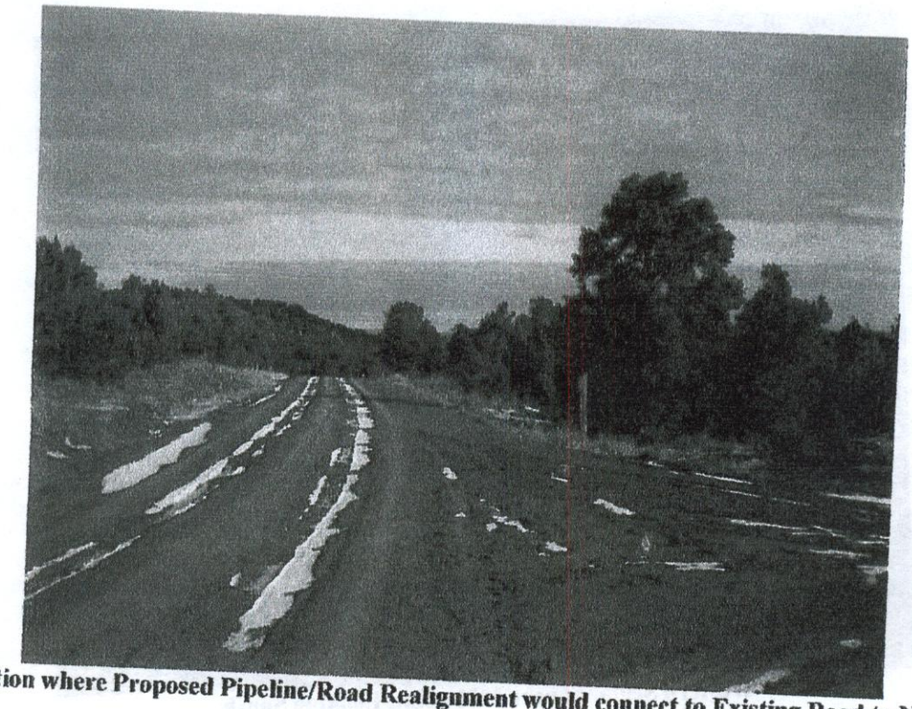
APPENDIX C – Photos



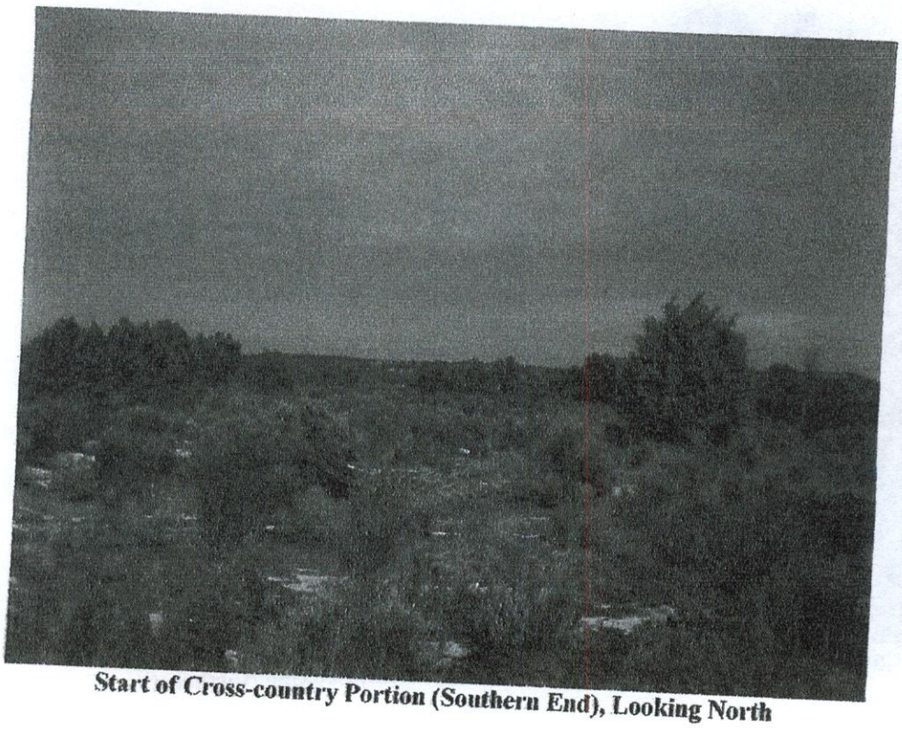
Western Segment near Mid-point, Looking South



