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FEATURES

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The Impact of Mineral Rights and Oil and Gas Activities on Agricultural Land Values

Agricultural land values can be significantly affected by subsurface mineral rights, leasing activities, and actual oil and gas activities. Disruption of the surface and other potential environmental considerations are important factors in investment decisions concerning the operation and long-term investment potential of agricultural lands. The author considers the potential conflicts between mineral rights as the "dominant" estate, and the surface owner's perspective, offering possible ways to reduce the negative effects of oil and gas activities, both on specific properties and adjoining properties.

Significant oil and gas production is found in every state of the United States except Maine, Vermont, New Hampshire, and Idaho.[1] In most states the mineral estate is the dominant estate, leaving the surface estate subservient to oil and gas activities. This can have significant effects on agricultural activities and the future development potential of the land's highest and best use, particularly for property located on the urban fringe with development potential.

The short- and long-term value implications of the drilling, production, transportation, and transmission of oil and gas off property is further complicated by changes in land title (e.g., leases, easements) and the likelihood of environmental contamination. These factors may not only reduce a property's value and mortgageability, but could leave a surface owner liable for cleanup or disclosure of these activities to future buyers.

From the moment a mineral lease is signed by the mineral owners, possible increases or decreases in land value must be considered: decreases from the perspective of long-term surface disruption potential, increases because of potential and possible mineral income from the land.[2] Previous research focused primarily on the positive cash flow aspects and valuation of royalty income to a surface owner who also owned the mineral rights. The focus of this article is the implications of oil and gas activities from a surface owner's standpoint who has no ownership or participation in the mineral royalties. The theoretical and actual effects of the drilling and operation of an oil well on the value of the surface estate are

1. L. Haines, "Exploration Highlights," *Oil and Gas Investor* (September 1986): 28.
2. J. S. Baen, "Oil and Gas Mineral Rights in Appraisal," *The Appraisal Journal* (April 1988): 205.

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addressed. In addition, the physical, environmental, and financial implications of oil and gas activities on agricultural properties are considered, and present and future valuation, damage, and financial exposure perspectives are offered.

CURRENT COMPENSATION PRACTICES

Surface owners without minerals are quite often contacted by the oil and gas exploration company's "land men" to arrange a one-time damage settlement at a proposed drill site. Because of the exploratory and speculative nature of oil and gas wells, the discussion of permanent roads, facilities, pipelines, equipment, and long-term land planning for other wells is generally not considered or discussed with the landowner. Adjoining landowners affected by the visual and possible environmental effects of a well are never contacted. The exploration company's primary objective is to gain peaceful and amicable access to the land with the surface owner's written approval. The settlement amounts are generally reached by negotiation according to common practice in the area, with the important proviso that all parties understand the mineral estate is the dominant estate and local courts of law will quickly establish what is reasonable if an agreement is not reached.

While surface damages for a proposed well site vary somewhat on the value of the land, the current compensation in several parts of the rural United States is a one-time check for $2,500.

During the initial drilling of a well, temporary roads tend to become permanent roads that are later graveled if the well is found to be economically productive. Permanent facilities, pipelines, electric power lines, and equipment generally radiate from the well to the closest access road, transmission pipeline, or powerline. Reduced construction expense generally takes precedence over long-term land use and planning implications.

All of these activities generally are unplanned and uncompensated for beyond the initial negotiated or court-imposed damage check for drilling a well. Oil and gas transmission pipelines beyond a well site and through the balance of the surface owner's property are generally "purchased" by the lineal foot.

Figure 1 represents the surface estate before and after a well has been developed. While Table 1 represents various activities that surface owners (often absentee) generally cannot visualize at the time a negotiated damage check is accepted before any activity occurring at the site.

