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An Assessment of Gas Resources in Low-permeability Sandstones of the Upper Cretaceous Mesaverde Group, Piceance Basin, Colorado

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ABSTRACT

A modified volumetric approach was used to estimate in-place and recoverable gas resources in the low-permeability sandstones of the Upper Cretaceous Mesaverde Group in the Piceance basin of western Colorado. For the analysis the Mesaverde Group was subdivided into three stratigraphic intervals, the Williams Fork Formation, the Iles Formation, and the Rollins or Trout Creek Sandstone Member. Each of these three stratigraphic intervals was then subdivided into two plays, a deeper gas play, which contains mainly sandstones that are gas-bearing, and a shallower transition play which contains both gas-bearing and water-bearing sandstones. Variations in levels of thermal maturity were used to define the boundaries of the three deep gas plays, and three transition gas plays.

Two different methods were used to calculate resources. In the first method, the volume of sandstone in each of the six plays was calculated directly from sandstone isopach maps. Average depth of the play was estimated from overburden maps, and these depths were used to calculate the average pressure and average temperature for each play. An estimate of areal extent, average porosity, average gas saturation, and percent gas saturated sandstone was then made for each play. This method produced a mean resource estimate for each of the six plays.

In the second method, a range of values assuming different levels of probability were assigned to the geologic parameters such as play area and sandstone thickness. These probability ranges were then run through two complex probability programs. The first probability program assigns estimates to the gas potential of an individual play at the 95%, 75%, 50%, 25%, and 5% probability levels. The second program computes the same five probability levels to the aggregated sum of gas in all six plays using varying degrees of dependency between the plays. Using the aggregation program and the most likely degree of dependency of 75% between the plays, the mean in-place resource for the aggregated six plays is 419.55 tcf. There is a 95% chance of at least 274.45 tcf of in-place gas and a 5% chance of at least 605.33 tcf of in-place gas in the Mesaverde.

Six different recovery factors were estimated for each play: a low, most likely, and high recovery factor assuming current technology with a gas price of five dollars per thousand cubic feet (mcf); and a low, most likely, and high recovery factor assuming future advanced technology without a gas price specified. The recovery factors were applied to the probability ranges calculated using the two probability programs. Using the current technology and five dollar gas assumptions, the range of estimates of recoverable gas for the aggregated six plays at the 95%, mean, and 5% probability levels are 2.92, 4.48, and 6.48 tcf for the low estimate, 8.75, 13.42, and 19.41 tcf for the most likely estimate, and 29.04, 44.45, and 64.20 for the high estimate. Using future advanced technology without a gas price specified, the range of estimates are 11.65, 17.85, and 25.80 tcf for the low estimate, 44.23, 67.95,

and 98.39 tcf for the most likely estimate, and 128.04, 196.22, and 283.65 tcf for the high estimate.

INTRODUCTION

A modified volumetric approach is used to estimate total in-place gas resources in the low-permeability (tight) sandstones of the Upper Cretaceous Mesaverde Group in the Piceance basin of western Colorado. The Piceance basin is one of several Rocky Mountain basins created during the Laramide orogeny that contain a thick sequence of gas-bearing low-permeability reservoirs of Creatceous age. These unconventional gas accumulations cover large areas of the structurally deeper parts of Laramide Rocky Mountain basins and differ from conventional oil and gas accumulations in that they cut across lithologic units, commonly occur structurally downdip from more permeable, water-filled reservoirs, lack easily definable conventional seals, and formation pressures vary from slightly below hydrostatic to significantly greater than hydrostatic. Low-permeability sandstone reservoirs are believed to contain major resources of natural gas; the National Petroleum Council (1980, p. 31) estimated about 33 trillion cubic feet of ultimatly physically recoverable natural gas independent of price in the Piceance basin.

In this report, the Mesaverde Group is subivided into six plays using a combination of stratigraphy and thermal maturity. Two different methods were then used to calculate in-place resources. The first method calculates a single or average value for the mean in-place resource, whereas the second method calcuates a range of in-place resource values at different probability levels. The second method is far more flexable because it allowed us to quantify the uncertainties in the estimates of geologic factors used in the resource calculations. The mean values for many of these geologic factors were derived during the first resource calculations; therefore the first method was a necessary first step which allowed us to perform the second, more comprehensive set of resource calculations.

In the first method, the average or mean volume of sandstone in each play was calculated from sandstone isopach maps. Overburden maps for each play were constructed, and these maps were used to estimate average overburden on each of the six plays. Average pressure and temperature for each play was then estimated using the average overburden. An average porosity and gas saturation was estimated for each play using available core information. From this set of data, a mean in-place resource for each of the six plays was calculated.

Two complex probability programs were used in the second method. The programs were originally constructed to estimate the oil and gas resources of the Arctic National Wildlife Reserve (ANWR) in Alaska, and was modified here for use in estimating resources in low-permeability gas sandstone reservoirs. In the programs the geologic variables such as play area and gas saturated sandstone thickness are assigned a range of values assuming different probability levels. The first program calcualtes ranges of values for the gas potential of an individual play at the 95%, 75%, 50%, 25%, and 5% probability levels. The second is an aggregation program which assigns the same range of probability levels to the aggregated sum of gas in all six plays assuming different degrees of dependency between the plays. Much of the geologic information used to make this estimate is presented in Johnson and

Nuccio (1986) and Johnson (in press) although considerable new geologic information is included in this summary.

GEOLOGIC SETTING

The Piceance basin is a highly asymmetrical structural and sedimentary basin (fig. 1) that subsided during the Laramide orogeny from latest Cretaceous through about the end of the Eocene. Deposition of the Mesaverde in the Piceance basin, however, began before the onset of the Laramide orogeny which created the basin. During the early part of Mesaverde deposition, the area of the Piceance basin was part of the much larger Rocky Mountain foreland basin, a structural and sedimentary basin that covered most of the central part of the North American Continent during the Cretaceous. Before the end of the Cretaceous, rising Laramide uplifts began to break up the foreland basin into several much smaller Laramide basins, including the Piceance basin.

The Mesaverde Group in the Piceance basin can be subdivided into two general sequences, a lower sequence which consists of several regressive marginal marine units that intertongue with marine shale, and an upper sequence consisting largely of fluvial deposits. The lower sequence was deposited during the Late Cretaceous Campanian along the western margin of the Cretaceous epeiric seaway, during a period when the shoreline of the seaway transgressed and regressed repeatedly across the Piceance basin area. The lower sequence overlies and intertongues with the Upper Cretaceous marine Mancos Shale. The upper sequence was deposited in coastal plain fluvial and paludal environments which covered the area of the Piceance basin once the seaway had retreated to east and southeast of the basin. Age of the upper coastal plain sequence is Late Cretaceous Campanian to Maestrichtian. Deposition of the lower marginal marine sequence appears to totally predate the onset of movement on nearby Laramide uplifts, and shoreline trends during this period typically are not influenced by these uplifts. Deposition of the upper coastal plain sequence clearly overlaps with the onset of movement on nearby Laramide upifts (Tweto, 1975). The influence of these local uplifts on sedimentation is not well understood.

Nomenclature for the Mesaverde in the basin is very complex and in many areas two or more different systems are used. The Mesaverde is a group in some areas whereas in others, it is considered a single formation. Nomenclature for the units deposited during individual transgressive and regressive cycles in the lower sequence is complex and overlaping. Transgressive marine shales are typically assigned member status in the Mancos Shale. Some regressive units on the other hand are considered members in some areas of the basin and formations in others, and in some cases, the same regressive unit has been assigned member status in two different formations in different areas of the basin. One widespread and important regressive unit has been called both the Rollins Sandstone and the Trout Creek Sandstone. In this report, the name Rollins or Trout Creek Sandstone will be used to refer to this sandstone. A complete discussion of these nomenclature problems is beyond the scope of this paper. For recent summaries see Collins (1976), Johnson (in press).

For simplicity here, the Mesaverde Group will be informally subdivided into two formations. The entire sequence of rocks deposited during regressive cycles is informally grouped together in this report and referred to as the

Iles Formation, and the overlying coastal plain sequence is refered to as the Williams Fork Formation. The names Iles and Williams Fork Formations are formally assigned to these sequences in only the northern and eastern parts of the basin. It must be stressed that it is not our intent to replace the other nomenclature systems used in the basin with the simple Iles and Williams Fork subdivisions. We are informally referring to these two sequences as Iles and Williams Fork for simplicity only.

The Iles Formation, as informally used here, varies in thickness from about 500 to 1,500 ft, including the tongues of the transgressive Mancos Shale (fig. 3). Individual regressive units thin and grade into Mancos Shale toward the southeast. Regressive units recognized within the Iles Formation from oldest to youngest are; the Morapos Sandstone (not shown), the Castlegate Sandstone, the lower part of the Sego Sandstone, the combined upper part of the Sego Sandstone and the Corcoran Sandstone, the Cozzette Sandstone, and the Rollins or Trout Creek Sandstone (fig. 2). The Castlegate and Sego are generally considered separate formations although the Sego is locally a member of the Iles Formation. The Morapos is a member of the Mancos Shale. The Corcoran and Cozzette Sandstones were originally defined as members of the Price River Formation, but are also considered members of the Mount Garfield Formation and Iles Formation. The top of the Rollins or Trout Creek Sandstone is the top of the Iles Formation and represents the last widespread marginal marine regressive sandstone deposited across the basin. The Rollins or Trout Creek Sandstone occurs everywhere except the western margin of the basin and in this liminted area, the base of the overlying Cameo-Fairfield coal zone described below, is used as the contact between the Iles and Williams Fork Formations. For a detailed description of these regressive units see Johnson (in press). The regressive marine units are lithologically very complex, and consist of a mixture of persistent marginal marine sandstones, brackish-water lagoonal sequences, lenticular channel sandstones of distributary channel and lower coastal plain origin, and coally intervals deposited in delta or lower coastal plain environments.

The overlying Williams Fork Formation is from 1,500 to 4,500 ft thick and was deposited in nonmarine coastal-plain and fluvial and paludal environments (fig. 4). The Cameo-Fairfield coal zone occurs at the base of the Williams Fork Formation and contains the majority of the coal resources in the basin. The Cameo-Fairfield coal zone was deposited landward the Rollins or Trout Creek shoreline as it slowly retreated in a general eastward direction across the basin, and is therefore part of the Rollins or Trout Creek regressive cycle. The top of the Rollins or Trout Creek is a much better defined contact than the top of the Cameo-Fairfield, however, and for simplicity the Cameo-Fairfield included in the Williams Fork play. The coals and carbonaceous shales of the Cameo-Fairfield coal zone are probably the source of much of the gas found in the Williams Fork Formation. The Cameo-Fairfield zone ranges from about 100 ft to 1,000 ft thick and averages about 300 ft thick. Total thickness of coal ranges from 20 ft to 180 ft but varies between only 40 ft and 60 ft throughout much of the basin (Johnson, in press). Overlying the Cameo-Fairfield zone is as much as several thousand feet of channel sandstones, gray mudstones and minor coally intervals deposited on the coastal plain that covered the area after the seaway had retreated. Channel sandstones are commonly stacked into thicker units that can reach several hundred feet thick. Sandstones compose from 32 to 48 percent of the Williams Fork.

STRATIGRAPHIC PLAYS

For the resource estimate, the Mesaverde Group was subdivided into three plays based on stratigraphy; the Iles Formation, the Rollins or Trout Creek Sandstone, and the Williams Fork Formation. The Iles play is mostly a mixture of persistent marginal-marine sandstones, small, lenticular distributary and lower coastal-plain sandstones, whereas the Williams Fork play contains mostly lenticular fluvial channel sandstones and stacks of fluvial sandstones which are generally thicker than the lenticular sandstones of the Iles. The regressive units of the Iles Formation intertongue with the Mancos Shale, and these shale tongues may act as widespread permeability barriers. Although the Iles and Williams Fork plays contain, for the most part, different types of sandstone reservoirs, there is some overlap. Substantial thicknesses of lenticular channel sandstones also occur locally in the Iles Formation, particularly in the northwest part of the basin, where many of the regressive cycles in the Iles grade into coastal plain deposits. At least two persistent marginal marine sandstones occur in the Williams Fork Formation in the extreme southeastern part of the basin. For detailed stratigraphic sections of the Iles and Williams Fork Formations see Johnson (in press). The Rollins or Trout Creek was considered a separate play, even though it is considered stratigraphically part of the Iles Formation, because in is commonly water bearing, even in the deepest areas of the basin. The persistent Rollins or Trout Creek appears to have acted through time as a major conduit for fluid movement in the basin.

SUBDIVISIONS OF THE THREE STRATIGRAPHIC PLAYS

The Mesaverde low-permeability gas accumulation in the Piceance basin was divided into three major zones: 1) a shallow, permeable, water-bearing zone around the margins of the basin which contains scattered gas accumulations in reservoirs with conventional or near conventional permeabilities, 2) a deeper, transition zone containing both water-bearing sandstones with conventional permeabilities and low-permeability gas-bearing sandstones, and 3) a deep gas zone with predominantly gas-bearing low-permeability sandstones (Johnson, in press). This three-zone subdivision was originally described in the low-permeability gas accumulations of the San Juan basin of New Mexico and Colorado, and the Deep basin of Alberta (Masters, 1979).

The three zones in the Piceance basin cut across three stratigraphic plays defined earlier. The shallow, predominantly water-bearing zone with scattered conventional gas reservoirs, was not considered in this resource estimate. Each of the three stratigraphic plays was divided into two plays, a transition play and a deep gas play for a total of six gas plays (fig. 5). The boundaries of the gas zone and the transition gas-and-water-bearing zone were approximately defined by Chancellor and Johnson (1986) using a combination of gas shows and production characteristics along a northwest-southeast line of section on the southwest flank of the basin (fig. 6). They suggest that the transition zone along this line of section extends from the top of the Williams Fork Formation downward for about 1,000 to 1,700 ft, while the basin-center gas zone extends through the remaining 3,300 to 4,000 ft of the Williams Fork and Iles. Unfortunately, reliable drilling information is scarce in many areas of the basin and in these areas the limits of these two zones are difficult to define using drilling information alone. The location of these two zones appears to be fairly closely related to thermal maturity,

however, and there is considerably more reliable thermal maturity information available for the basin than reliable drilling information. Therefore, we have used variations in thermal maturity to generally define the boundaries of the basin center gas zone and the transition zone. Levels of thermal maturity have also been used to generally define the boundaries of low-permeability gas accumulations in other Rocky Mountain basins (Meissner, 1984; Law, 1984). A general discussion of the origin of these low-permeability gas accumulations is needed in order to understand why the boundaries of the accumulations are related to thermal maturity.

ORIGIN OF LOW-PERMEABILITY GAS ACCUMULATIONS

A general model explaining the origin of these unconventional accumulations has been developed recently by a number of authors (Miessner, 1984; 1980; 1981; Mcpeek, 1981; Law and others, 1979; 1980; Law and Dickinson, 1985; Spencer and Law 1981; Spencer, 1985). While these authors disagree about some of the details of the development of these accumulations, they all agree on the basic model. Source rocks and reservoir rocks are believed to be closely associated and gas found in low-permeability reservoirs is not believed to have migrated great distances when compared to migration distances for many conventional gas accumulations. A combination of two conditions must occur during basin subsidence and burial heating to form a low-permeability gas accumulation: 1) available source rocks must be heated sufficiently to generate large quantities of gas, and 2) an early loss of permeability by a combination of compaction and diagenesis must occur. This loss of permeability helps trap the gas in the deep central areas of the basins where the gas is being generated. The discontinuous nature of most low-permeability reservoirs also appears to help trap the gas.

During formation of the accumulation, gas is generated at greater rates than it can escape, raising formation pressures to above regional hydrostatic pressure. These high gas pressures help displace the formation water out of sandstones in the expanding gas accumulation. The high formation pressures found today in many of these accumulations are believed to indicate areas where significant gas is still being generated (Law, 1984; Law and others, 1980). Low-permeability, basin-center gas accumulations can therefore form only where source rocks are at least moderately rich and abundant, and have been heated sufficiently to have generated large quantities of methane. If formation temperatures decrease substantially enough to drop the rate of gas generation to below the rate of gas leakage, then pressures drop to below hydrostatic, and water invades into the margins of the accumulation with a consequent reduction in the size of the gas accumulation (Law and Dickinson, 1984).

Most hydrocarbons are generated by three general types of organic matter: sapropelic or liptinic, humic or coally, and an intermediate type. Sapropelic organic matter is hydrogen-rich, occurs mainly in rocks of marine origin, and generates mainly oil during the early stages of thermal maturation. At higher levels of maturation, oil breaks down into gas that is rich in longer chain hydrocarbon molecules and condensate. Significant quantities of sapropelic organic matter is probably present in the Mancos Shale which underlies the Mesaverde Group throughout the basin, and the presence of a "burned out" oil zone near the base of the Mesaverde at MWX strongly suggests that some of the gas found in the lower part of the Mesaverde resulted from the breakdown of

oil that migrated upward from the underlying Mancos Shale (Pitman and Spencer, 1984,). Humic or coaly matter is hydrogen-poor and generates mainly methane gas while undergoing thermal maturation. It appears to be the dominant type of organic matter found in the Mesaverde Group. The intermediate type of organic matter generates both oil and condensate-rich gas.