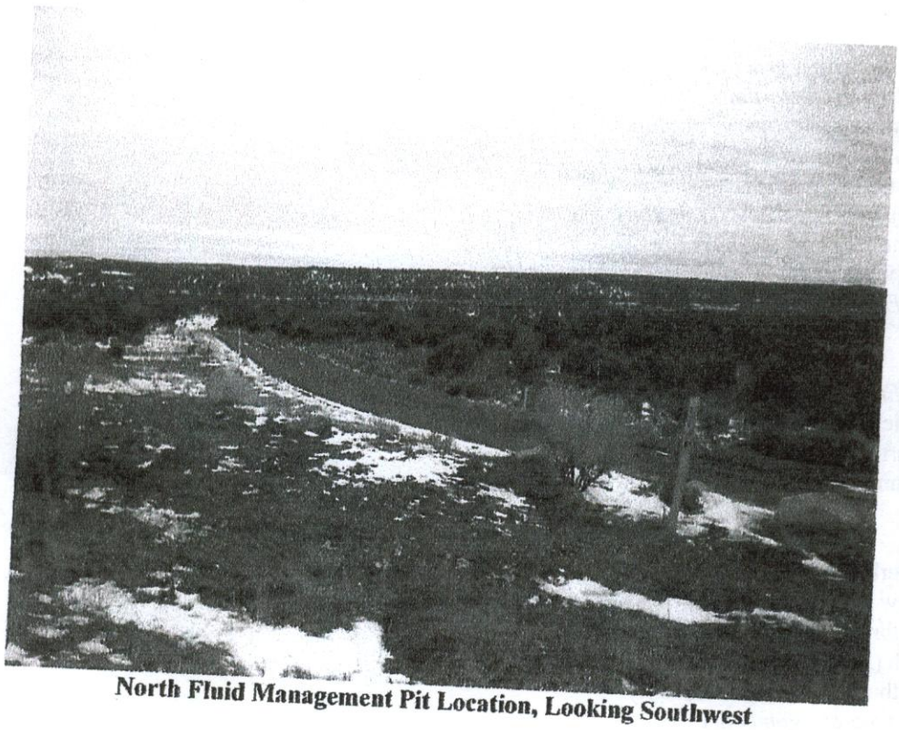
Beginning of Proposed Pipeline/Road Re-alignment, Looking Northeast



Location where Proposed Pipeline/Road Realignment would connect to Existing Road to North (End)



Start of Cross-country Portion (Southern End), Looking North



North Fluid Management Pit Location, Looking Southwest

***Grasses**
Blue grama *(Bouteloua gracilis)*
Cheatgrass *(Bromus tectorum)*
Crested wheatgrass *(Agropyron cristatum)*
Galleta grass *(Hilaria jamesii)*
Indian ricegrass *(Achnatherum hymenoides)*
Western wheatgrass (*Agropyron smithii*)
Smooth brome (*Bromus inermis*)
Intermediate wheatgrass (*Agropyron intermedium*)
Squirreltail (*Elymus elymoides*)

***Forbs**
Buckwheat *(Eriogonum* sp.)
Russian thistle *(Salsola tragus)*
Indian paintbrush (*Castilleja* sp.)
Skunkbush sumac (*Rhus trilobata*)

***Shrubs**
Antelope bitterbrush *(Purshia tridentata)*
Broom snakeweed (*Gutierrezia sarothrae*)
Rubber rabbitbrush *(Ericameria nauseosa)*
Big sagebrush (*Artemisia tridentata*)
Fourwing saltbush (*Atriplex canescens*)
Gambel oak (*Quercus gambelii*)

***Cacti/Yucca**
Narrowleaf yucca *(Yucca angustissima)*
Banana yucca (*Yucca baccata*)

Trees
One-seed juniper *(Juniperus monosperma)*
Utah juniper (*Juniperus osteosperma*)
Piñon pine (*Pinus edulis*)

***Birds**
Common raven (*Corvus corax)*
Western scrub jay (*Aphelocoma californica*)
Black-billed magpie (*Pica hudsonia*)
Dark-eyed junco (*Junco hyemalis*)

Mammals
Desert cottontail (*Sylvilagus audubonii*)
Mule deer (*Odocoileus hemionus*)
Elk *(Cervus elaphus)*
Coyote (*Canis latrans*)
Pocket gopher (*Thomomys* sp.)

*Number of species detected is limited due to the January survey date and amount of snow cover.

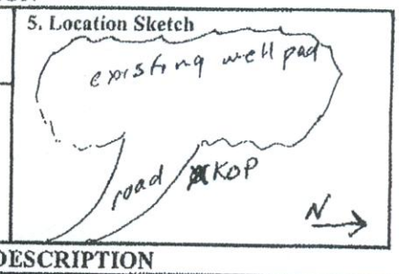
APPENDIX G

VISUAL CONTRAST RATING WORKSHEETS

Form 8400-4
(September 1985)

UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF LAND MANAGEMENT VISUAL CONSTRAST RATING WORKSHEET	Date: 9/22/11 District: FFO Resource Area: Middle Mesa Activity (Program): Well Pad