RESEARCH HYPOTHESIS

The purpose of this research is to challenge the traditional and contemporary practice of the single well-site damage payment, and to elucidate other factors indicating that the customary damages generally received by surface owners are far less than the present value of the overall reduction in the property's market value over time through:

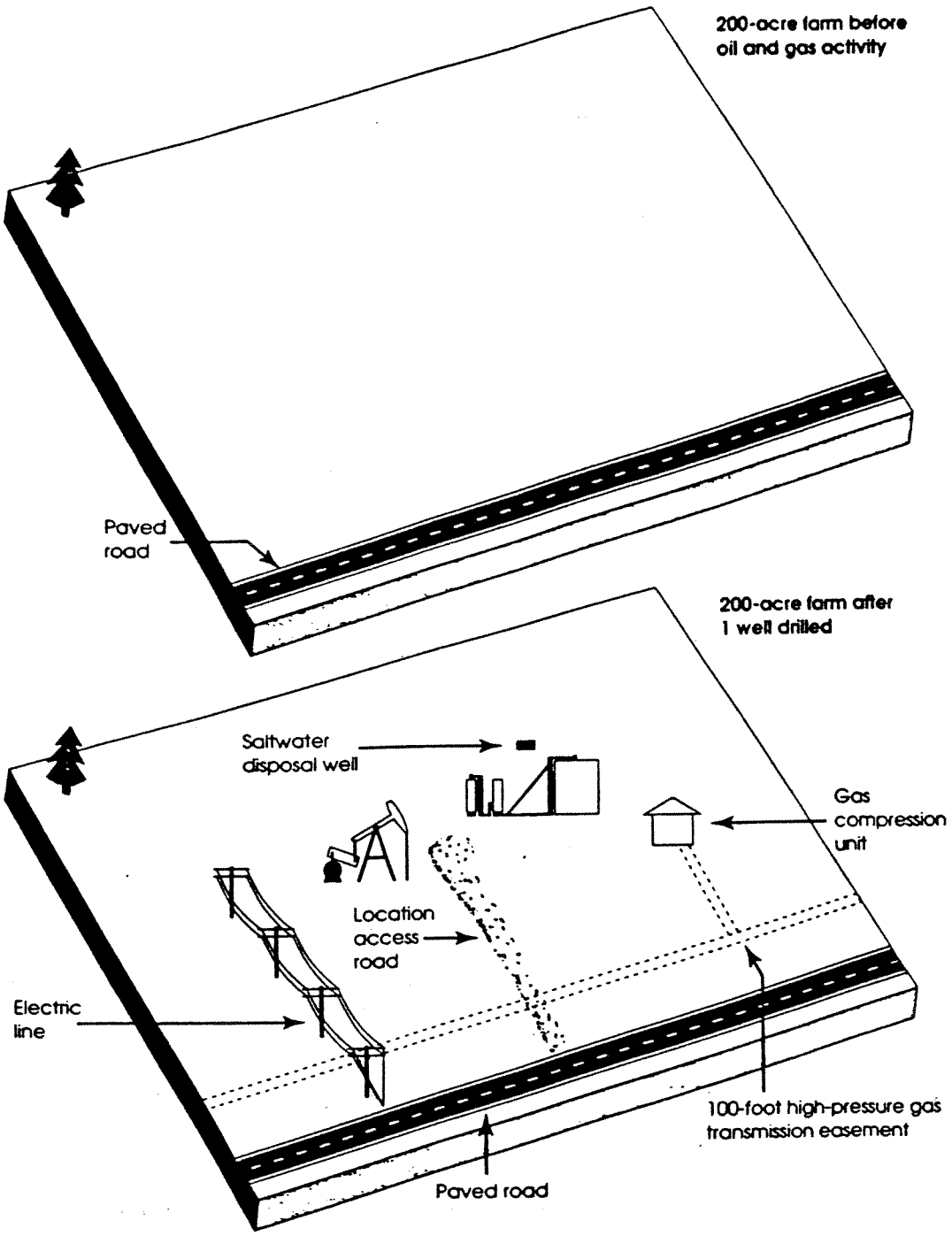
- Disruption of the surface for future development by the erection of barriers, roads, pipelines, and electric lines
- Actual and potential pollution of the property's soil, groundwater, surface water, scenic views, air and noise pollution, and other changes to the original character of the land
- Perceived or actual damages of pipelines, compressors, oil tanks, motors, pumping units, and high-voltage electricity
- Reduction in the privacy and security of the surface estate and increased daily traffic to and from the well site, together with heavy equipment from time to time
- Reduced income from agricultural activities, particularly farming, which uses irrigation systems