A general relationship between levels of thermal maturity and hydrocarbon generation by the three basic types of organic matter is fairly well established (fig. 7). The most commonly used measure of thermal maturity in humic-rich source rocks such as those found in the Mesaverde Group is percent vitrinite reflectance in oil (%Ro). Vitrinite reflectance is a measure of the reflectivity of polished organic vitrinite particles under oil, and the vitrinite reflectance scale can be directly converted to coal rank. Quantitative models relating the amount of methane generated by coals to coal rank or %Ro have been presented by Juntgen and Karweil (1966) and Juntgen and Klein (1975).

The onset of significant thermal methane generation by coals and carbonaceous material occurs at about an Ro 0.73%. Therefore any gas accumulation found in rocks with an Ro of less than 0.73% is either biogenic gas formed during early burial, or it has migrated vertically or laterally for some distance. As previously discussed migration distances are believed to be relatively small in most low-permeability accumulations. There appears to be very little low-permeability Mesaverde gas production in the basin where the Mesaverde has not achieved an Ro of 0.73% (Johnson, in press), and therefore an Ro of 0.73% is used here to define the outer boundary of the gas-water transition zone.

Much of the methane generated by humic or coaly organic matter during the early stages of thermal methane generation may be retained in the source rocks and unavailable to migrate into nearby reservoir rocks. Meissner (1984) in his study of the gas resources of the San Juan basin points out that low-rank coals are very porous and can absorb large quantities of gas. Meissner suggests that much of the gas generated by coals during the early stages of thermal maturation may be retained in the porosity of the coal, and hence unavailable to migrate into nearby reservoir rocks. Meissner defines the "expulsion limit" of a coal as the coal rank at which the volume of methane generated by the coal is equal to the amount of gas that the coal can absorb. The amount of gas that a coal can absorb is related to coal rank, pressure and temperature but under average reservoir pressure and temperature conditions in the Piceance basin, the expulsion limit is interpreted to occur at an Ro of about 1.1%. Thus if a coal was totally water wet at the onset of gas generation, the coal could conceivably absorb all of the gas that it generates until a Ro of 1.1% is reached. Meissner suggests that methane expulsion occurs at a somewhat lower rank than 1.1%, because some of the coal porosity is likely to be filled with biogenic gas generated prior to deep burial. The presence of low-permeability methane accumulations in all Rocky Mountain basins at vitrinite reflectance levels lower than 1.1% strongly suggests that either migration distances are considerably greater than now believed or that expulsion occurs at a vitrinite reflectance of less than 1.1%.

An Ro of 1.1% appears to very approximately correspond to the contact between the transition zone and the basin-center gas zone along the cross section shown on figure 6, and an Ro of 1.1% is used in this resource estimate, to define the top of the basin center gas accumulation. The transition zone appears to, in part, represent the zone where the amount of gas expelled from available source rock was insufficient to saturate all of the available sandstone reservoirs.

LIMITATIONS OF THE THERMAL MATURITY APPROACH

There are, however, some limitations to defining the boundaries of the gas accumulation using just thermal maturity. Although porosity and permeability are progressively lost during basin subsidence, original lithologic variations cause the rate of this loss to vary. In the low-permeability gas accumulation of the Alberta deep basin for instance, the rate of porosity and permeability loss with depth for coarse conglomeratic intervals is far less than that for finer grained intervals (Masters, 1979). As a result, the conglomeratic intervals are permeable and water-wet further into the basin than the finer grained sandstones. Permeability differences due to original lithologic variations appear to be less pronounced in the Piceance basin than in the Alberta Deep basin but differences are clearly present. At this time there is too little information to quantify these differences and we will not attempt to compensate for these differences at this time.

Variations in the distribution and organic richness of source rocks also affect the gas accumulation. If potential source rocks are sparse, a low-permeability gas accumulation is unlikely to form. Law (1984) in his discussion of overpressuring in the Green River basin, notes that smaller pressure increases occur in organically lean intervals when compared with organically rich intervals. In the Piceance basin, the distribution of organic matter appears to be, in general, fairly uniform throughout the basin. The thickness of coal in the Cameo-Fairfield coal zone, which is thought to be the major source of gas in the Williams Fork Formation varies between 40 ft and 60 ft throughout much of the Piceance basin. Organic matter is, however, concentrated in the lower part of the section. Theoretically this should cause the basin center gas zone to extend into lower levels of thermal maturity in the lower organic-rich part of the Mesaverde than in the upper part. This was not detectable with the limited data available, and we have not attempted to compensate for this problem.

Cooling caused by declining thermal gradients and/or downcutting during the last 9 ma may have contracted the boundaries of the gas accumulation in some areas of the basin. The amount of downcutting is highly variable however. Over a mile of section has been removed in some areas whereas virtually none has been removed from others, and it is likely that this variation has allowed water to penetrate deeper in some areas than in others. At MWX the top of the deep gas zone occurs at a depth of about 5600 ft (Spencer, 1987) and at a vitrinite reflectance level of somewhat greater than Ro 1.35% (fig 6). The MWX site is located near the bottom of the Colorado River canyon where about 5,000 ft of downcutting has occurred since the canyon began to form about 9 ma. In the Green River basin of Wyoming, the top of the basin-center gas accumulation occurs at a thermal maturity level of only about Ro 0.8% (Law, 1984) rather than at an Ro of 1.1% as in the

Piceance. Less downcutting in the Green River basin when compared to the Piceance basin may be, in part, responsible for this difference. This is certainly a significant problem that will have to be addressed at some later date when sufficient drillhole data can be obtained.

PROCEDURE USED TO CALCULATE TOTAL IN-PLACE RESOURCES IN THE SIX PLAYS

An assessment of the total volume of sandstone in each of the six plays was needed before the total in-place resource estimate could be calculated. Figures 8 and 9 are isopach maps of total sandstone present in the Williams Fork and Iles Formations. Sixty drillholes and measured sections were used for the preparation of the Williams Fork isopach map and ninety three were used for the Iles. Only sandstones 10 ft thick or greater are included in these two isopach maps. For the Rollins or Trout Creek Sandstone, an approximate average thickness of 75 ft was assumed for the entire basin.

Next, the approximate positions of the Ro 0.73% and Ro 1.1% levels of thermal maturity in the basin were determined using available Ro information (Freeman, 1979, Nuccio and Johnson, 1983; in press; Johnson and Nuccio, 1986; Chancellor and Johnson, 1986). Isopach maps showing of the interval between the top of the Rollins or Trout Creek Sandstone and the Ro 1.1% and Ro 0.73% levels were constructed (figs. 10 and 11). The volume of sandstone in the Williams Fork that had attained these two Ro values was calculated first. Maps showing the percentage of the Williams Fork that had attained an Ro of 1.1% or greater and an Ro of .73% or greater (figs. 12 and 13) were determined by overlaying figures 10 and 11 on the isopach of the total thickness of the Williams Fork (fig. 4). Next, the thickness of sandstone in the Williams Fork that had attained an Ro 1.1% and Ro of 0.73% (figs. 14 and 15) was estimated by overlaying the percent isopachs (figs. 12 and 13) on the isopachs of total thickness of sandstones ten feet or greater in the Williams Fork (fig. 8). In the deepest part of the basin, the entire Williams Fork has attained at least an Ro of 0.73% (fig. 15), and in this area the isopach of sandstones 10 ft or greater in the Williams Fork is the same as the isopach of sandstone in the Williams Fork that have attained an Ro of at least 0.73%. The sandstone isopach maps were then planimetered, and the results are shown in tables 1 and 2.

Some special geometric problems were encountered when attempting to calculate the volume of sandstone in the Iles Formation that had attained an Ro of 1.1% and an Ro of 0.73%. The volume of sandstone in the areas where 100 percent of the Iles had attained one of the two Ro values was easily determined by planimetering the sandstone thicknesses within those two 100 percent boundaries (tables 3 and 4). Because the Iles Formation is comparatively thin, however, the percent thickness of the Iles that has achieved an Ro of 0.73% and 1.1% varies from 0 percent to 100 percent over fairly short horizontal distances (figs. 16 and 17), and it was physically impossible to draw 20, 40, 60, and 80 percent lines. The volume of sandstone in the areas between the 0 percent and 100 percent lines was estimated by planimetering the total thickness of Iles sandstone in these areas and dividing by two (tables 5 and 6). It can be seen on figure 5 that the areas between 0 percent and 100 percent of each of the Ro values are really wedge shaped, with volumes that are approximately equal to half of the total volume.

The main shortcoming of this approach of determining the total sandstone volumes that had achieved an Ro of .73% or greater and 1.1% or greater is that it assumes that sandstones are more or less equally distributed vertically through the Iles and Williams Fork Formations throughout the basin. This assumption is not totally accurate. A method of compensating for this problem would be to determine the thickness of sandstones below each of the two Ro values in each of the drillholes used to generate the sandstone isopachs and then isopach these values. This would be a time consuming process that would probably not significantly affect the final resource numbers, and was therefore not attempted.

Average formation pressure and temperature for each of the six plays was then determined. It was assumed that pressure and temperature were directly related to depth, and that both temperature and pressure gradients were constant with depth in each of the six plays. These assumptions are only approximately correct. Temperature logs run at the Multiwell site near Rulison (figs 1 and 6) indicate that thermal gradients are higher in some intervals of the Mesaverde than in others, and there is considerable evidence for variations in pressure gradients with depth in low-permeability gas accumulations (Law, 1984, Spencer, 1987). At this time there is no method to compensate for these complexities, and the temperature and pressure gradients estimated for each play here are considered approximate average gradients.

A series of overburden maps was constructed in order to apply the estimated thermal gradients and pressure gradients for each of the six plays. Figure 18 is a map showing depth to the top of the Rollins or Trout Creek Sandstone. This is also essentially an overburden map on the top of the two Rollins or Trout Creek plays and is very close to the overburden present on the top of the two Iles plays. The extreme variations in overburden shown on this figure is caused largely by the downcutting of the Colorado River and its tributaries.

Next, overburden maps to the top of the Ro 1.1% and Ro 0.73% levels of thermal maturity (figures 19 and 20) were constructed by overlaying the isopach maps of the intervals between the top of the Rollins or Trout Creek and the Ro 1.1% and Ro 0.73% levels respectively on the overburden map on the top of the Rollins or Trout Creek. Although these maps were constructed in order to determine average pressures and temperatures, they may also be useful in exploration and development, since they show where the gas accumulation is closest to the surface.

These maps estimate overburden on the top of the various plays; whereas, average overburdens for individual plays were needed for the resource estimate. Figures 21 and 22 are overburden maps on an interval midpoint between the top of the Rollins or Trout Creek Sandstone and the Ro 1.1% and Ro .73% levels. These maps were used to determine pressures and temperatures in the two Williams Fork plays. Because the Iles Formation averages only about 1,000 ft thick, average overburden on the midpoints of the two Iles plays was estimated by simply adding 500 ft to the overburden map on the top of the Rollins or Trout Creek Sandstone.

The average overburden for each of the sandstone isopach lines on figures 14-17 was then estimated by overlaying the sandstone isopachs on the maps showing overburden to the midpoint of the plays (figs. 21 and 22 for the Williams Fork plays; fig 19 for the Iles and Rollins or Trout Creek plays) and

estimating the percent of each isopach line that was under each 1,000 foot overburden interval and then determining a weighted average of the overburden. The results are listed on tables 1-6. The process is illustrated on figure 23. In essence, all of the sandstone in a given play is placed at the midpoint level of the play and an average overburden at this midpoint is estimated.

Temperature gradients are not constant across the basin (Johnson and Nuccio, 1986), and therefore temperature at any given depth varies from place to place. To roughly compensate for this variation, a simplified geothermal gradient map (fig. 24) was overlaid on the sandstone isopach maps for each play and an average geothermal gradient for each 50 or 100 foot sandstone isopach interval was estimated. These results are also listed on tables 1-6.

We now have determined an average depth and an average geothermal gradient for all of the sandstone in all of the six plays. Average formation pressure gradients, porosities, and water saturations were then estimated for each of the six plays (tables 1-6). Average pressure gradients estimated for the six plays vary from 0.39 psi per foot or slightly below hydrostatic for the Williams Fork transition play to 0.45 psi per foot or slightly above hydrostatic for the Iles basin center gas play. These estimates are based on the scarce formation pressure information available for the basin (Chancellor and Johnson, 1986; Johnson, in press; Spencer, 1987). Estimates of porosity and gas saturations are based principally on the detailed core analysis from MWX, supplemented with some core analyses from other areas of the basin.

Resource estimates were then calculated for each of the six plays (tables 7a-c). The basin-center gas plays had to be calculated first followed by the transition gas plays. A simple integration procedure was followed in which the maximum and minimum isopached intervals were averaged. The procedure is illustrated in figure 23b. The play is outlined by the dashed line. The volume of the set of boxes above the dashed line was averaged with the volume of those below to approximate the volume below the dashed line.

In order to calculate resources in the Iles and Williams Fork transition plays, the total resource in sandstones with an Ro 0.73% or greater had to be calculated and then the resource in sandstones with an Ro 1.1% or greater was subtracted. The in-place resource in sandstones with an Ro 1.1% or greater could be correctly subtracted from the total in-place resource in sandstones with an Ro 0.73% or greater only if the same formation pressure gradient, porosities, and water saturations were used for both (tables 1-6). Once the subtraction was performed, a correction factor was applied to the total in-place resource for some of the plays to obtain the correct estimates of formation pressure gradients, porosities, and water saturations (tables 7a-c).

CALCULATION OF PROBABILITY DISTRIBUTIONS OF ESTIMATES FOR THE SIX PLAYS

The total in-place resource estimates presented in tables 7a-c are considered to be mean or average resource numbers, calculated using averages of sandstone thickness, porosity, water saturations, depth of burial, geothermal gradients, and formation pressure gradients. A complex probability program was then used to estimate a range of in-place gas resources values for each of the six plays. The probability program was originally designed to be

used with conventional oil and gas accumulations, and was modified in order to be used for unconventional low-permeability gas reservoirs. A summary of the probability model used is presented here.

In play analysis a petroleum assesment area is partitioned into geologic plays, and the individual plays are analyzed. A play consists of a collection of prospects having a relatively homogeneous geologic setting. A prospect is a potential hydrocarbon accumulation. A hydrocarbon accumulation is a discrete oil or gas accumulation, which may consist of one or more pools depending upon the specific play concept. A prospect is modeled by separately considering the uncertainty as to the presence of a hydrocarbon accumulation, and its size if present. An accumulation of hydrocarbon is modeled as gas in this study. There are three sets of geologic attributes or random variables involved in this play-analysis approach; these are for (1) the play, (2) the prospect, and (3) the hydrocarbon volume. The play and the prospect attributes are concerned with the presence or absence of certain geologic characteristics at the play and prospect levels, respectively. The hydrocarbon-volume attributes are concerned with the size of the hydrocarbon accumulation.

The play attributes are (1) existence of a hydrocarbon source, (2) favorable timing for migration of hydrocarbons from source to trap, (3) potential migration paths, and (4) existence of potential reservoir facies. The presence of all four play attributes (in which case the play is said to be "favorable") is a necessary, but not sufficient, condition for the existence of oil or gas deposits in the play. Thus, if one or more of these attributes is not present, all the prospects within the play are dry. Subjective judgments are made by experts for estimating the probability of the presence of each play attribute. Assuming independence, the product of these four probabilities is the probability that the play is favorable for the existence of hydrocarbon accumulations and is called the marginal play probability. A probability of 1 or complete certainty is assumed here for each of the play attributes for the Piceance basin low-permeability gas accumulation because there is no question that the hydrocarbon accumulations actually exists.

The prospect attributes are (1) trapping mechanism, (2) effective porosity, and (3) hydrocarbon accumulation. Given a favorable play, the presence of all three prospect attributes is a necessary and sufficient condition for the existence of a hydrocarbon accumulation in the prospect. Again, subjective judgements are made by experts for estimating the probability of the presence of each prospect attribute. Assuming independence, the product of these three probabilities is the probablility that a prospect is a hydrocarbon accumulation, given the play is favorable, and this is called the conditional accumulation probability. In this case, there is no question that the single prospect within each play contain gas, therefore, a probability of 1 or total certainty was also assigned to the prospect attributes.

The hydrocarbon-volume attributes are (1) area of closure, (2) thickness of reservoir rock, (3) effective porosity, (4) trap fill, (5) depth to reservoir, and (6) hydrocarbon saturation. The hydrocarbon-volume attributes jointly determine the volume of the hydrocarbon accumulation which in this case is the play. The following reservoir engineering equation is used to calculate the in-place volume of gas in thousands of cubic feet.