SECTION A. PROJECT INFORMATION

1. Project Name	4. Location	5. Location Sketch
Rosa Unit 03		
2. Key Observation Point 107 28.369 36. 55.57	Township 36 North Range 6 West	
3. VRM Class II	Section 4	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	level, Low, rounded	sparse, mounded, short	vertical, cylindrical
LINE	irregular straight oval	weak, broken, circular	straight, angular geometric
COLOR	Brown, Green	Light Brown/yellow grayish green	green
TEXTURE	contrasting, Discontinuous smooth	coarse, discontinuous Dense to sparse	smooth, matte

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	linear, flat	Low, rounded, barren	cylindrical angular
LINE	irregular, broken,	short, smooth	hard, bold,
COLOR	tan, Brown, gray	green to Light Brown	green, monotone
TEXTURE	contrasting, smooth, Linear	coarse to smooth Dense to Sparse	smooth, matte clumped

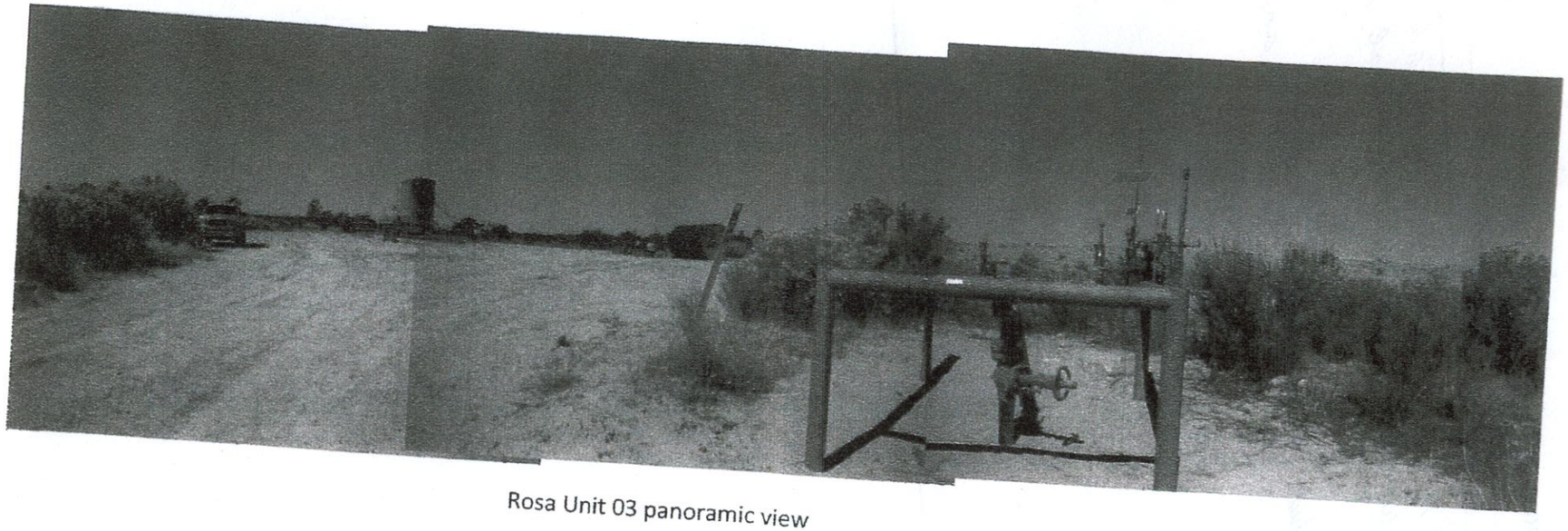
SECTION D. CONTRAST RATING ☐ SHORT TERM ☒ LONG TERM

1. DEGREE OF CONTRAST		FEATURES: LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form			✓				✓				✓	
	Line			✓				✓				✓	
	Color			✓					✓				✓
	Texture			✓					✓				✓

2. Does project design meet visual resource management objectives? ☒ Yes ☐ No (Explain on reverse side)

3. Additional mitigating measures recommended. ☐ Yes ☒ No (Explain on reverse side)

Evaluator's Names:	Date
Joey Herring	9/22/11



Rosa Unit 03 panoramic view

BLM VISUAL CONTRAST RATING SHEET CONTINUED

SECTION D. (Continued)

Comments from item 2: The level of change would be weak to none as the proposal would add to existing visual changes to the landscape

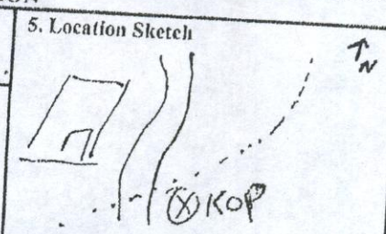
mitigation would include low profile equipment and paint.