PREVIOUS RESEARCH

There has been little published in the area of valuation implications for surface owners and compensation for mineral activity occurring on their land. While Baen briefly discusses types of generalized surface disruptions and effects on the surface estate,[3] no discussion, specifics, or conclusions are

3. Ibid., 210–211.

FIGURE 1 Surface Estate Before and After Oil Well Development



offered as to such effects on the value of the land. The conclusion, however, is that "oil and gas mineral rights can have important implications on the valuation of the surface rights being appraised."[4] Most of the previous research has been written on the subject of mineral rights and mineral income valuation.[5] The current trend in surface estate research is in the environmental impact realm and tends to be from the new envi-

4. Ibid., 215.

5. Philip, Grossman, "The Valuation of Land with Underlying Natural Resources," *The Appraisal Journal* (April 1935): 236–241. See also, H. J. Gruy and F. A. Garb, "Determining the Value of Oil and Gas in the Ground," *World Oil* (March 1982): 105–108; Walter Priddy, "Oil Property Evaluation," (Fort Worth, Texas: Pritchard and Abbott Inc., 1986): 1–14; and Anthony J. Rinaldi, "A Review of Hoskold and the Valuation of Mineral Property," *The Appraisal Journal* (October 1981): 578.

TABLE 1 Oil and Gas Drilling and Production Activities That Can Negatively Influence the Present and Future Value of the Surface Owner/Tenant

I. Filing of the Oil and Gas Lease
   A. Actual notice of pending activity and potential surface disruption. Filed in county/province. (Surface owner *not* generally notified until well is drilled.)
   B. Current and future development plans need to be forwarded immediately to oil operator/driller to reduce negative influences to the future highest and best use of surface.

II. Preliminary Activities Before Drilling Well
   A. Seismograph activities are becoming more prevalent utilizing 3-D subsurface mapping of oil formation. Surface activities include dozing and drilling in strips across the property.
   B. Planning the location of the drill site.
      1. Best geological site versus optimal surface location.
      2. Source of optimal surface location water for drilling well.
      3. Access road planned with long-term implications considered.
      4. Drill site planned.
      5. Environmental implications and plan.
      6. Surface owner/tenant notification planning, negotiation, and compensation for first well site only.
   C. Multiple well locations/repeat steps IIB 1–6.

III. Well Drilling and Completion Activities
   A. Digging of surface mud pits and drill-site leveling.
   B. Drilling activities (24 hours/day for 3–30 days depending on depth and number of wells drilled)
      1. Heavy equipment ruts can cause erosion and surface damage that can take years to heal.
      2. Legal trespass of drilling crews (three shifts/day) administrative staff, logging trucks, mud trucks, geologists, pipe trucks, cementing trucks, fuel trucks, and an array of other service providers and salespersons.
      3. Drilling rig noises and diesel electric generator units.
   C. Well completion activities
      1. Fracturing and acidizing trucks.
      2. Workover rig crews and activities.
      3. Burning or flaring of gas and oil during workover operations.
      4. Temporary fracturing tanks and production tanks.
      5. "Swabbing" and testing of well into surface pits.