Gas in place = 1,537.8*1,000*A*F*H*P*Sh*(Pe/T)*(1/Z) where
A = area of closure (1,000 acres)
F = trap fill (decimal fraction)
H = reservoir thickness (feet)
Sh = hydrocarbon saturation (decimal fraction)
Pe = virgin reservoir pressure (psi)
T = reservoir temperature (degrees Rankine)
Z = gas compressibility factor

The equation consists of a product of factors that are functions of the hydrocarbon-volume attributes. The attributes are treated as continuous independent random variables, with the exception of effective porosity which is perfectly positively correlated with hydrocarbon saturation. The probability distribution for an attribute is determined from subjective judgments made by experts, usually geologists, based either on actual geological and geophysical data, when available, or on the experience and knowledge of the experts using analog data and geologic extrapolations when data is unavailable. The probability distribution for each attribute is described by a complementary cumulative distribution function determined from seven estimated fractiles (100th, 95th, 75th, 50th, 25th, 5th, 0th). The 5th fractile, for example, is an attribute value such that there is a 5% chance of at least that value. In each play analyzed the seven fractiles are estimated for all of the hydrocarbon-volume attributes.

The probabilistic methodology used to process the geologic data is an analytic method derived from probability theory. The analytic methodology was developed by the application of the laws of expectation and variance. The methodology systematically tracks through the geologic model, computes all of the means and variances of the appropriate random variables, and calculates all of the probabilities of occurrence. The log-normal distribution is used as a probability model in order to arrive at probability fractiles. On the basis of this methodology, a computer program was designed and called the Fast Apprasal System for Petroleum (FASP). A separate methodology was developed for estimating the aggregation of a set of plays. In this method, the resource estimates of the individual plays from the FASP program are aggregated by means of probability theory in a computer program called the Fast Appraisal System for Petroleum Aggregation (FASPA) The computer package consisting of FASP and FASPA is described in Crovelli (1985, 1986) and Crovelli and Balay (1986).

Estimates of three of the seven fractiles (100th, 50th, 0th) are needed for each of the hydrocarbon volume attributes in the six plays. The remaining four fractiles (95th, 75th, 25th, 5th) are then calculated assuming a log-normal distribution. Mean or average values for each attribute can be generally derrived from the information used to calculate resources in the first method. In the input for the probability programs, however, only fractiles are used, and the mean or average values of the volume attributes are not know until they are calculated by the programs. The mean will be the same as the 50th percent fractile only if there is no skewness in the seven fractiles. For the first attempt at running the probability programs, these mean or average values were assumed to be equal te the 50th fractile. Fortunately, there was generally very little skewness in the fractile estimates for the volume attributes, and hence there was very little difference between the mean values, and 50th percentiles for each of the

volume attributes. These minor differences, however, cause the probability program to calculate slightly different mean resource estimates for the six plays then were calculated using the first method. To compensate for this, the seven fractiles were varied slightly until the probability program calcualated approximately the same mean resource numbers as were calculated using the first method. This proceedure is not entirely valid since there are some minor incompatabilities between the two methods used here to calculate resources, such as the previously mentioned inability of the probability program to take into account variations in thermal gradients in the basin. It was felt, however, that it was more important to have agreement between the mean resources numbers calculated by the two methods. The mean estimate and five fractile estimates of in-place resources in each of the six plays calculated by the probability program are listed on tables 8-13.

The avearge area of closure (A) was determined from the planimetered areas listed on tables 1-6. The average reservoir thickness (H) was determined by adding up reservoir volume columns on tables 1-6 and dividing by the area of the play. The average reservoir depth, which is used to calculate virgin reservoir pressure (Pe), and reservoir temperature (T), was generally determined by calculating a weighted average using the volume columns and the depth columns on tables 1-6. The complex shape of the Iles and Williams Fork transition plays made this determination difficult, and some trial and error was needed. A source of minor error is that variations in thermal gradients in the basin were compensated for when the mean resource numbers in table 7 were calculated using the first method; whereas, a constant thermal gradient had to be assumed in the probability program.

A more precise method to estimate the seven fractiles for four of the volume attributes (area of closure, reservoir thickness , original or virgin pressure, and reservoir temperature) would be to estimate the fractiles for the positions of the two critical thermal maturity levels (Ro .73 and Ro 1.1) in the basin prior to estimating the fractiles for these four volume attributes. Because these four volume attributes are directly related to the positions of these two thermal maturity levels in the basin, once the fractiles for these thermal maturity levels are known, the fractiles for these four volume attributes could be calculated. For instance, if it was estimated that there was 100 percent chance that the Ro 1.1 thermal maturity level was no deeper than 1000 ft below the estimated average position in the basin, then the 100th fractile for the volume attributes listed above could be calculated provided that new overburden maps and new maps showing sandstone thickness for this 0 percent probability position were constructed. Using this method, the interelationship between the volume attributes would be better quantified, however, the process would have been extremely time consuming and was therefore not attempted.

The resource numbers for all six plays were then run through an aggregation program which calculates five fractiles (95th, 75th, 50th, 25th, 5th) for the total aggregated resource in all six plays. Five degrees of dependency were tried, 0%, 25%, 50%, 75%, and 100% (tables 14-18). Because of the similar geologic histories of the six plays, it was decided that a 75% degree of dependency probably most closely describes the Mesaverde low-permeability resource.

RECOVERY FACTORS

Recovery factors are used to calculate the percent of total in-place gas that is likely to be recovered under a defined set of conditions. Two approaches were tried; the first approach assumes present day technology and a $5.00 per thousand cubic feet price for gas in 1987 dollars, while the second set assumes advanced technology and high but unspecified gas prices; the price as yet undefined. High, low, and most likely recovery factors were estimated for each play. The values assigned to the six recovery factors are different for each of the six plays, and are listed on table 19. It was felt that the differences in porosity, sandstone geometry, fracture distribution, and depth that occurs between the six plays would result in different recovery percentages. The reasoning process used to estimate each recovery factor was based on the experience of the authors, and historical development and productive performance. Both technology and economics were considered when developing these recovery factors. The six plays were run through the two probability programs using the six recovery factors. A 75% degree of dependency between the six plays was assumed for the aggregation program.

Current technology with $5.00 per thousand cubic feet gas (1987 dollars)

The low current technology recovery factors assume that the thick intervals of lenticular sandstones that make up the majority of the Mesaverde reservoirs will be considerably more difficult to produce than it now appears, and that perhaps some of the large areas of the basin that are now virtually untested will prove to be considerably more difficult to produce than areas where production has already been established. Low current technology and $5.00 gas recovery factors for the six plays are 1% for the Williams Fork Ro 1.1% or greater, Williams Fork transition, and Iles Ro 1.1% or greater plays, 2% for the Iles transition, and Rollins or Trout Creek Ro 1.1% or greater plays, and 3% for the Rollins or Trout Creek transition play. Using the above recovery factors, the six plays were run through the probability program that calculates probability fractiles for individual plays and the results are listed in tables 20-25. Table 26 lists the results from the aggragation program at a 75% dependency between the six plays.

The most likely current technology recovery factors are based on an estimate of the percent of the total in-place resource that can be recovered today using good state-of-the-art technology and a gas price of about five dollars per thousand cubic feet. If current depressed gas prices are assumed instead, then recovery factors would be quite low and limited to production from existing wells. It appears that little or no new development of Mesaverde tight reservoirs will occur under current market conditions. It is suggested that the five dollar gas price may ultimately represent a more reasonable long-term average price for gas than the present depressed market price. Most likely current technology and $5.00 gas recovery factors for the six plays are 3% for the Williams Fork Ro 1.1% or greater, Williams Fork transition, and Iles Ro 1.1% or greater plays, 6% for the Iles transition play, 5% for the Rollins or Trout Creek Ro 1.1 or greater play, and 10% for the Rollins or Trout Creek transition play. The results from the probability program for individual plays are listed on tables 27-32, and table 33 lists the results from the aggragation program.

The high current technology recovery factors assume that the thick sequences of lenticular sandstones will be considerably easier to produce than it now appears, and that perhaps most of the problems in establishing Mesaverde production thus far are the result of poorly completed wells. The high current technology factors for the six plays are 10% for the Williams Fork Ro 1.1% or greater, Williams Fork transition, Iles Ro 1.1% or greater, and Rollins or Trout Creek Ro 1.1% or greater plays, 20% for the Iles transition play, and 15% for the Rollins or Trout Creek transition play. The results from the probability program for individual plays are listed on tables 34-39, and table 40 lists the results from the aggregation program.

Future advanced technology

The rationale for the future advanced technology recovery factors are far more speculative. The low advanced technology recovery factors assume some relatively modest improvements in current technologys and a restoration of five dollar gas prices in 1987 dollars. These recovery factors are only slightly higher than the most likely recovery factors using current technology and five dollars per thousand cubic feet gas. The low advanced technology recovery factors for the six plays are 4% for the Williams Fork Ro 1.1% or greater, Williams Fork transition, and Iles Ro 1.1% or greater plays, 8% for the Iles transition and Rollins or Trout Creek transition plays, 6% for the Rollins or Trout Creek 1.1 or greater plays. The results from the probability program for individual plays are listed on tables 41-46, and table 47 lists the results from the aggregation program.

The most likely advanced technology recovery figures assume major but not unrealistic breakthroughs in development technologies such as horizontal or inclined drilling and considerably improved techniques for completing multiple pays that would allow a large percentage of Mesaverde sandstones in each play to be intersected and effectively drained. The thick, heterogeneous nature of the Mesaverde Group is considered the main obstacle to achieving these most likely recovery factors. A substantial increase in gas prices above five dollars per thousand cubic feet and (or) a significant improvement in the efficiency of the drilling process would be required to achieve these most likely figures. Most likely advanced technology recovery factors for the six plays are 15% for the Williams Fork Ro 1.1% or greater and Iles Ro 1.1% or greater plays, 18% for the Williams Fork transition play, 20% for the Iles transition and Rollins or Trout Creek Ro 1.1 or greater plays, and 22% for the Rollins or Trout Creek transition play. The results from the probability program for individual plays are listed on tables48-53, and table 54 lists the results from the aggratation program.

The high recovery factors for the various plays represent approximately the expected average percent of movable or producable gas in all the reservoirs in each play. For each individual sandstone in the play, movable gas is defined as approximately the percent of gas that can be ultimately produced from the sandstone if it contains an extensive natural fracture system and the majority of the fracture system is in communication with the well bore by virtue of undamaged induced (hydraulic) fractures, inclined drilling, or some other methods. The recoverable gas is generally considered to be around 40 to 50% of the total in place gas, depending on original porosity and permeability. To achieve these high figures, the movable gas in every Mesaverde low-permeability gas sandstone reservoir ten feet thick or

greater in a given play would have to be produced. This level of success is considered to be almost unachievable, and would probably require an unrealistically close well spacing and as yet undeveloped technology that would permit the gas in every sandstone encountered to be very efficiently drained. An unrealistically high gas price would probably also be needed. High advanced technology recovery factors for the six plays are 45% for the Williams Fork Ro 1.1% or greater and Iles Ro 1.1% or greater plays, 50% for the Williams Fork transition, Iles transition, and Rollins or Trout Creek Ro 1.1 or greater plays, and 55% for the Rollins or Trout Creek transition play. The results from the probability program for individual plays are listed on tables 55-60, and table 61 lists the results from the aggregation program.

The 95%, mean, and 5% probability fractiles for the total in place resource, and the resource using the six recovery factors for the six plays is summarized in table 62.

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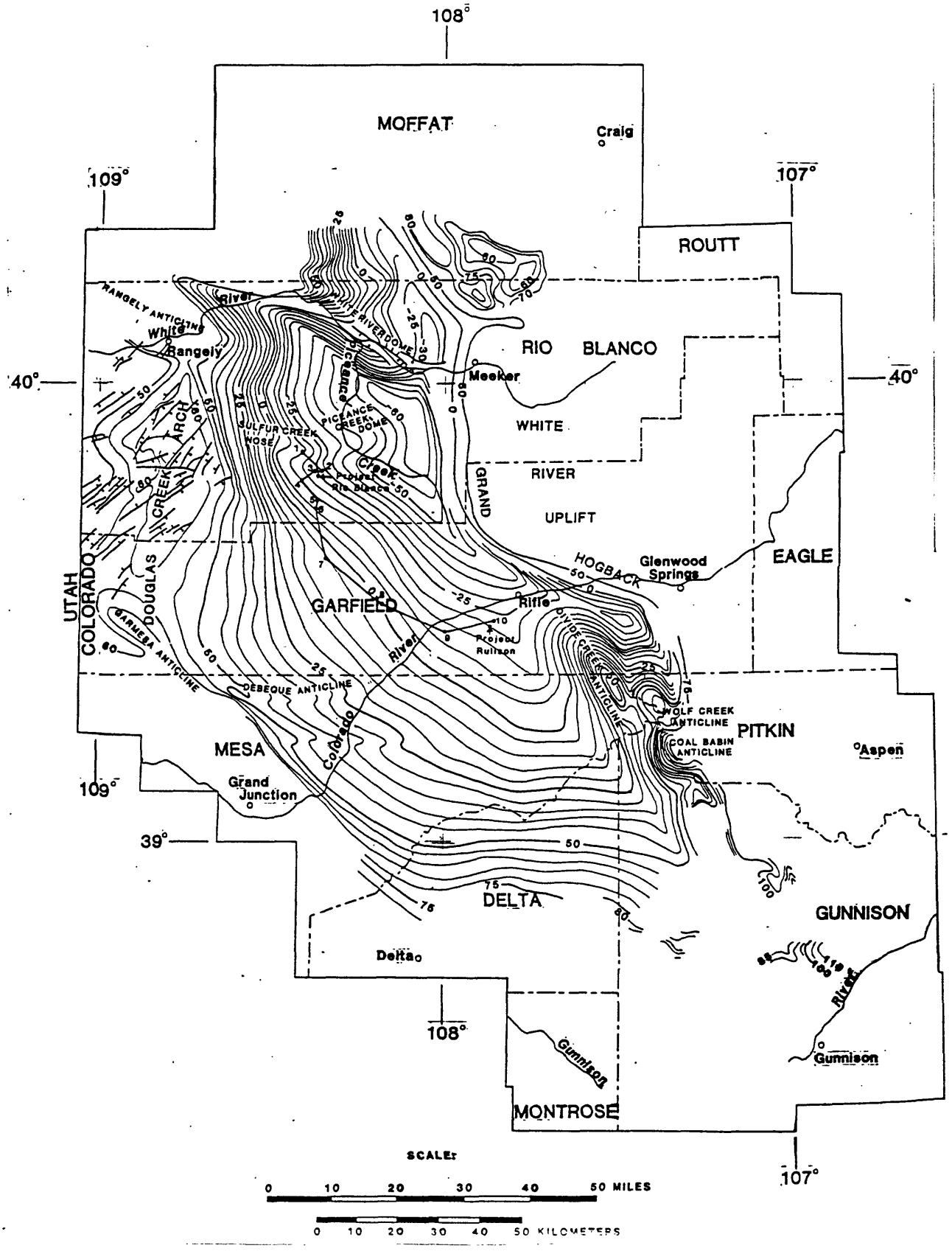


Figure 1. Structure contour map of the top of the Rollins or Trout Creek Sandsone. Contour interval: 500 ft.

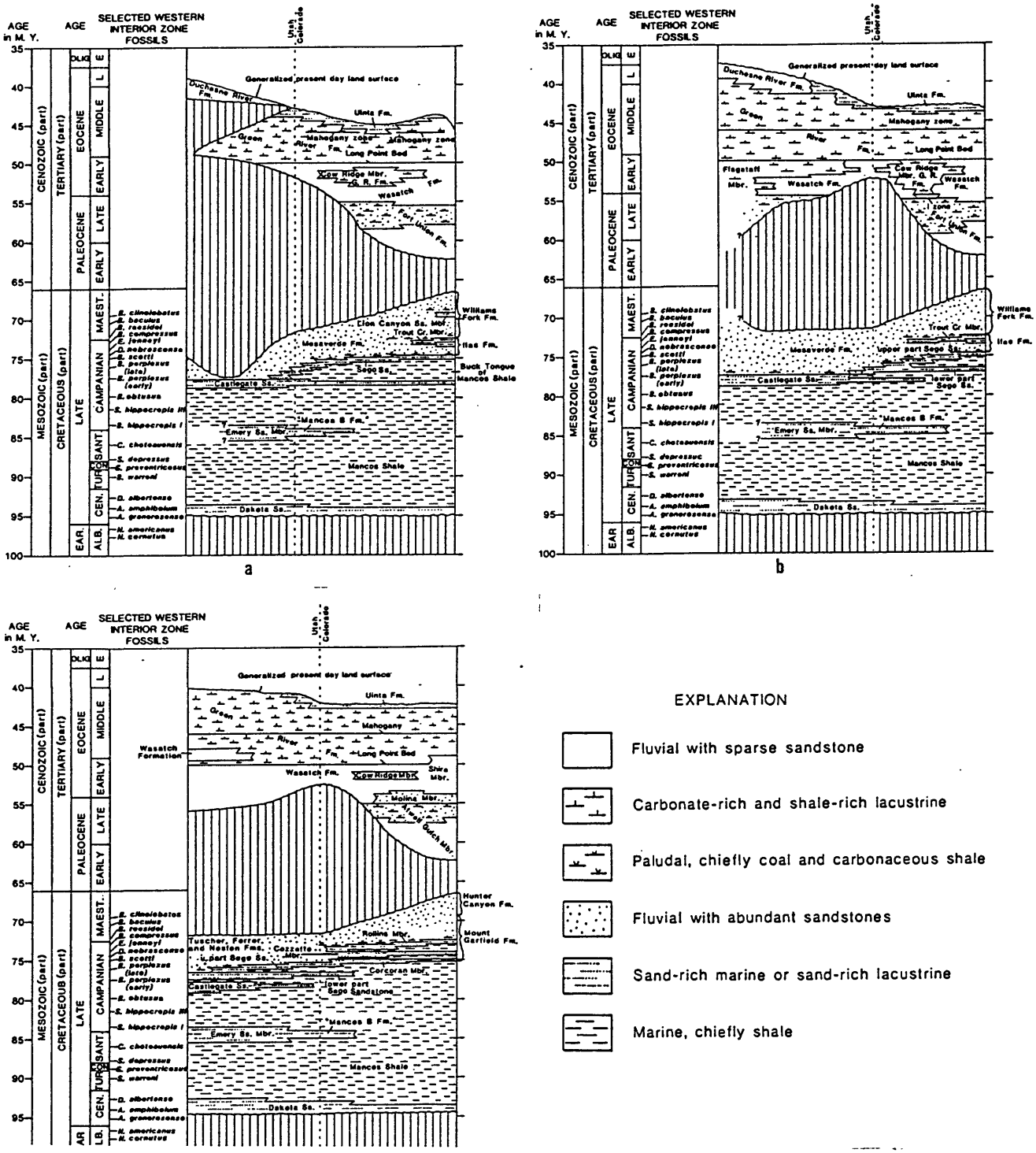


Figure 2. Generalized stratigraphic charts for the Piceance basin: a) northern part of study area, b) central part of study area, 3) southern part of study area. From Johnson and Finn (1986).