Additional Mitigating Measures (See item 3):

Form 8400-4
(September 1985)

UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF LAND MANAGEMENT VISUAL CONSTRAST RATING WORKSHEET	Date: 9/22/11 District: FFO Resource Area: Middle Mesa Activity (Program): Well Pad

SECTION A. PROJECT INFORMATION

1. Project Name	4. Location	5. Location Sketch
Rosa Unit #05		
2. Key Observation Point 107 28.273 36 55.153	Township 31 North Range 6 West Section 9	
3. VRM Class II		

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	irregular, linear, Straight	irregular, mounded	square, linear
LINE	Bold Regular, Horizontal	conical, straight, diverging, short	straight, vertical, Blocky
COLOR	Brown, gray, muted	green, Brown, gray, dull	green, white
TEXTURE	rough, Directional	rough, patchy	slatted, irregular smooth

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	linear, flat, mildly rolling	irregular, mounded	square, linear, Angular
LINE	Irregular, broken	mounded, short	straight, vertical Blocky
COLOR	Brown, muted	green, Brown, gray	green, white
TEXTURE	smooth, irregular	monotone, patchy	irregular, smooth

SECTION D. CONTRAST RATING

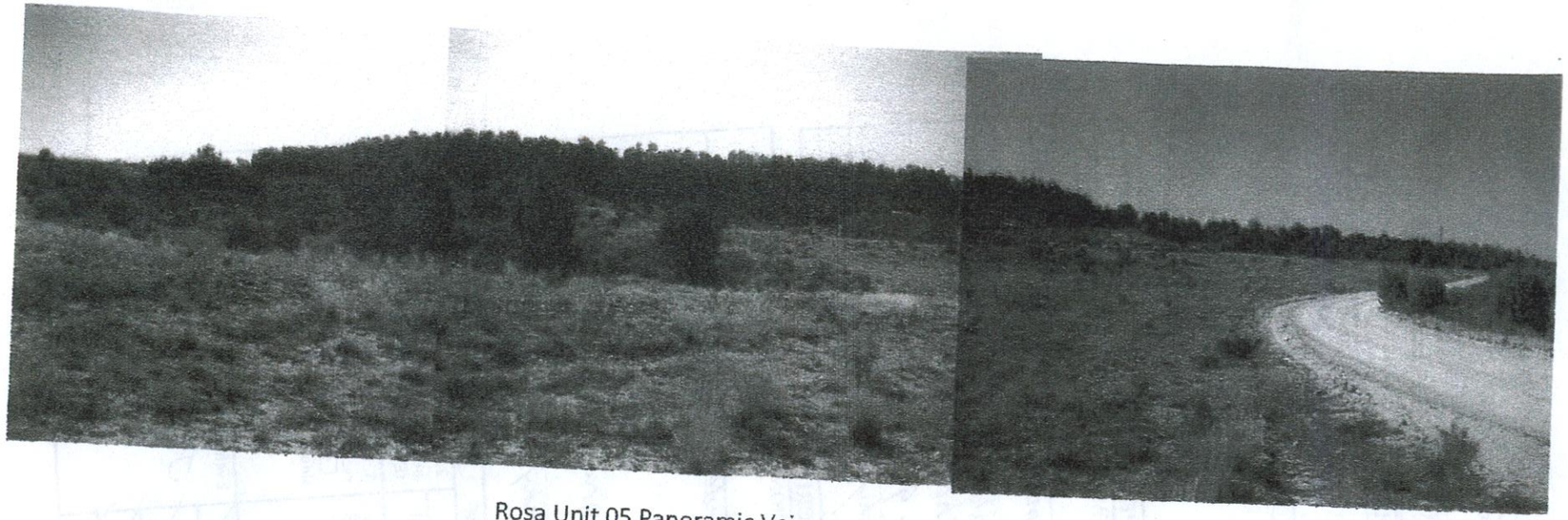
☐ SHORT TERM ☒ LONG TERM

1. DEGREE OF CONTRAST		FEATURES: LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form			✓				✓					✓
	Line			✓				✓					✓
	Color			✓					✓				✓
	Texture			✓					✓				✓

2. Does project design meet visual resource management objectives? ☒ Yes ☐ No (Explain on reverse side)

3. Additional mitigating measures recommended. ☐ Yes ☒ No (Explain on reverse side)

Evaluator's Names:	Date
Joey Herring	9/22/11



Rosa Unit 05 Panoramic Veiw

- "Emissions from equipment leaks at wellhead per well" are based on standard pneumatic operating pressure on surface equipment.
- "Number of producing wells" is 65 based on the Middle Mesa POD.

Ops_Dehydrators

- Emission Estimate for Heaters (tank and production equipment) is based on 6 tank heaters and 4 production unit heaters per pad – ((4 X 0.375 MMBtu) + (6 X 0.250 MMBtu))/ 8 wells = 0.375 MMBtu. Operating hours are found by the following (180 days X 24 hours) X 2 = 8640. Assuming that all heaters are operating 50% of the time we have a total operating hours for the year of 4320.

More Notes:

- The numbers added to this calculator were based per well not per pad.
- Days per well were figured on 25 days per horizontal well drilling 53 wells.