IV. Post Completion Production Activities
   A. Well site/lease location
      1. Covering of surface mud pits.
      2. Construction of surface equipment and systems.
      3. Rocking or graveling the access roads and production area.
      4. Construction of retaining walls and fences around oil tanks, well head, and other equipment.
      5. Construction of permanent gates, cattle guards, and culvert from a public road to the well site.
      6. Painting of all gates and surface equipment.
      7. Installation of locks and other security measures.
   B. Construction of oil/gas pipelines and electricity to/through the property to the well/production/storage area.
      1. Obtain easements from landowner.
      2. Clear right-of-way 50–100 feet wide.
      3. Construct and bury pipeline to minimum/required depth.
      4. Reseed and plow disturbed pipeline right-of-way.
      5. Post high-pressure pipeline signs along easement with emergency notification telephone numbers.
      6. Implement pipeline monitoring program to check for leaks and right-of-way encroachments.
      7. Program to remove regrowth of trees.
   C. Arrange for 24-hour access to well for the following service providers:
      1. Production employees
      2. Oil truck/purchaser
      3. Saltwater handlers
      4. Gas pipeline metering staff
      5. Electric company metering
      6. Supply and equipment deliveries
      7. Workover and repair personnel
      8. State and federal agency inspectors
      9. Access/road maintenance

continued

TABLE 1 ***Continued***

D. Possible surface production equipment and/or chemicals on site
   1. Well head, valves, and gauges
   2. Pumping units
      a. Gas-operated units (noise pollution)
      b. Electric units (electric lines to well head)
   3. Oil, condensate, and saltwater storage tanks
   4. Oil, gas, water separator units
   5. Gas compressor units
   6. Oil or saltwater injection pump
   7. Gas collection and metering station
   8. Gas/oil/saltwater lease pipelines to each well
   9. Gas and/or oil pipelines for sale/transmission to and/or through the subject property

E. Production supplies, bi-products, chemicals and well additives
   1. Oil tank sludge
   2. Bottom, sludge, and water
   3. Paraffin inhibitors
   4. Surfactants
   5. Emulsion breakers
   6. Scale inhibitors
   7. Paint
   8. Oily rags
   9. Pipe dope
   10. Injection and production filters
   11. Polish rod packing
   12. Various rubber products (seals, hoses, belts)
   13. Drums/barrels of chemicals
   14. Oil tank treatment chemicals

V. Drilling of Additional Wells on the Subject Property (repeat steps I-IV)

VI. Discontinuation of Oil and Gas Production—1 to 50 years after drilling
   1. Wells plugged and abandoned.
   2. Equipment removed from a site.
   3. Drilling pits should be permanently marked to prevent construction of home or other buildings at these particular locations.
   4. Mineral lease should be canceled and releases filed of record.
   5. Dormant pipelines (lease and transmission pipelines) should be dug up and removed.
   6. Surface should be restored to as close to predrilling conditions as possible.

VII. Environmental Site Assessment (Phase I, II, and III as required)
   1. Should be conducted at oil company's expense on behalf of the owner. Copy of report completed by outside environmental consulting firm should be provided to the landowner.
   2. Landowner should offer oil company a written release of further surface work on repairs to be completed.

ronmental litigation perspective, which is more regulatory in character.

Many newspaper articles have recently articulated the growing conflict between the surface estate owners and mineral owners and oil operators. Under new rules adopted by the Colorado Oil and Gas Conservation Division in September 1993, a landowner can ask the commission to make an oil operator post a bond before oil and gas activities begin on a lease if no surface agreement is in effect.[6] While farmers can be royalty owners and make significant income on their minerals, many also want payment for crop and soil damages and other economic burdens that affect their surface estates. It has been suggested that oil and gas operations can also create psychological stress in farm families, which may require compensation in some cases.