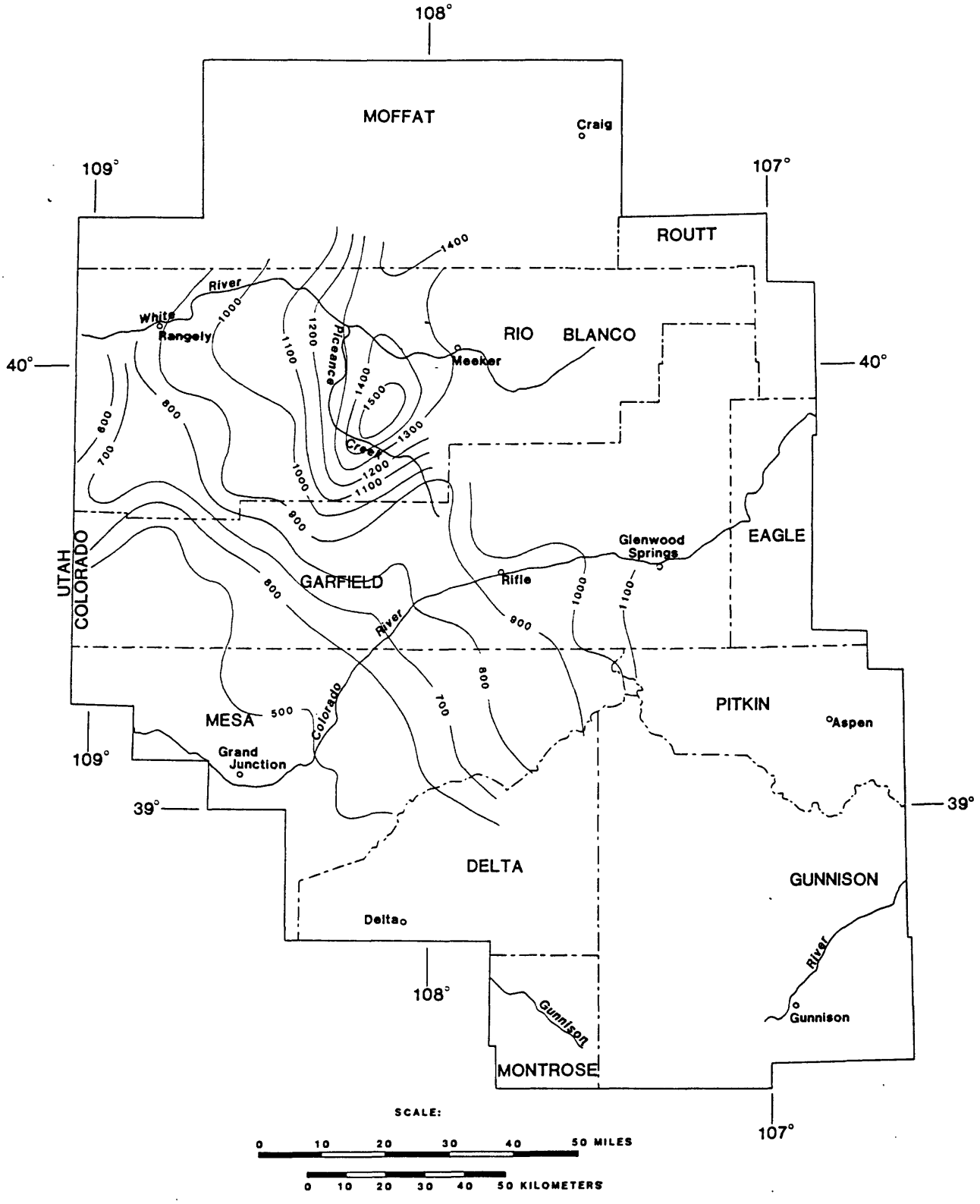


Figure 3. Isopach of the Iles Formation (excluding the Castlegate Sandstone). Contour interval: 100 ft.

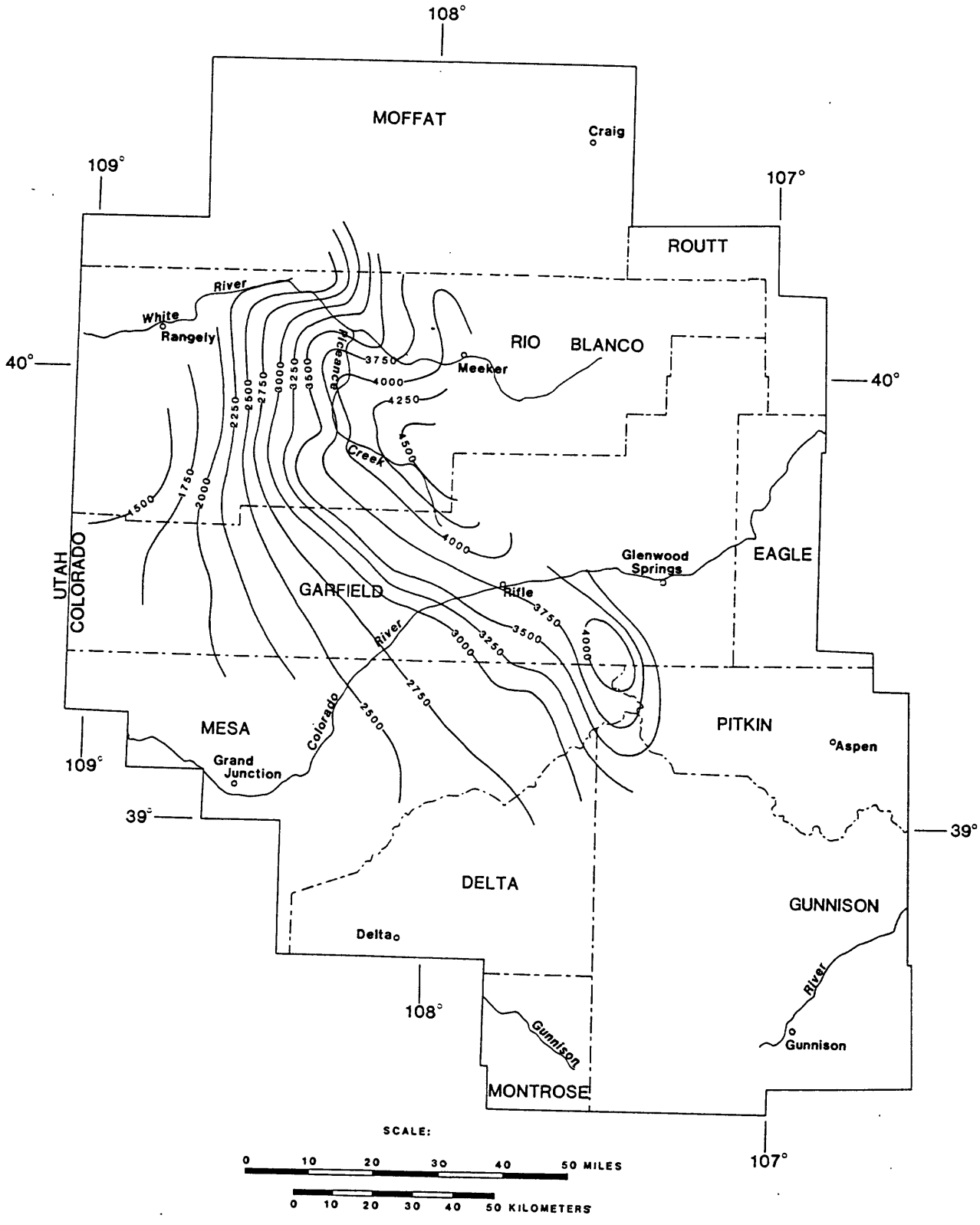


Figure 4. Isopach map of the Williams Fork Formation. Contour interval: 250 ft.

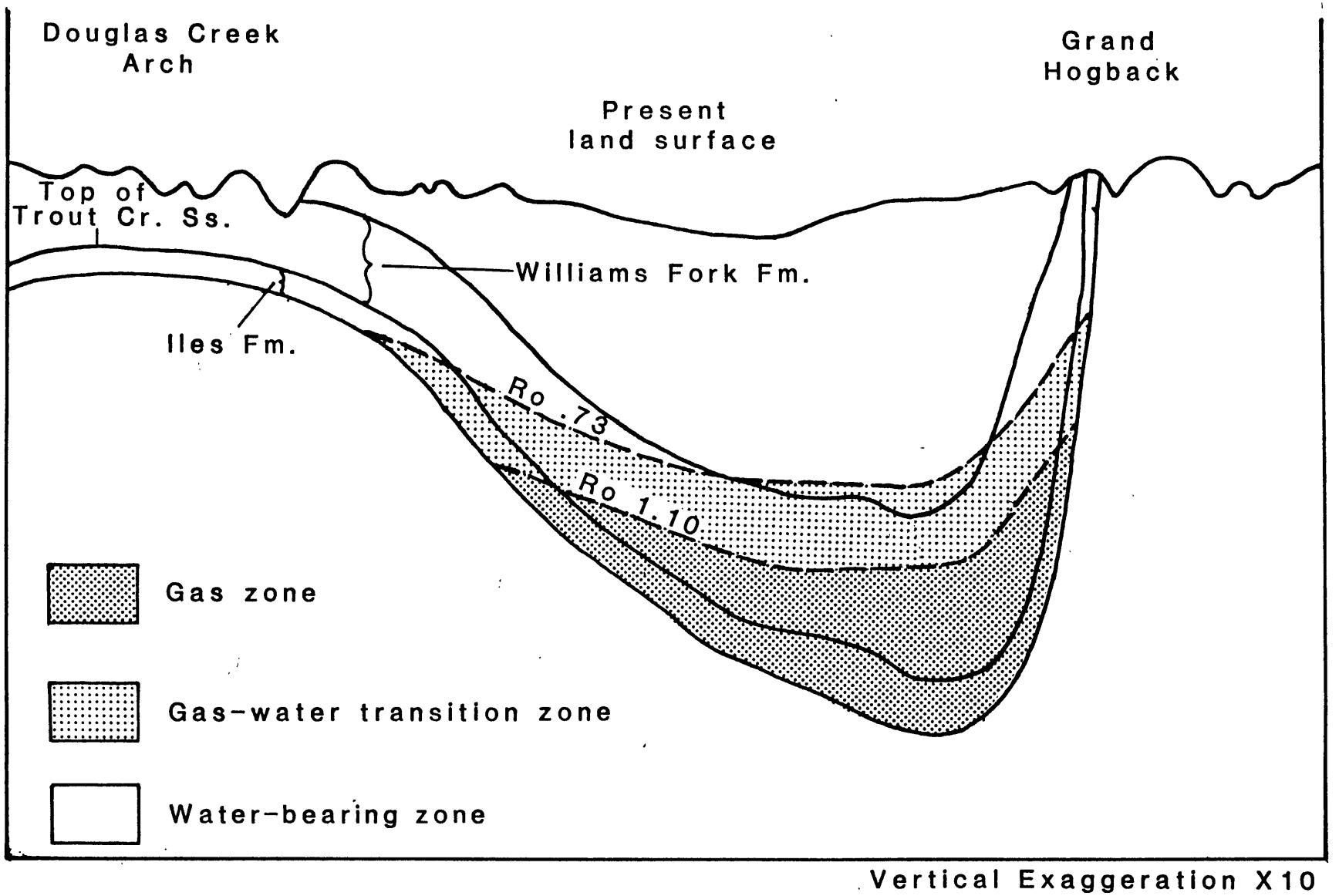
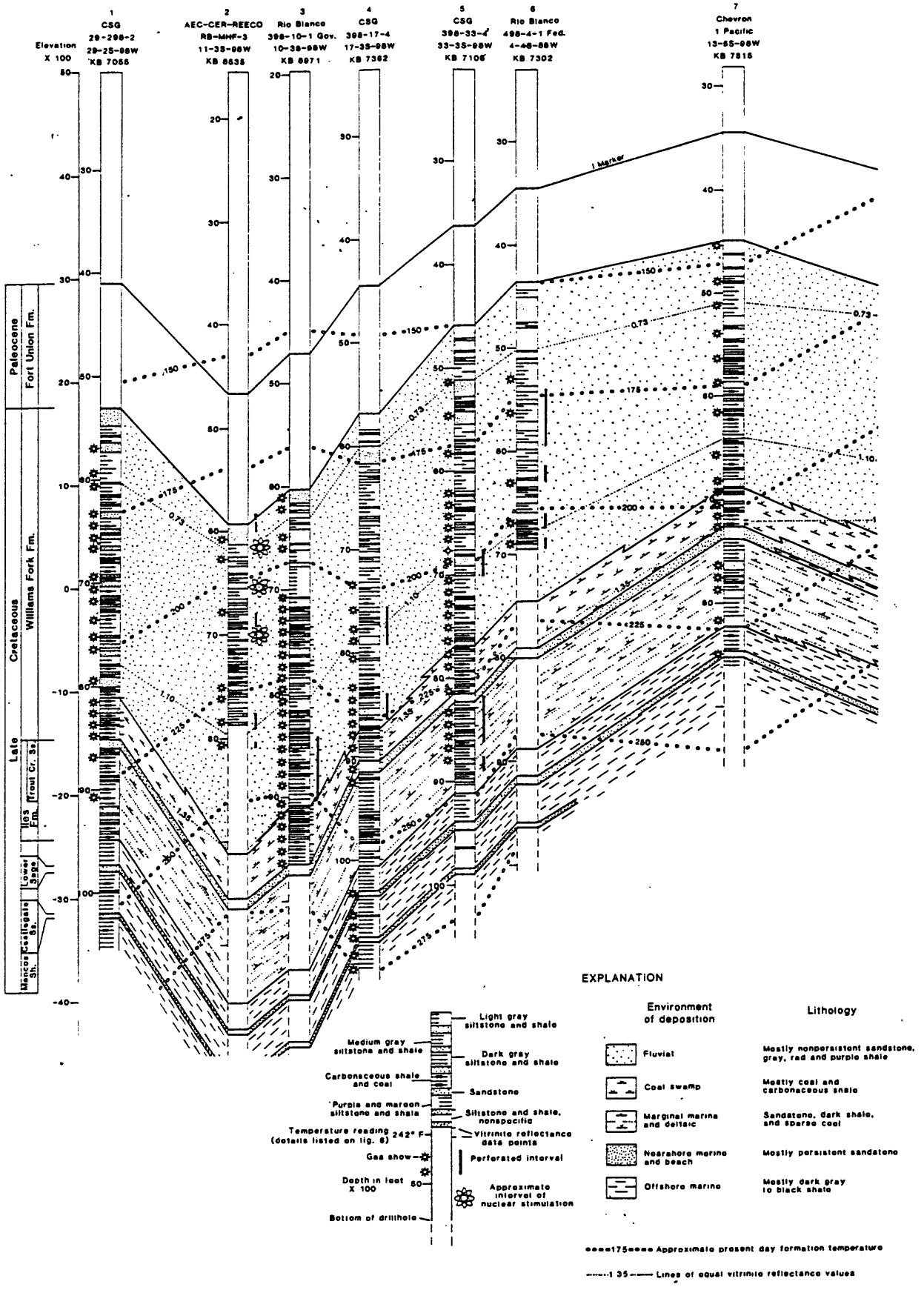


Figure 5. Generalized east-west cross section showing the Iles and Williams Fork Formations, and the gas, and gas-water transition zones.