BLM VISUAL CONTRAST RATING SHEET CONTINUED

SECTION D. (Continued)

Comments from item 2: Will to be trimmed! level of change would be weak to none.
Mitigation - paint, low profile equipment.
revegetation.

Additional Mitigating Measures (See item 3):

Form 8400-4
(September 1985)

UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF LAND MANAGEMENT VISUAL CONSTRAST RATING WORKSHEET	Date: 9/22/11 District: FFO Resource Area: Middle Mesa Activity (Program): Remote Frac Pad

SECTION A. PROJECT INFORMATION

1. Project Name	4. Location	5. Location Sketch
Remote Fracturing Site		road KOP N
2. Key Observation Point	Township Range 31 North 16 West	
3. VRM Class II	Section 9	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Bold, Blocky, level, Broken	Short, rounded, smooth conical	none
LINE	Straight, Flat, Linear	rounded, patchy, Broken	none
COLOR	tan, muted	green, gray, muted	none
TEXTURE	rough patchy	patchy, round, random	none

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	level, graduated	Short, mounded	none
LINE	straight, flat	Short, clumped, patchy	none
COLOR	tan	green, lite brown	none
TEXTURE	flat, smooth	smooth, monotone	none

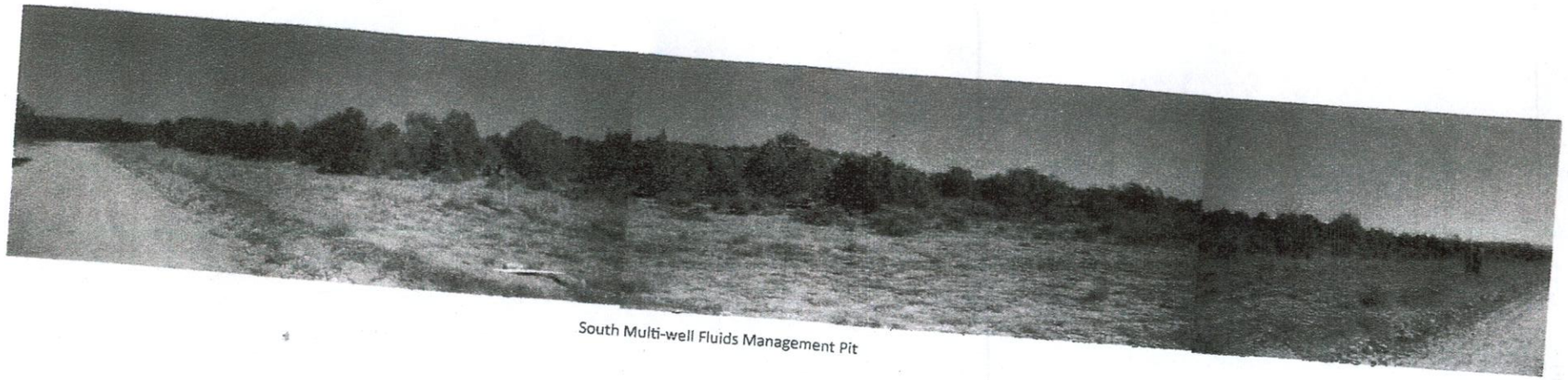
SECTION D. CONTRAST RATING ☒ SHORT TERM ☒ LONG TERM

1. DEGREE OF CONTRAST		FEATURES: LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form		✓				✓						✓
	Line		✓				✓						✓
	Color			✓				✓					✓
	Texture			✓			✓						✓

2. Does project design meet visual resource management objectives? ☒ Yes ☐ No (Explain on reverse side)

3. Additional mitigating measures recommended. ☐ Yes ☒ No (Explain on reverse side)

Evaluator's Names:	Date
Joey Herring	9/22/11



South Multi-well Fluids Management Pit

BLM VISUAL CONTRAST RATING SHEET CONTINUED

SECTION D. (Continued)

Comments from item 2:

Additional Mitigating Measures (See item 3):