With any oil and gas well being developed, there will be some level of contamination that occurs on the property (addressed later in this article). Contamination of any kind can produce stigmas that have market implications, as presented by Patchin.[7] A stigma may be broadly defined as a loss in value beyond the cost to cure the contamination itself. This can include,

6. Oil and Gas Journal, "Mineral, Surface Rights at Issue in Colorado," *Oil and Gas Journal*, v. 91, no. 43 (October 25, 1993): 30–32.
7. P. J. Patchin, "Contaminated Properties—Stigma Revisited," *The Appraisal Journal* (April 1991): 167–172.

but is not limited to, the fear of hidden cleanup costs, the "trouble" factor or cost to cure, the fear of public liability, and the lack of mortgageability.

MINERAL OWNER AND LESSEE'S RIGHTS TO THE SURFACE—THE LEGAL ENVIRONMENT

Most states allow the minerals to be the dominant estate over the surface. This concept has been extended by the courts to the following extent:

> The surface estate exists for the benefit and use of the mineral owner. Otherwise, the mineral estate would be worthless if the mineral owner (or their lessee) could not enter the surface to explore for and produce minerals.[8]

Fambrough further develops a list of what has *not* been found by the Texas courts to be negligence or an undue taking of the surface:

1. Failing to restore the surface when operations cease.
2. Failing to fence the area of operations to restrict grazing livestock from any harmful subsurfaces, etc.
3. Causing subsidence due to drilling or extraction of hydrocarbons.[9]

The current trend in the courts is to consider minerals the dominant estate, but to further consider the rights and damages of surface owners on a case-by-case basis.

The problem, of course, is how to allow each estate (surface and mineral) to fully use their legal rights without harm, or at least with adequate compensation, to all parties. To fairly compensate all parties, however, the oil and gas development process, risks, and environmental and health exposures need to be fully disclosed to the surface owners (see Tables 1, 2, and 3).

In theory, many federal, state, and local regulations regulate commercial activities that can have implications to the health and welfare of the public. The oil and gas industry is generally regulated by various state oil and gas commissions, but is also affected by the many environmental laws. In an attempt to reduce environmental and legal exposure for the oil and gas industry, Butler and Binion[10] produced a guide for oil and gas operators that considers the federal regulations that have a direct impact on surface estate owners (see Table 2).

TABLE 2 Possible Federal Environmental Law Implications to Surface Owner/Tenants Because of Oil and Gas Production Drilling Operations

Resource Conservation and Recovery Act (RCRA, 1976) (42 U.S.C. ff 6901-6992k)

Solid Waste Disposal Act (SWDA, 1965)

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, 1980) (Superfund Act). (42 U.S.C. ff 9601-9675)

Emergency Planning and Community Right to Know Act (EPCRA, 1986) (42 U.S.C. ff 11001-11050)

Clean Water Act (CWA, 1972) (33 U.S.C. ff 1251-1387)

1. National Pollutant Discharge Elimination System (NPDES)—Point Discharge Permits
2. Spill Prevention Control and Countermeasure plans (SPCC)
3. Wetlands U.S. Army Corps of Engineers Section 404 Permit Process for discharge fill or dredged materials (Alvayay Baen).

Federal Water Pollution Control Act (1948)

Safe Drinking Water Act (SDWA, 1974) (42 U.S.C. ff 300f-300j-26)

Oil Pollution Control Act of 1990 (OPA-90) (33 U.S.C. ff 2701-2761)

Toxic Substances Control Act (TSCA, 1976) (15 U.S.C. ff 2601-2671)

Occupational Safety and Health Act (OSHA) (29 U.S.C. ff 651 et. seq.)