1
CSG
29-298-2
29-25-98W
KB 7055
2
AEC-CER-REECO
RB-MHF-3
11-38-98W
KB 8635
3
Rio Blanco
398-10-1 Gov.
10-38-98W
KB 8071
4
CSG
398-17-4
17-38-98W
KB 7362
5
CSG
398-33-4
33-38-98W
KB 7106
6
Rio Blanco
498-4-1 Fed.
4-48-98W
KB 7302
7
Chevron
1 Pacific
13-85-98W
KB 7815
Elevation X 100
Paleocene
Fort Union Fm.
Cretaceous
Williams Fork Fm.
Late
Iles Fm.
Trout Cr. Ss.
Lower Sego
Mancos Fossiliferous Sh.
Mancos Sh.
1 Marker
EXPLANATION
Environment of deposition
Lithology
Fluvial
Mostly nonpersistent sandstone, gray, red and purple shale
Coal swamp
Mostly coal and carbonaceous shale
Marginal marine and deltaic
Sandstone, dark shale, and sparse coal
Nearshore marine and beach
Mostly persistent sandstone
Offshore marine
Mostly dark gray to black shale
Light gray siltstone and shale
Medium gray siltstone and shale
Dark gray siltstone and shale
Carbonaceous shale and coal
Sandstone
Purple and maroon siltstone and shale
Siltstone and shale, nonspecific
Temperature reading (details listed on fig. 8) 242° F
Vitrinite reflectance data points
Gas show
Perforated interval
Depth in feet X 100
Approximate interval of nuclear stimulation
Bottom of drillhole
175 Approximate present day formation temperature
1.35 Lines of equal vitrinite reflectance values

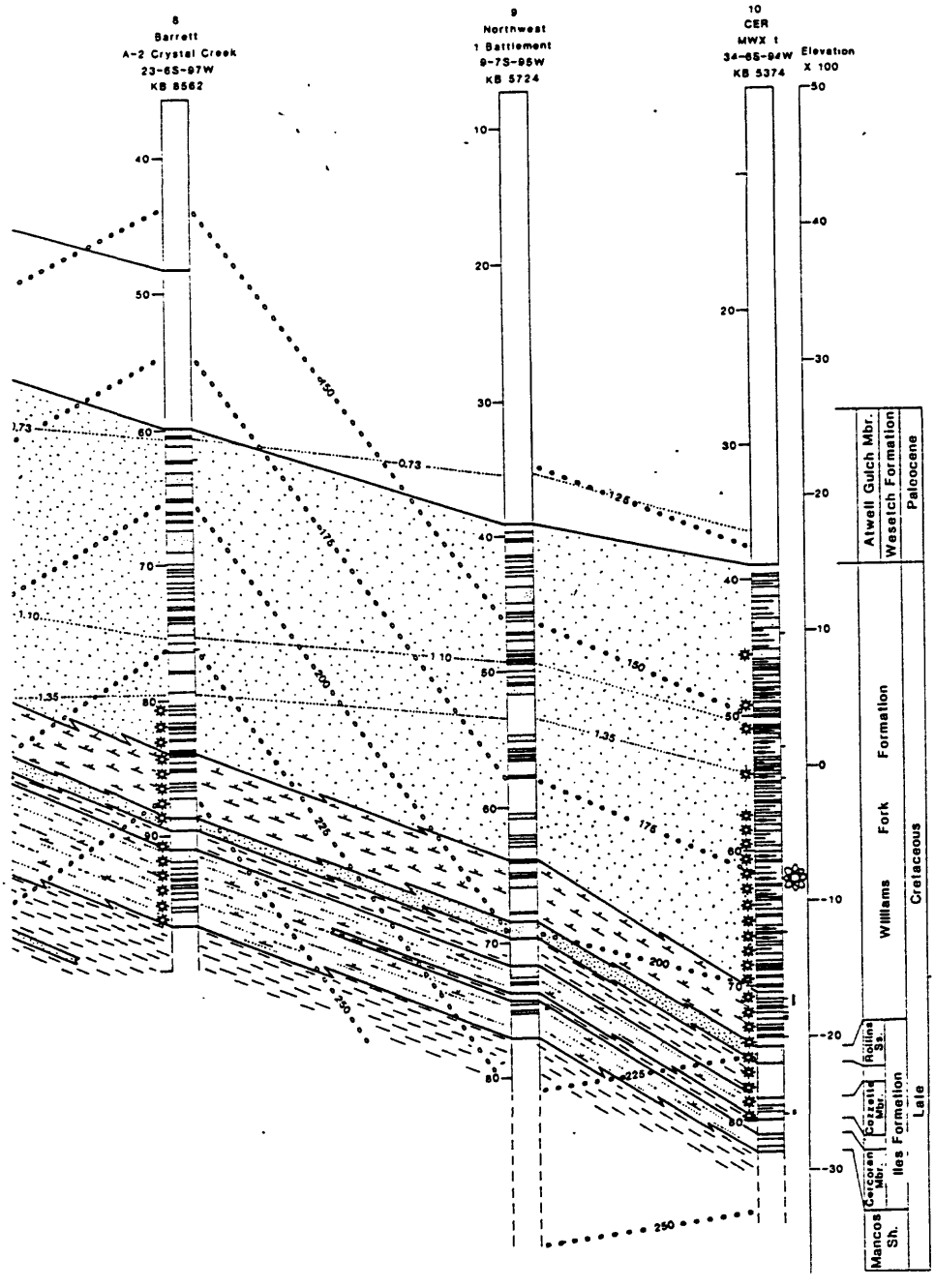


Figure 6. Cross section showing lithologies, environments of deposition, present-day formation temperatures, vitrinite reflectance, gas shows, and perforation recoveries. From Chancellor and Johnson (1986). Location of cross section on figure 1.

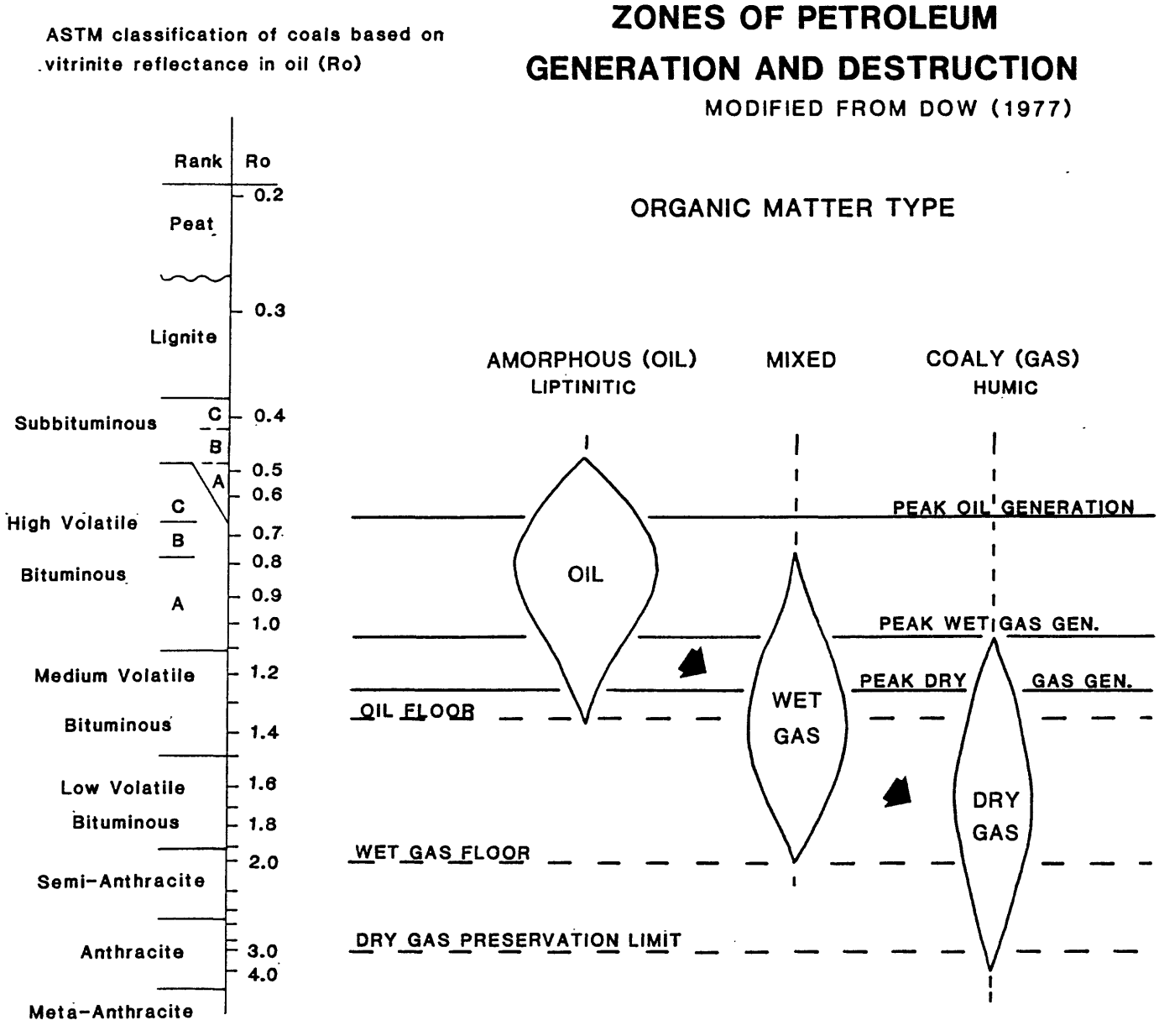


Figure 7. Chart showing relationship between Ro and hydrocarbon generation for type I, type II and type III organic matter. From Dow (1977).

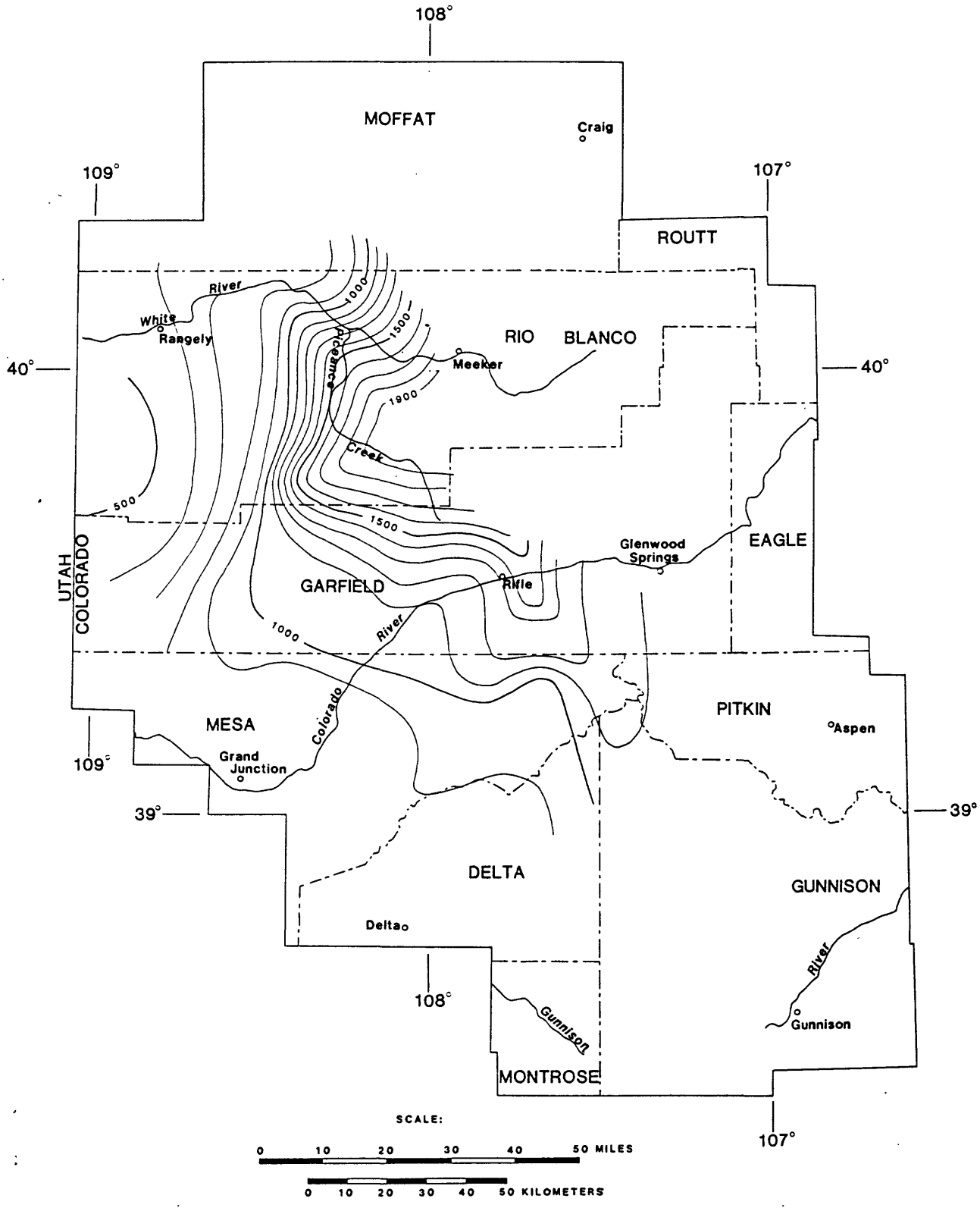


Figure 8. Isopach map showing total thickness of sandstones ten feet or greater in the Williams Fork Formation. Contour interval: 100 ft.

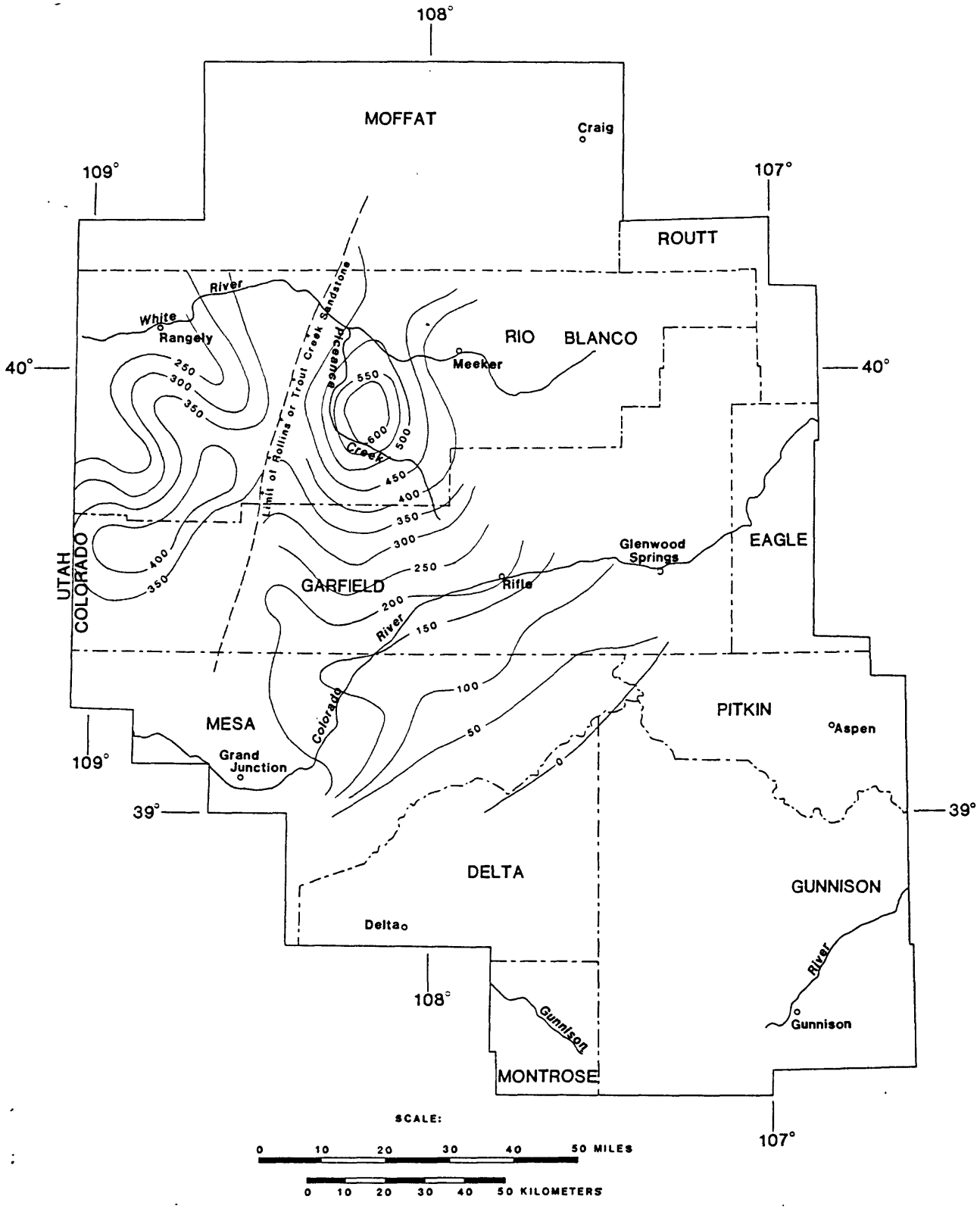


Figure 9. Isopach map showing total thickness of sandstones ten feet thick or greater in the ILes Formation. Contour interval: 50 ft.