APPENDIX H

ASSUMPTIONS USED IN THE AIR EMISSIONS CALCULATOR AND SUMMARY CALCULATIONS

Calculator 1- Directional Well (14 August 2012)	Annual Emissions (Tons)											
Activity	PM_{10}	$PM_{2.5}$	NO_x	SO_2	CO	VOC	HAPs	CO_2	CH_4	N_2O	CO_{2eq}	CO_{2eq} metric tonnes
Well Pad Construction - Fugitive Dust	0.15	0.02	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	0.28	0.27	4.92	0.12	1.34	0.36	0.04	616.23	0.01	0.01	618.42	561.18
Commuting Vehicles - Construction	2.88	0.30	0.15	0.00	0.19	0.07	0.01	38.86	0.00	0.00	39.06	35.44
Wind Erosion	0.64	0.10	---	---	---	---	---	---	---	---	---	---
Completion Venting	---	---	---	---	---	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sub-total: Construction	**3.95**	**0.68**	**5.07**	**0.12**	**1.53**	**0.43**	**0.04**	**655.09**	**0.01**	**0.01**	**657.48**	**596.62**
Well Workover Operations - Fugitive Dust	0.09	0.01	---	---	---	---	---	---	---	---	---	---
Well Workover Operations - On-site Exhaust	0.01	0.01	0.13	0.00	0.04	0.01	0.00	10.51	0.00	0.00	10.55	9.57
Well Workover Operations - On-road Exhaust	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.45	0.00	0.00	0.45	0.41
Well Visits for Inspection & Repair - Operations	0.15	0.01	0.01	0.00	0.20	0.01	0.001	3.94	0.00	0.00	3.99	3.62
Wellhead and Compressor Station Fugitives	---	---	---	---	---	0.00	0.00	0.19	1.97	0.00	41.66	37.81
Compression	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Station Visits - Operations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dehydrators	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.54	0.00	0.00	0.55	0.50
Sub-total: Operations	**0.24**	**0.03**	**0.14**	**0.00**	**0.25**	**0.02**	**0.00**	**15.63**	**1.98**	**0.00**	**57.19**	**51.90**
Road Maintenance	0.00	0.00	0.01	0.000	0.00	0.00	0.000	1.56	0.00	0.00	1.56	1.42
Sub-total: Maintenance	**0.00**	**0.00**	**0.01**	**0.000**	**0.00**	**0.00**	**0.000**	**1.559**	**0.000**	**0.00**		**1.42**
Road Reclamation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well Reclamation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sub-total: Reclamation	**0.00**	**0.00**	**0.00**	**0.0000**	**0.00**	**0.000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**
Total Emissions	**4.19**	**0.71**	**5.23**	**0.12**	**1.78**	**0.45**	**0.05**	**672.28**	**1.98**	**0.01**	**714.67**	**649.94**

Calculator 3-Hoizontal Well 14 August 2012	Annual Emissions (Tons)											
Activity	PM_{10}	$PM_{2.5}$	NO_x	SO_2	CO	VOC	HAPs	CO_2	CH_4	N_2O	CO_{2eq}	CO_{2eq} metric tonnes
Well Pad Construction - Fugitive Dust	0.01	0.00	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	0.23	0.10	1.76	0.50	5.05	0.24	0.02	272.36	0.00	0.00	272.82	247.57
Commuting Vehicles - Construction	2.65	0.17	0.07	0.00	0.07	0.02	0.00	19.24	0.00	0.00	19.32	17.53
Wind Erosion	0.33	0.05	---	---	---	---	---	---	---	---	---	---
Completion Venting	---	---	---	---	---	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sub-total: Construction	**3.23**	**0.32**	**1.83**	**0.50**	**5.11**	**0.26**	**0.03**	**291.60**	**0.01**	**0.00**	**292.14**	**265.10**
Well Workover Operations - Fugitive Dust	0.09	0.01	---	---	---	---	---	---	---	---	---	---
Well Workover Operations - On-site Exhaust	0.01	0.01	0.13	0.00	0.04	0.01	0.00	10.51	0.00	0.00	10.55	9.57
Well Workover Operations - On-road Exhaust	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.45	0.00	0.00	0.45	0.41
Well Visits for Inspection & Repair - Operations	0.15	0.01	0.01	0.00	0.20	0.01	0.001	3.94	0.00	0.00	3.99	3.62
Wellhead and Compressor Station Fugitives	---	---	---	---	---	0.00	0.00	0.19	1.96	0.00	41.27	37.45
Compression	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Station Visits - Operations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dehydrators	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.66	0.59
Sub-total: Operations	**0.24**	**0.03**	**0.14**	**0.00**	**0.25**	**0.02**	**0.00**	**15.73**	**1.96**	**0.00**	**56.91**	**51.64**
Road Maintenance	0.00	0.00	0.01	0.000	0.01	0.00	0.000	1.73	0.00	0.00	1.74	1.58
Sub-total: Maintenance	**0.00**	**0.00**	**0.01**	**0.000**	**0.01**	**0.00**	**0.000**	**1.730**	**0.000**	**0.00**		**1.58**
Road Reclamation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well Reclamation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sub-total: Reclamation	**0.00**	**0.00**	**0.00**	**0.0000**	**0.00**	**0.000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**
Total Emissions	**3.47**	**0.35**	**1.99**	**0.51**	**5.37**	**0.28**	**0.03**	**309.07**	**1.96**	**0.00**	**349.06**	**318.32**

Ops_Dehydrators

- Emission Estimate for Heaters (tank and production equipment) is based on 2 tank heaters and 2 production unit heaters per pad – ((2 X 0.375 MMBtu) + (2 X 0.250 MMBtu))/ 4 wells = .3125 MMBtu. Operating hours are found by the following (180 days X 24 hours) X 2 = 8640. Assuming that all heaters are operating 50% of the time we have a total operating hours for the year of 4320.