Endangered Species Act (ESA, 1988) (16 U.S.C. ff 1531-1544)

National Historic Preservation Act (NHPA) (16 U.S.C. ff 470-470-v-6)

Migratory Bird Treaty Act (MBTA) (16 U.S.C. ff 703-711)

Hazardous Material Transportation Act (HMTA, 1990) (49 U.S.C. ff 1801-1813)

Department of Transportation (DOT) Gas Transmission Pipeline Regulations

8. J. Fambrough, "A Thin Layer of Rights," *Tierra Grande—Texas Real Estate Research Center* (1983): 4–6.
9. Ibid., 7.
10. Butler and Binion, Attorneys at Law, *Environmental Law Simplified: A Practical Guide for Oil and Gas Operations* (Tulsa, Okla.: Penn Well Books, 1993)

TABLE 3 Theoretical Model of Estimating Damages of Oil and Gas Activities to Surface Owner Estate*

$$SD = PV - (W + RW + S + A + N + V + RLA + RHBU + PVRI + ATE + ELE + HAZ + STIG + RMORT + AR)\,(NW^{*})$$

- *SD* = Damages due surface owner at t^{0} or in stages of oil and gas development.
- *PV* = Present value of surface estate in an undisturbed state before drilling.
- *W* = Water, surface/subsurface contamination through production practices, spills and injection/disposal wells.
- *RW* = Reduction in water supplies or quantity through dropping water table.
- *S* = Soil (same as above).
- *A* = Air—pollution/dust/odors/smells, etc.
- *N* = Noise—compressors, pumping units, well servicing operation, daily vehicular traffic.
- *SW* = Solid waste—some operators dispose of solid wastes inappropriately at well sites and pits.
- *V* = Visual—changes in the landscape and natural environment.
- *RLA* = Reduction in usable land area (value).
- *RHBU* = Reduction in highest and best use of total parcel of land potential.
- *PVRI* = Present value in future agricultural income as a result of reduced usable land area caused by well site, roads, rights-of-way, etc.
- *ATE* = Additional title encumbrances to the property:
  - Mineral leases
  - Oil and gas transmission pipeline easements
  - Electric utility easements
  - Access road easements or rights
- *ELE* = Environmental law exposure to landowner
- *HAZ* = Personal or livestock health hazards, fire, chemical, accidents, spills, etc.
- *STIG* = Reduced property value due to stigma.
- *RMORT* = Reduced property value due to reduced mortgageability.
- *AR* = Aesthetics and/or privacy.
- *NW** = Number of wells factor that will be drilled or could be drilled in the future on the subject property (spacing factor). Figure 1 indicates one well drilled, the initial lease allows multiple wells to be drilled (depending on depth) every 10, 40, 80, or 160 acres.

* This equation represents theoretical factors that should be considered by appraisers. It is, however, no substitute or replacement for the professional judgment as to the market value impact on a subject property.

In addition to the federal environmental regulations (Table 2) and the processes (Table 1), there are state oil and gas commission guidelines for the development and operation of oil and gas wells. While the primary risk is to the oil and gas company, several of these statutes contain possible financial and legal liability and future economic burdens that could carry over to the surface estate owner. These risks and property exposure have value implications that exceed traditional appraisal and valuation methodologies.

Table 1 presents a synopsis of the oil and gas well drilling and production process. The range of activities that occur during a 24-hour period are why many cities require industrial zoning inside their city limits and a specific use permit to be file before drilling begins.

Table 3 presents a theoretical model of estimating damages of oil and gas activities to the surface owner estate. All factors would not be present at every well drilled, and it would be necessary for an appraiser to consider the effect on any tract of land on a case-by-case basis. Oil and gas activity at the surface can have important land value implications, and this model is offered to ensure that these factors are considered in an appraiser's analysis. Those factors that are not readily quantifiable or present at a location would of course weigh less in the appraiser's concluding valuation report.

Figures 2 and 3 are offered as overviews of the agricultural land and mineral situation in regard to increasing control of the surface estates. Figure 2 assumes an oil and gas lease is not in effect, while Figure 3 indicates changes in the highest and best use potential of the surface estate as a result of mineral/oil and gas activities. Minerals that are leased but not drilled need to be mentioned in any appraisal report as the potential for surface disruption has value implications.