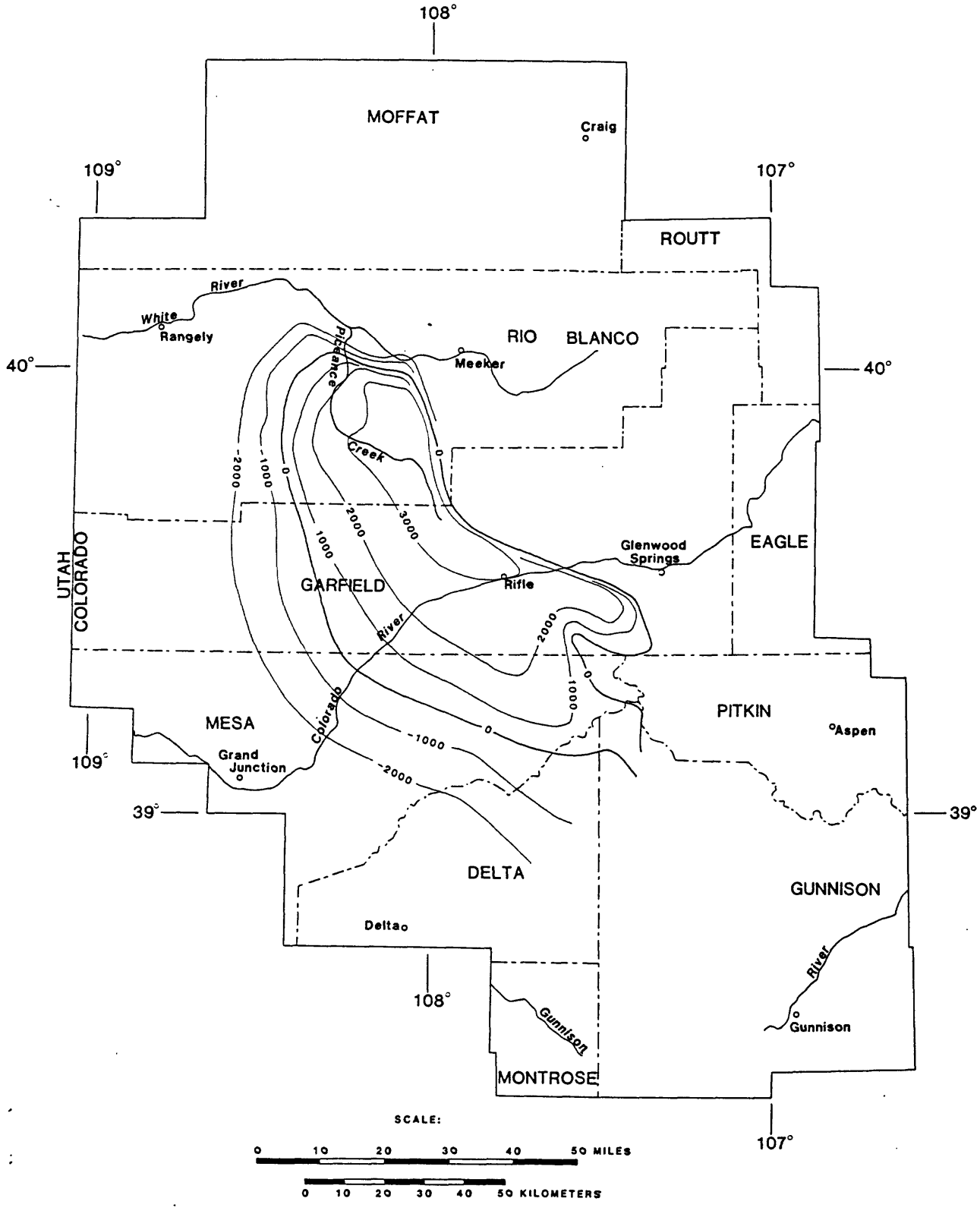


Figure 10. Approximate distance above or below the top of the Rollins or Trout Creek Sandstone to the Ro 1.1 thermal maturity level. Contour interval: 1000 ft.

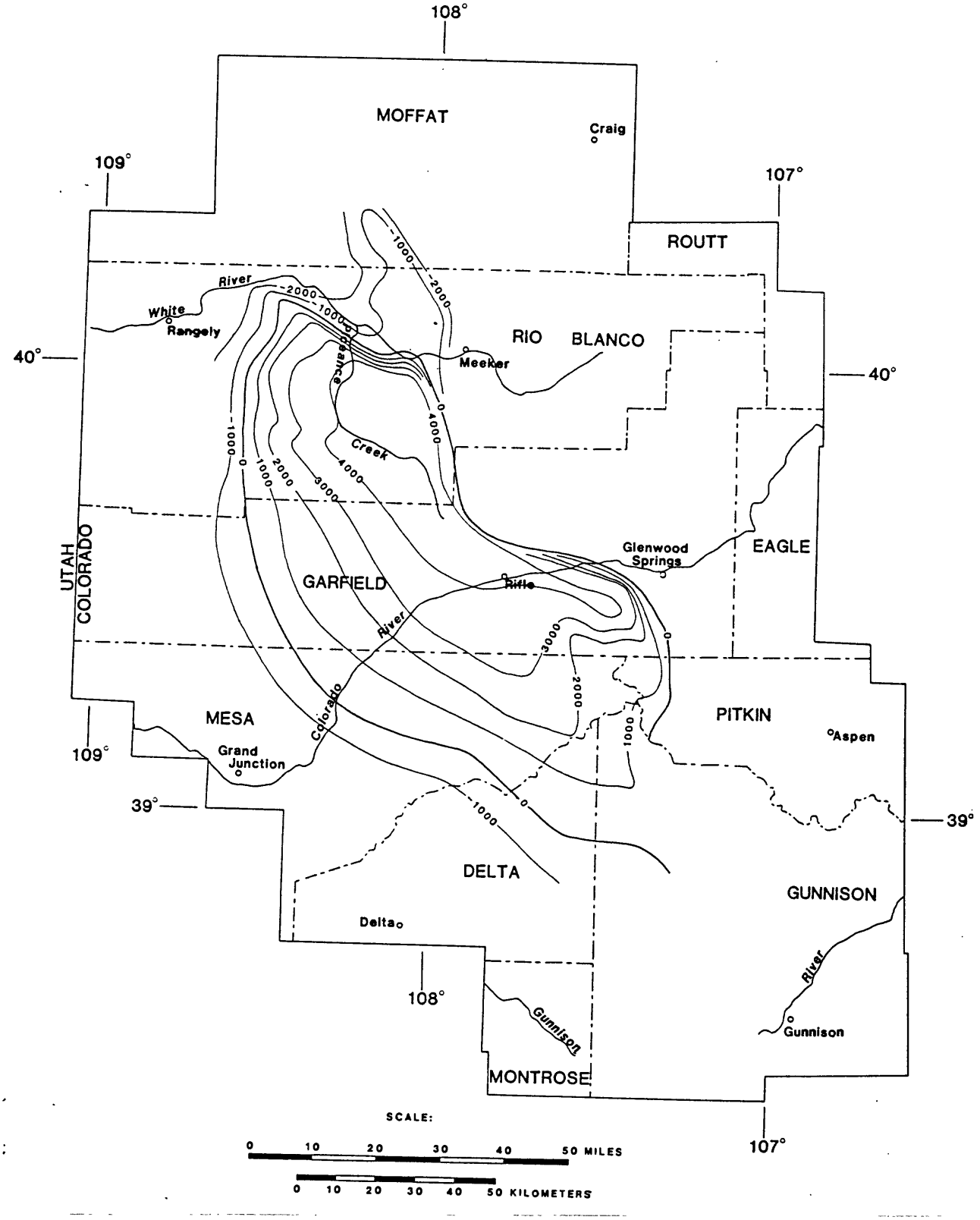


Figure 11. Approximate distance above or below the top of the Rollins or Trout Creek Sandstone to the Ro 0.73 thermal maturity level. Contour interval: 1000 ft.

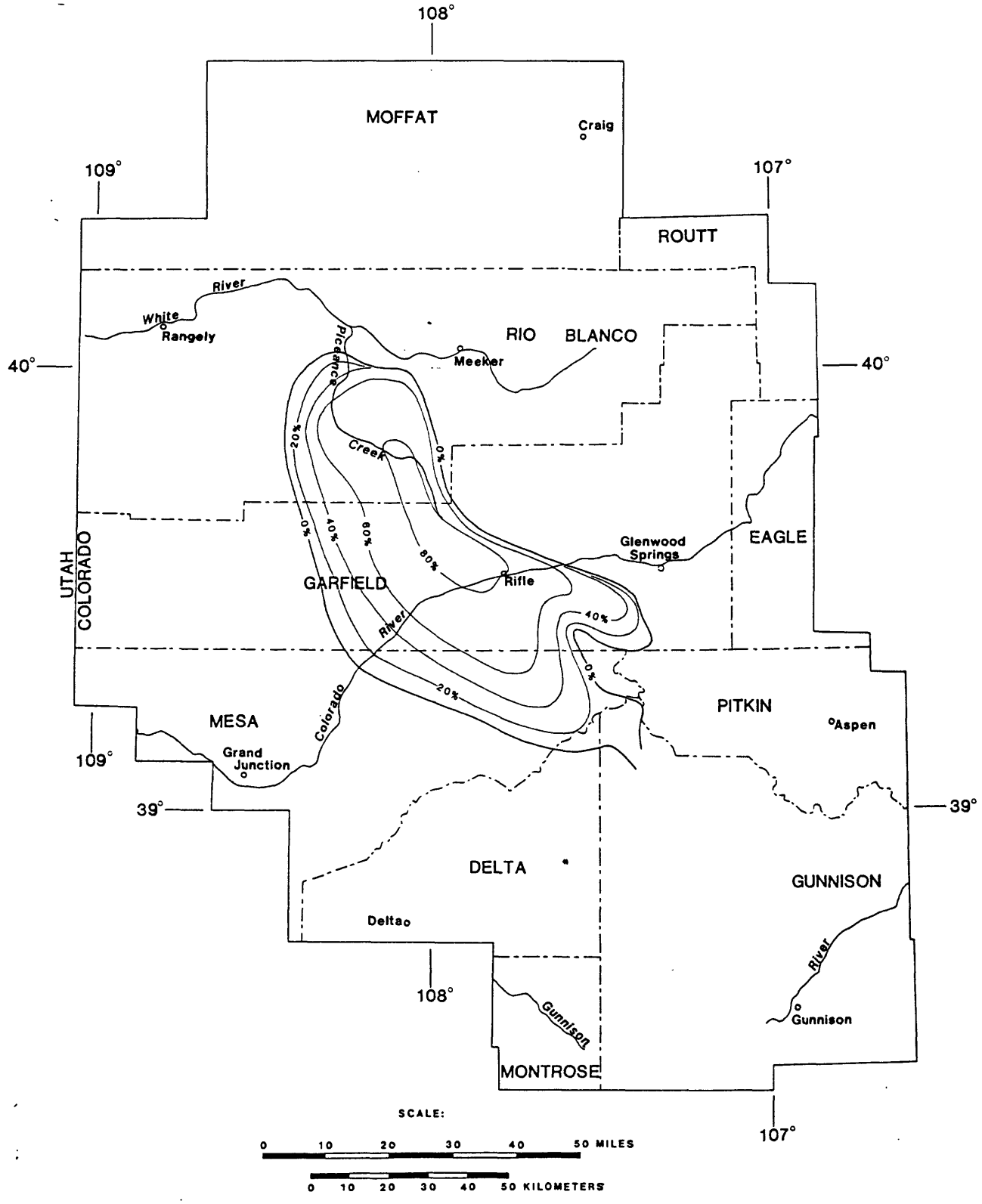


Figure 12. Percent of Williams Fork Formation that has attained an Ro of 1.1.

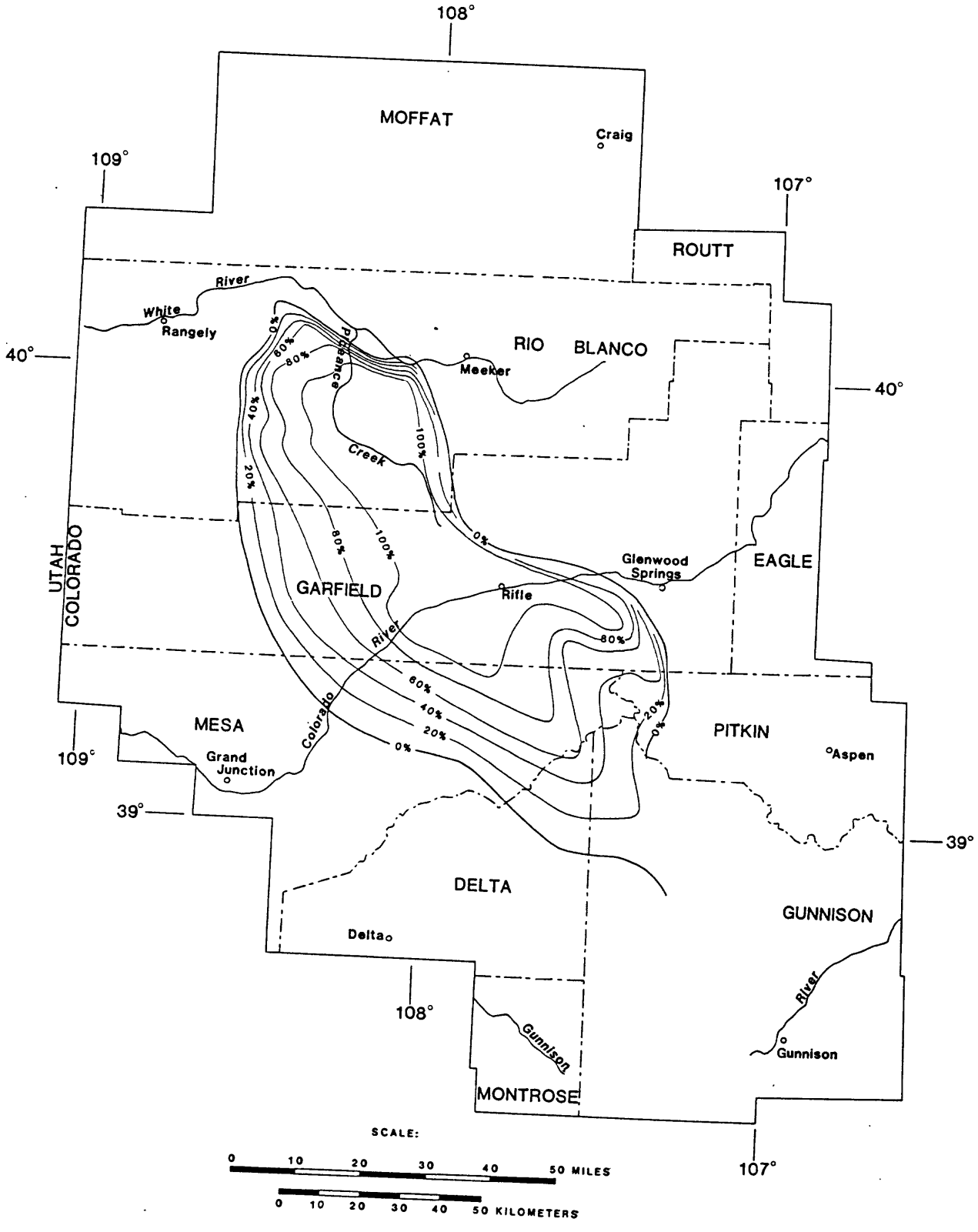


Figure 13. Percent of Williams Fork Formation that has attained an Ro of 0.73.