More Notes:

- The numbers added to this calculator were based per well not per pad.
- The total number of pads to develop the Mancos directionally is 29 with 4 wells per pad.
- The total number of wells to develop the Mancos directionally on 40 acre spacing is 116.
- All Drilling data was given by Garry Sizemore. It was determined that drilling time would be 18 days.
- All Completion data was given by Kirk Place. It was determined that completion time for all stages of the Mancos (3) would be 8 days.

- **HDD Lake x-ing**
  - Number of operating days per well – 65 wells 21 days to drill. 21/65 = .3230769 days per well.
- **Well Stimulation**
  - One stage of stimulation will take approximately 6 hours of run time for the blender and pump trucks. Thus 12 stages X 6 hours gives 72 hours per well.

Const_Drill Vehicles – Fug Dust

- We are assuming that round trip from Farmington to East side of lake is a total of 144 miles, of which 26 miles are off pavement. Round trip distance from Farmington to west side of lake is a total of 150 miles of which 14 miles are off pavement.
- The round trip distance from the residential camp to location is no greater than 6 miles.
- **Frac Pond**
  - Semi Trucks – 65 wells 6 round trips total to build and reclaim. 6/65 = 0.0923076 trips per well.
  - Pickup Trucks – 65 wells 180 round trips total to build and reclaim. 180/65 = 2.7692307 trips per well.
- **Well Pad**
  - Semi Trucks – 8 wells per pad 4 round trips per pad. 8/4 = .5 trips per well.
  - Pickup Trucks - 8 wells per pad 4 round trips per pad. 8/14 = 1.75 trips per well.
- **LGS Line**
  - Semi Trucks – 65 wells 10 round trips total to build and reclaim. 10/65 = 0.1538461 trips per well.
  - Pickup Trucks – 65 wells 120 round trips total to build and reclaim. 120/65 = 1.8461538 trips per well.
- **HDD Lake x-ing (East)**
  - Semi Trucks – 65 wells 8 round trips total to build and reclaim. 8/65 = 0.1230769 trips per well.
  - Pickup Trucks – 65 wells 87 round trips total to build and reclaim. 87/65 = 1.3384615 trips per well.
- **HDD Lake x-ing (West)**
  - Semi Trucks – 65 wells 7 round trips total to build and reclaim. 7/65 = 0.1076923 trips per well.
  - Pickup Trucks – 65 wells 46 round trips total to build and reclaim. 46/65 = .7076923 trips per well.
- **Rig-Up, Drilling, and Rig Down**
  - Rig Crew – (Stay at Man Camp) 23.7 days/well, 1 week tour, (26 miles X 4 tours) + (6 miles X 23.7 Days) = 246 miles per well.
  - Co. Supervisor – (Stay on Location) 1 tour per well on location housed in trailer. 26 miles total per well.

- **HDD Lake x-ing (East)**
  - Semi Trucks – 65 wells 8 round trips total to build and reclaim. 8/65 = 0.1230769 trips per well.
  - Pickup Trucks – 65 wells 87 round trips total to build and reclaim. 87/65 = 1.3384615 trips per well.
- **HDD Lake x-ing (West)**
  - Semi Trucks – 65 wells 7 round trips total to build and reclaim. 7/65 = 0.7076923 trips per well.
  - Pickup Trucks – 65 wells 46 round trips total to build and reclaim. 46/65 = .1076923
- **Rig-Up, Drilling, and Rig Down**
  - Cuttings Haul Truck – 144 miles round-trip from Farmington, 86 miles round trip to landfill. 144 + 86 = 230 miles round trips for 2 loads. 15 loads per well. 230 X 7.5 = 1440 miles per well.
  - Rig Crew – (Stay at Man Camp) 25 days/well, 2 week tour, (144 miles X 2 tours) + (6 miles X 25 Days) = 438 miles per well.
  - Co. Supervisor – (Stay on Location) 1 tour per well on location housed in trailer. 144 miles total per well.
  - Tool Pusher - (Stay on Location) 1 tour per well on location housed in trailer. 144 miles total per well.
  - Mud Logger – (Stay on Location) 1 tour per well on location housed in trailer. 144 miles total per well
  - Directional Engineer - (Stay on Location) 1 tour per well on location housed in trailer. 144 miles total per well
  - Mud Engineer - (Stay at Man Camp) 23.7 days/well, 2 week tour, (144 miles X 2 tours) + (6 miles X 23.7 Days) = 430 miles per well.
- **Well Completion and Testing**
  - Pickup Completion, Pusher – 144 miles round trip for Farmington, 5 days driving 6 miles round trip from man camp to location. 144 + (6 X 5) = 174 miles per well.
  - Pickup Perforators, Engineer - 144 miles round trip for Farmington, 2 days driving 6 miles round trip from man camp to location. 144 + (2 X 6) = 166 miles per well.
  - Pickup Fracing, Engineer - 144 miles round trip for Farmington, 1 day driving 6 miles round trip from man camp to location. 144 + (1 X 6) = 150 miles per well.
  - Pickup Co. Supervisor - 144 miles round trip for Farmington, 1 day driving 6 miles round trip from man camp to location. 144 + (10 X 6) = 204 miles per well.