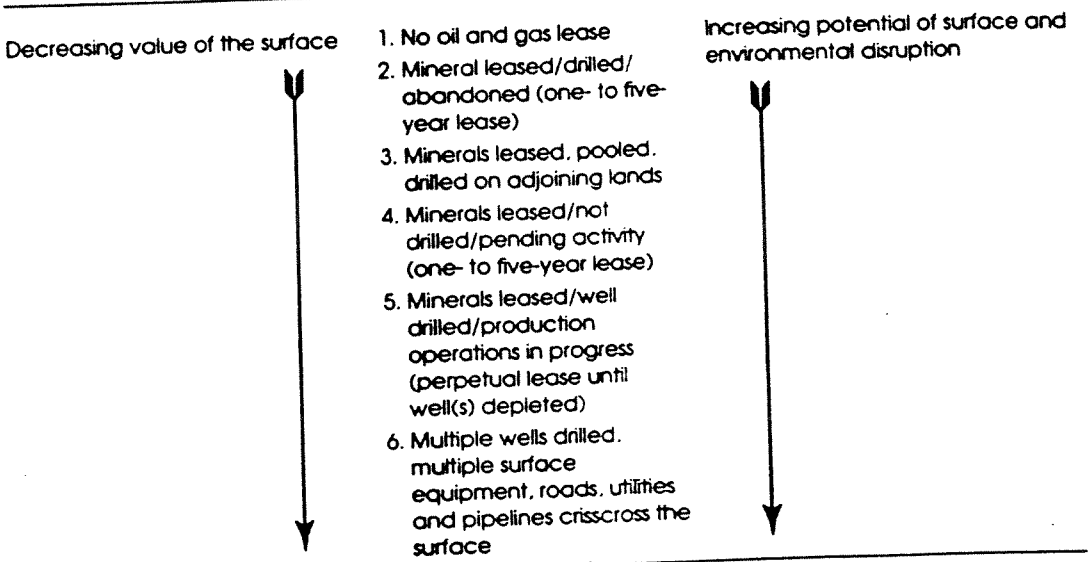
FIGURE 2 Agricultural Land/Mineral Situation Assuming No Oil Lease in Effect

Ag Land Owned All Minerals Owned	Minerals Owned Only	Ag Land Ownec Partial Minerals Owned	Ag Land Owned No Minerals Owned	Ag Land Leased No Minerals Owned

Increasing Control of Surface

NOTE: At the time minerals are leased, the surface owner or tenant s rights to the surface become "less dominant" and control of the surface is greatly reduced as well as the property's highest and best use after a well has been drilled.

FIGURE 3 Changes in Highest and Best Use of Surface Estate due to Mineral/Oil and Gas Activities



Suggestions for reducing damages and improving mineral owner/lessee–landowner relationships

- Each party should maintain a respectful stewardship toward the other's estate.
- A disinterested third-party professional appraiser, market analyst, or land planner should be consulted to plan the surface development of oil and gas activities to minimize surface damages and to some extent create offsetting improvements to the land that could, in some cases, add value to the surface estate with little additional expense to either estate owner.
- A surface operating plan and landowner agreement should be negotiated after all known factors have been evaluated and considered, and a written appraisal should be prepared that quantifies the damages to the surface estate owner.
- An advance cash payment for damages that reflect market value effects should be paid to the landowner before surface disruption, and a significant bond should be posted that the construction cleanup and operations are completed according to the written surface operating plan mentioned earlier.

CONCLUSION

Oil and gas activities are a major disruption of the surface and have significant value implications for surface estate owners. Many landowners and appraisers are not fully aware of the full impact of oil and gas exploration and production activities to a property's present and future market value. The first step is to become more

aware of the oil and gas well development procedures and processes.

The second step is to assist landowners and oil companies to better plan proposed facilities, and the third step is to estimate the present value implications of proposed wells from the standpoint of reduced income for the agricultural lands; reduction in the potential highest and best use; increased exposure to environmental contamination; and consideration of health, welfare, stigmas, and other marketability factors affecting the property.