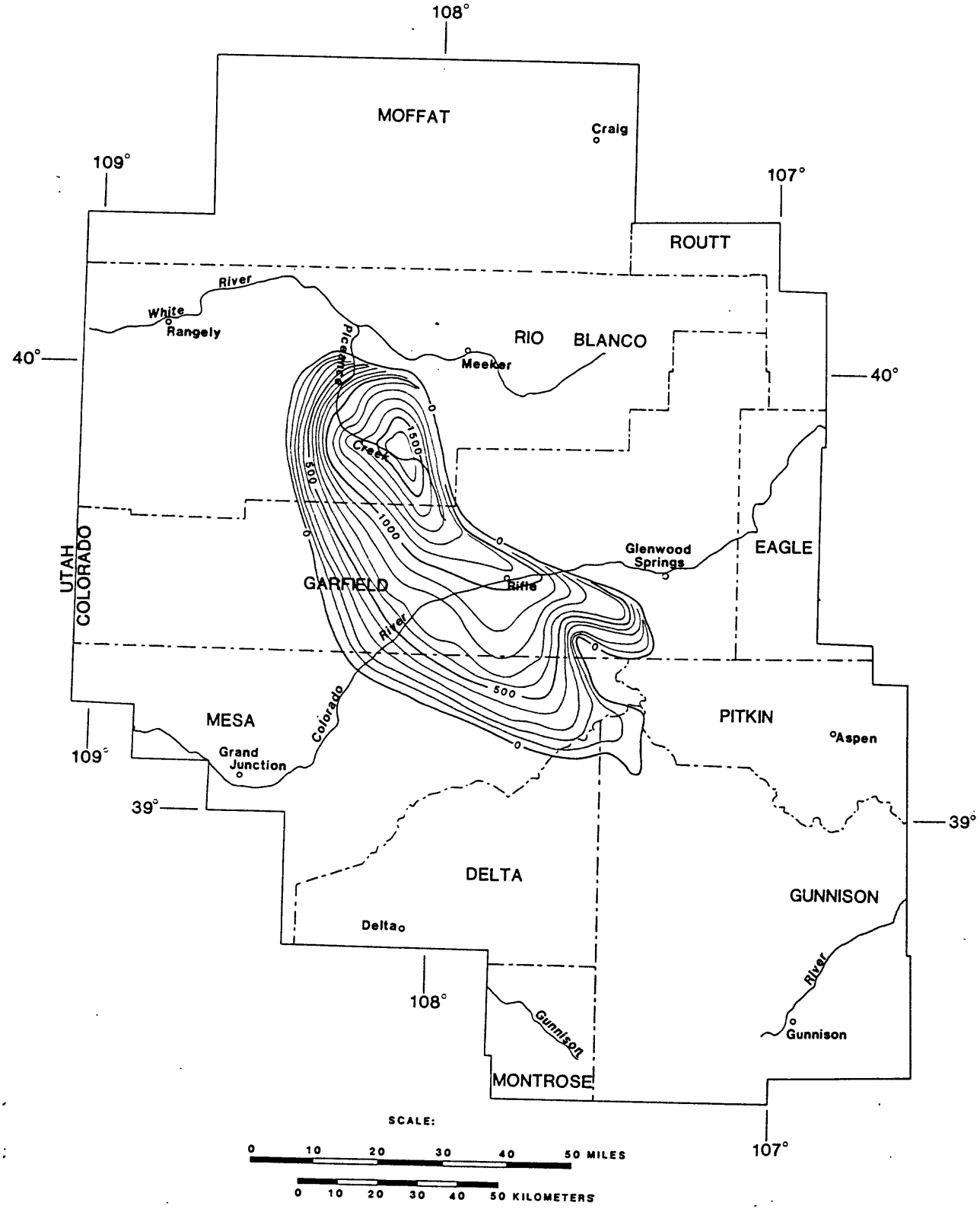


Figure 14. Thickness of sandstones in Williams Fork that have attained an Ro of 1.1. Contour interval: 100 ft.

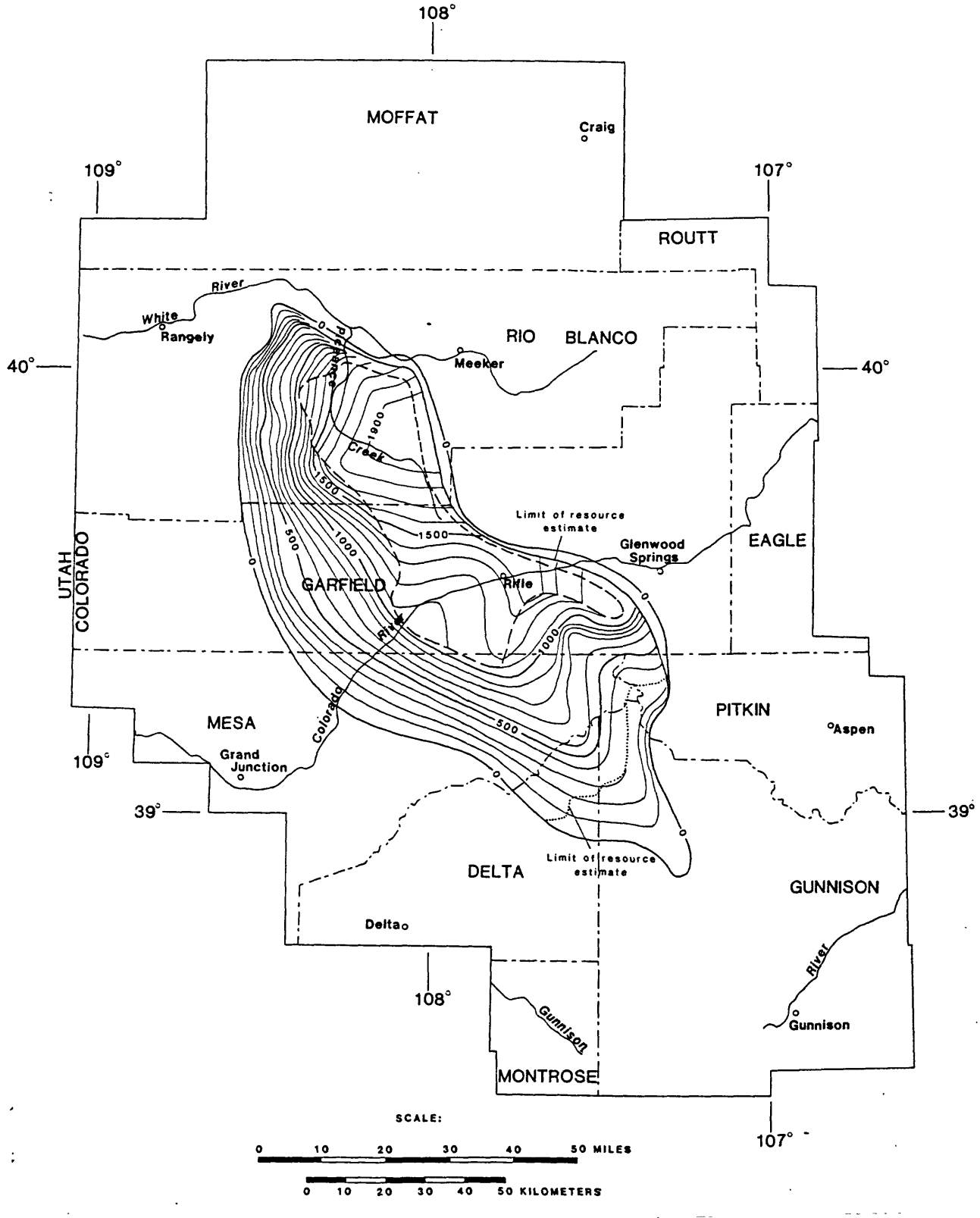


Figure 15. Thickness of sandstones in Williams Fork that have attained an Ro of 0.73. Contour interval: 100 ft. The Ro 0.73 level intersects the top of the Williams Fork along the dotted line. Inside the dotted line, the entire Williams Fork has attained an Ro of 0.73.

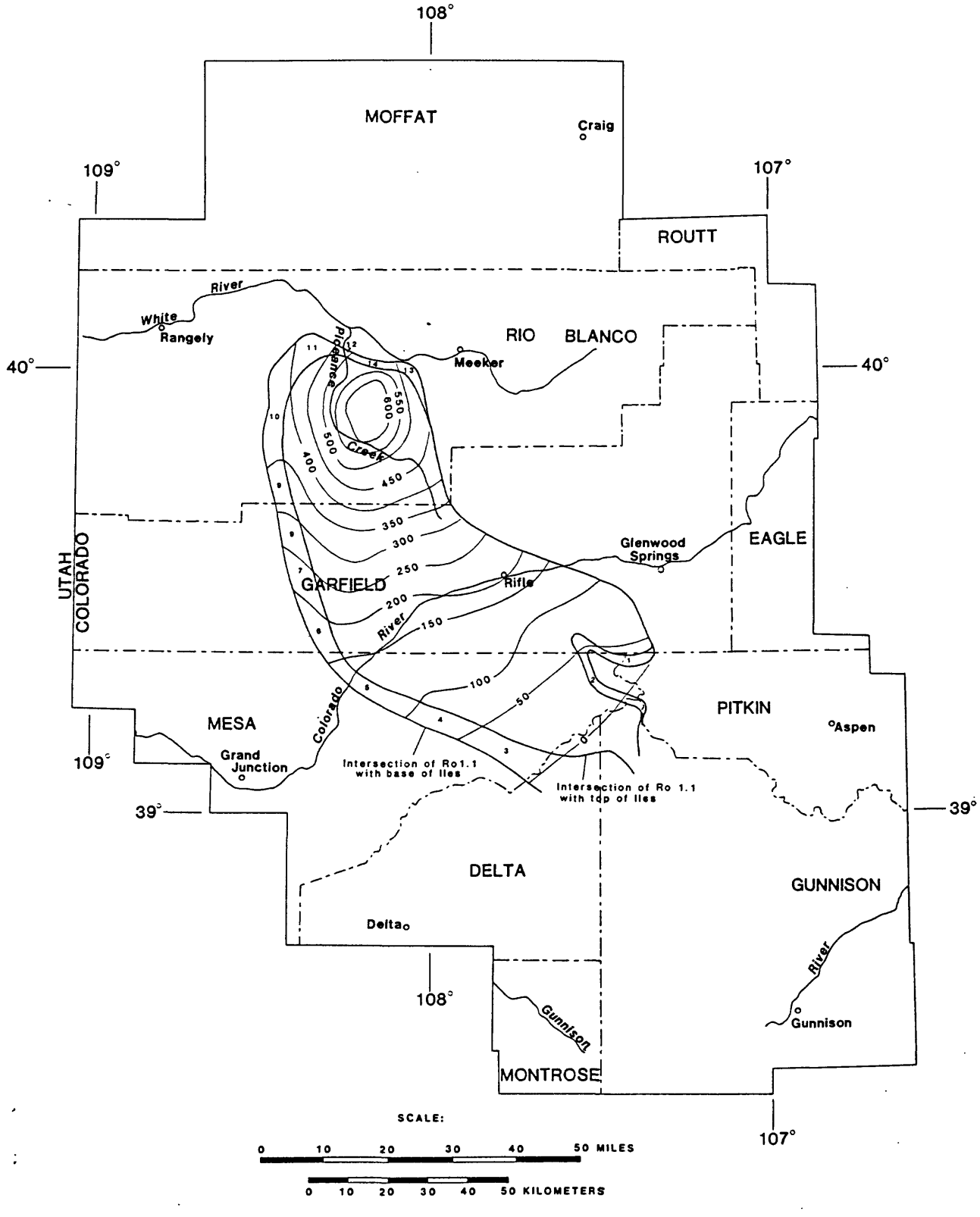


Figure 16. Thickness of sandstones in Iles Formation that have attained an Ro of 1.1. Contour interval: 100 ft. Numbers correspond to planimetered areas keyed to table 5.

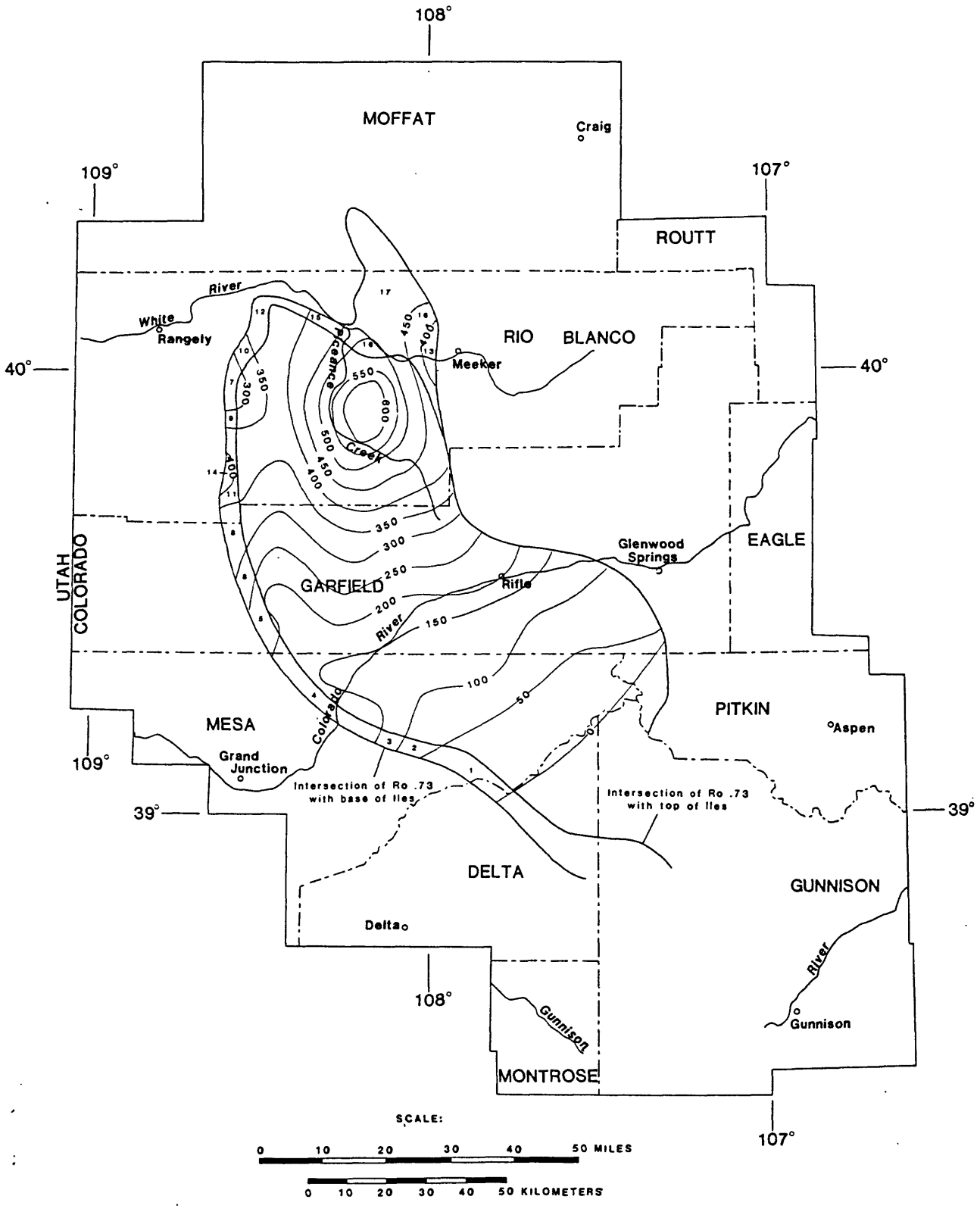


Figure 17. Thickness of sandstones in Iles Formation that have attained an Ro of 0.73. Contour interval: 100 ft. Numbers correspond to planimetered areas keyed to table 6.

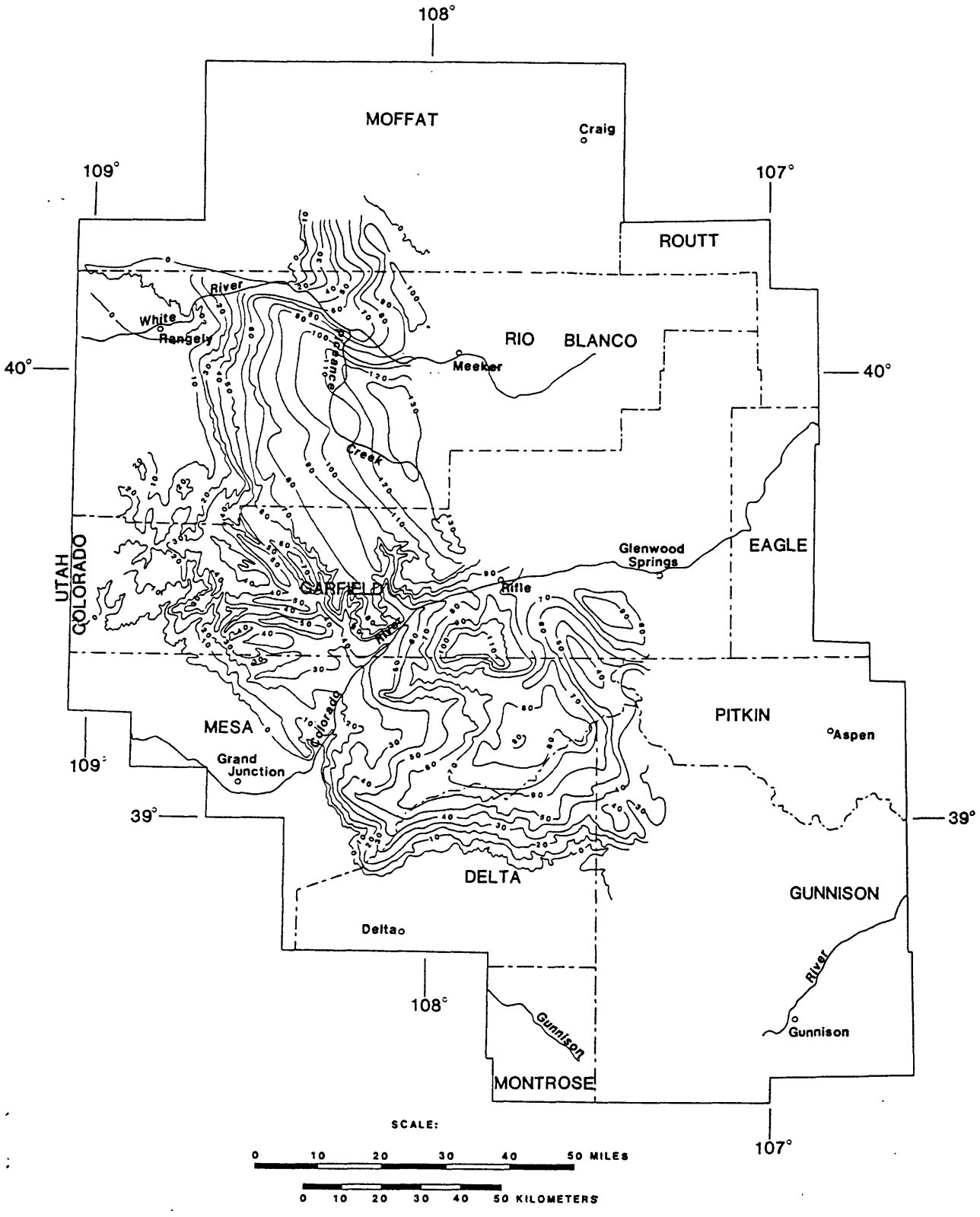


Figure 18. Depth to top of Rollins or Trout Creek Sandstone. Contour interval: 1000 ft. Contours are in hundreds of ft.