Ops_Well Workover – Exhaust

- We are assuming that round trip from Farmington to location is a total of 144 miles, of which 26 miles are off pavement.

Ops_Wellhead

Air Emissions Calculator Notes (horizontal)

Construction - Fugitive Dust

- Existing roads and no new wellhead compression will be utilized in the addition of the new wells.
- Frac Pond – 4.02 Acres/ 53 wells = .075849. 25 days/ 53 wells = .4716981 per well to build. 25 days/ 53 wells = .4716981 per well to reclaim. .4716981 X 2 = 0.9433962.
- Well Pad and other structures - 8 wells per pad 5.5 acres total pad. 5.5/8 = .6825 acres per well.
- LGS Line – A large portion of the LGS line will be done in existing roadway. Per Google earth the distance that will be new disturbance is 1,620' long and 30' wide. Total acres of new disturbance is 1.12.

Const_Drill Equip – Exhaust

- Max Annual Emissions were updated to represent the use of the Jenbacher natural gas generator
- **Frac Pond**
  - Blade – 53 wells 60 days total to build and to reclaim. 60/53 = 1.1320754 days per well.
  - Dozer – 53 wells 60 days total to build and to reclaim. 60/53 = 1.1320754 days per well.
- **Well Pad**
  - Blade – 8 wells per pad 1 day per pad operating. 1/8 = .125 operating days per well.
  - Dozer – 8 wells per pad 13 days per pad operating. 13/8 = 1.625 operating days per well.
  - Rig on location for 25 days per well .
- **Lake x-ing Pad (East and West)**
  - Blade – 53 wells 1 day total to build and to reclaim per pad. 2/53 = .0377358 days per well.
  - Dozer – 53 wells 6 days total to build and to reclaim per pad. 6/53 = .1132075 days per well.
- **LGS Line**
  - Blade – 53 wells 20 days total to build and to reclaim. 20/53 = .3773584 days per well.
  - Dozer – 53 wells 20 days total to build and to reclaim. 20/53 = .3773584 days per well.
  - Excavator - 53 wells 20 days total to build and to reclaim. 20/53 = .3773584 days per

- Tool Pusher - (Stay on Location) 1 tour per well on location housed in trailer. 26 miles total per well.
- Mud Logger – (Stay on Location) 1 tour per well on location housed in trailer. 26 miles total per well.
- Directional Engineer - (Stay on Location) 1 tour per well on location housed in trailer. 26 miles total per well.
- Mud Engineer - (Stay at Man Camp) 25 days/well, 2 week tour, (26 miles X 2 tours) + (6 miles X 25 Days) = 202 miles per well.

- **Well Completion and Testing**
  - Haul Perforators Logging Truck – 1 trip for 4 wells. 1/4 = .25 trips per well.
  - Haul Fracing Tanks – 12 trips for 4 wells. 12/4 = 3 trips per well.
  - Haul Fracing Pump – 9 trips for 4 wells. 9/4 = 2.25 trips per well.
  - Pickup Perforators, Engineer – (Stay at Man Camp) 2 days/well, 26 miles + (6 miles X 2 Days) = 38 miles per well.
  - Pickup Fracing, Engineer - (Stay at Man Camp) 1 day/well, 26 miles + (6 miles X 1 Days) = 32 miles per well.
  - Pickup Co. Supervisor - (Stay at Man Camp) 10 days/well, 26 miles + (6 miles X 10 Days) = 86 miles per well.

Const_Drill Vehicles – Exhaust

- We are assuming that round trip from Farmington to west of lake location is a total of 144 miles.
- We are assuming that round trip from Farmington to east of lake location is a total of 150 miles.
- The round trip distance from the residential camp to location is no greater than 6 miles.
- The vehicle type "Semi Rig Transport, Drill Rig" will have one move into Middle Mesa then will remain on one location to drill all wells per pad. Moving from drilled pad to pad to be drilled will be no greater than 6 miles.
- **Frac Pond**
  - Semi Trucks – 53 wells 6 round trips total to build and reclaim. 6/53 = 0.1132075 trips per well.
  - Pickup Trucks – 53 wells 180 round trips total to build and reclaim. 180/53 = 3.3962264 trips per well.
- **Well Pad**
  - Semi Trucks – 8 wells per pad 4 round trips per pad. 8/4 = .5 trips/well/year.
  - Pickup Trucks - 8 wells per pad 4 round trips per pad. 8/14 = 1.75 trips/well/year.
- **LGS Line**
  - Semi Trucks – 53 wells 10 round trips total to build and reclaim. 10/53 = 0.1886792 trips per well.
  - Pickup Trucks – 53 wells 120 round trips total to build and reclaim. 120/53 = 2.2641509 trips per well.