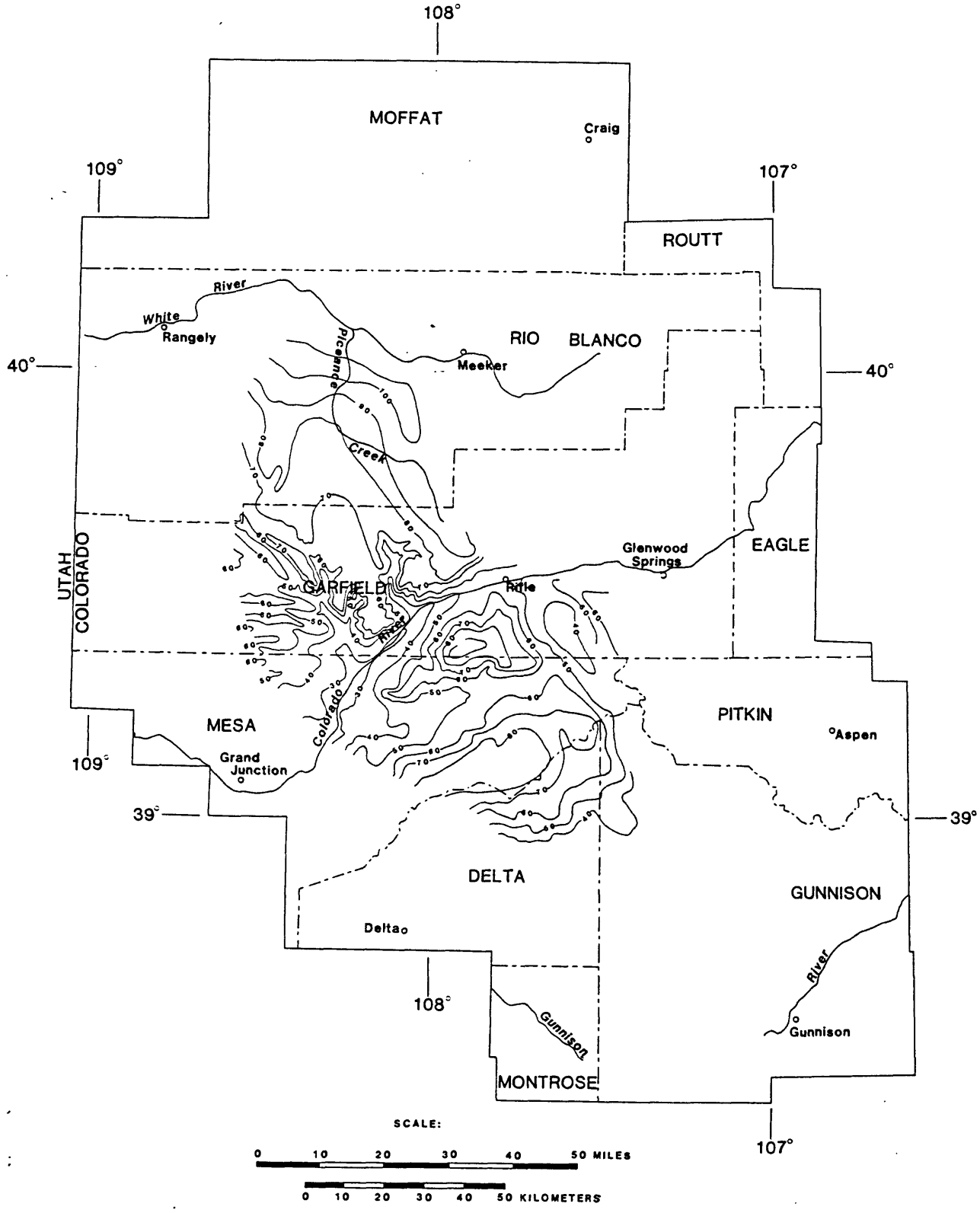


Figure 19. Depth to top of Ro 1.1 thermal maturity level. Contour interval: 1000 ft. Contours are in hundreds of feet.

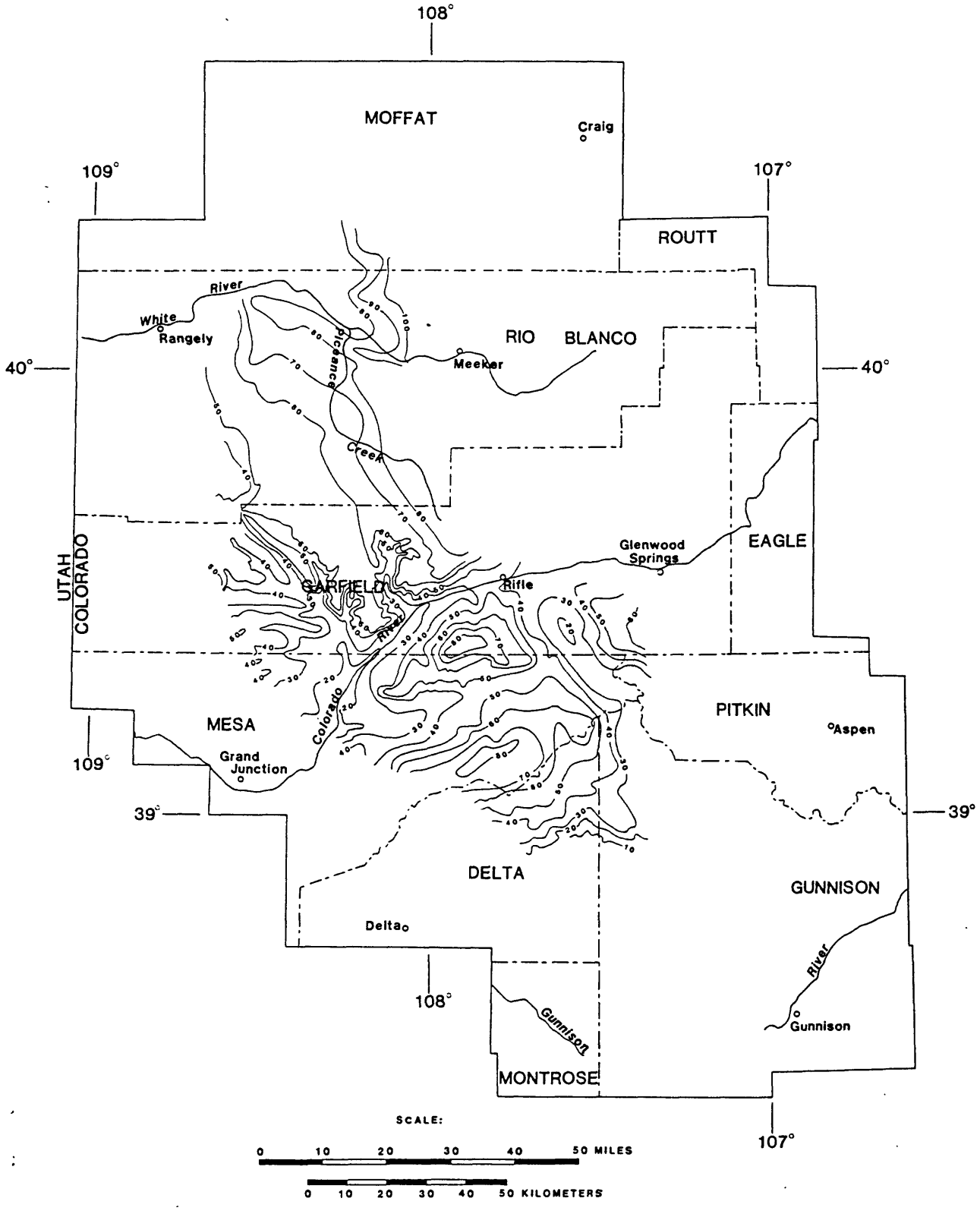


Figure 20. Depth to top of Ro 0.73 thermal maturity level. Contour interval: 1000 ft. Countours are in hundreds of ft.

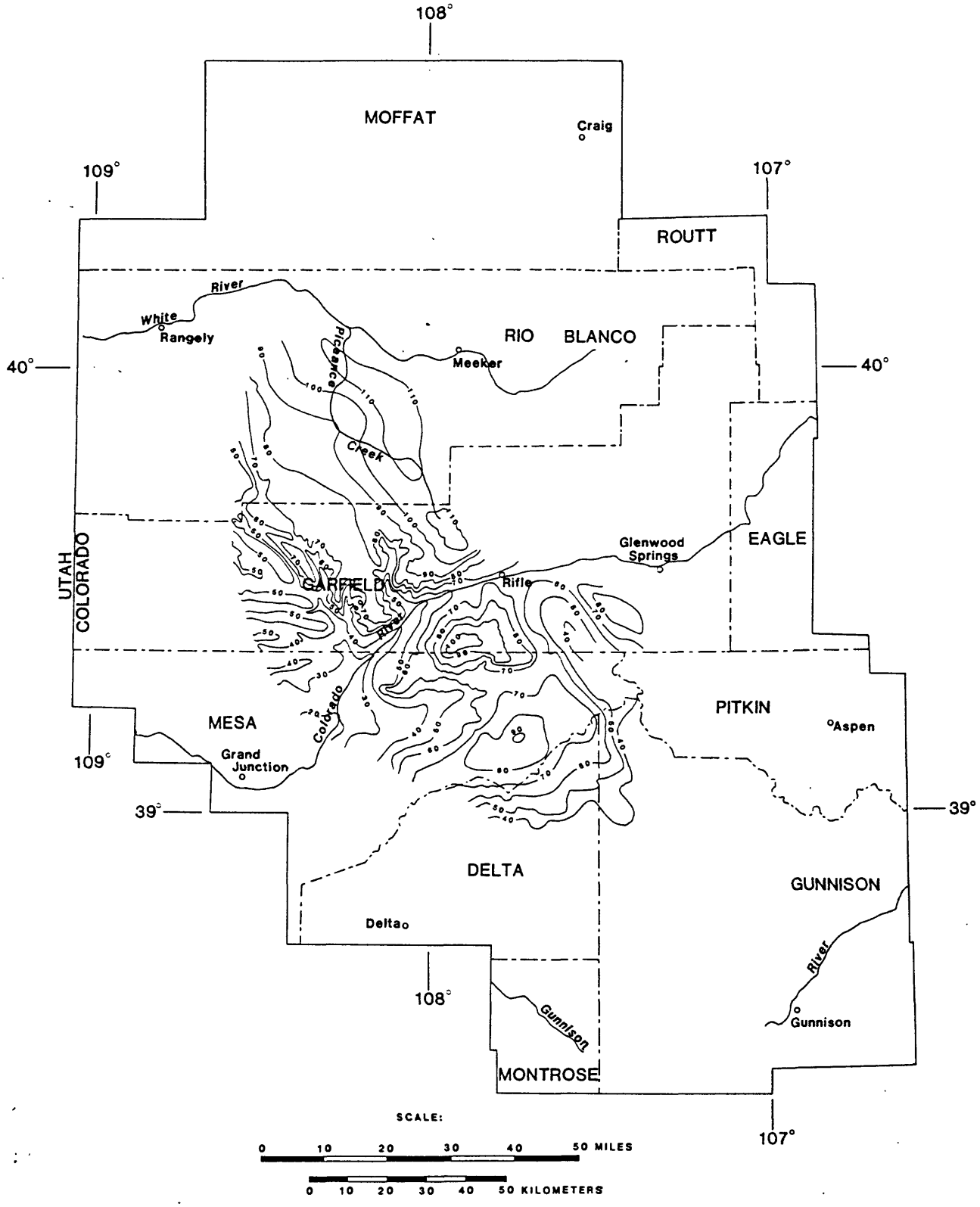


Figure 21. Depth to half way between top of Ro 1.1 thermal maturity level and the top of the Rollins or Trout Creek Sandstone. Contour interval: 1000 ft. Contours are in hundreds of ft.

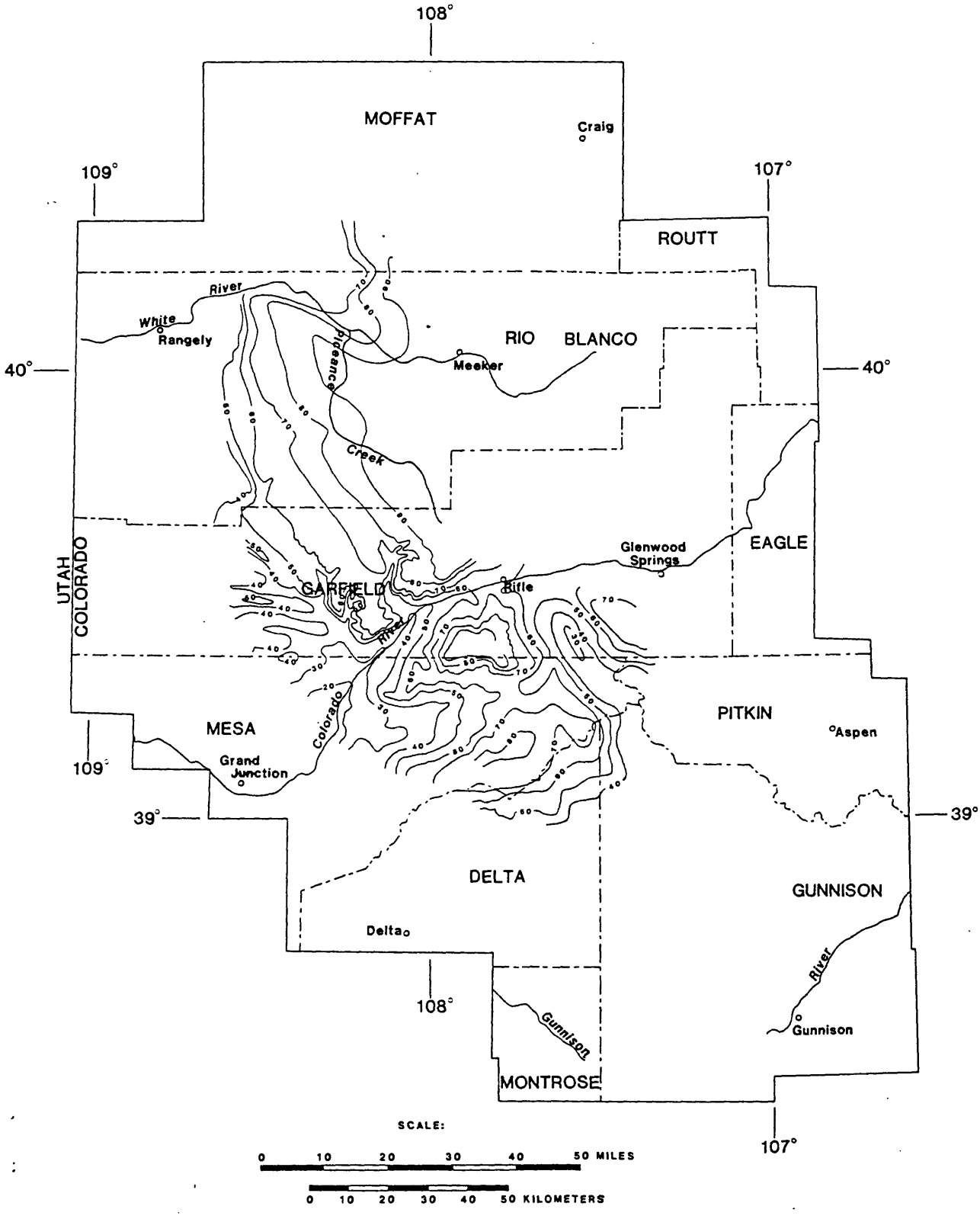


Figure 22. Depth to half way between top of Ro 0.73 thermal maturity level and the top of the Rollins or Trout Creek Sandstone. Contour interval: 1000 ft. Contours are in hundreds of ft.

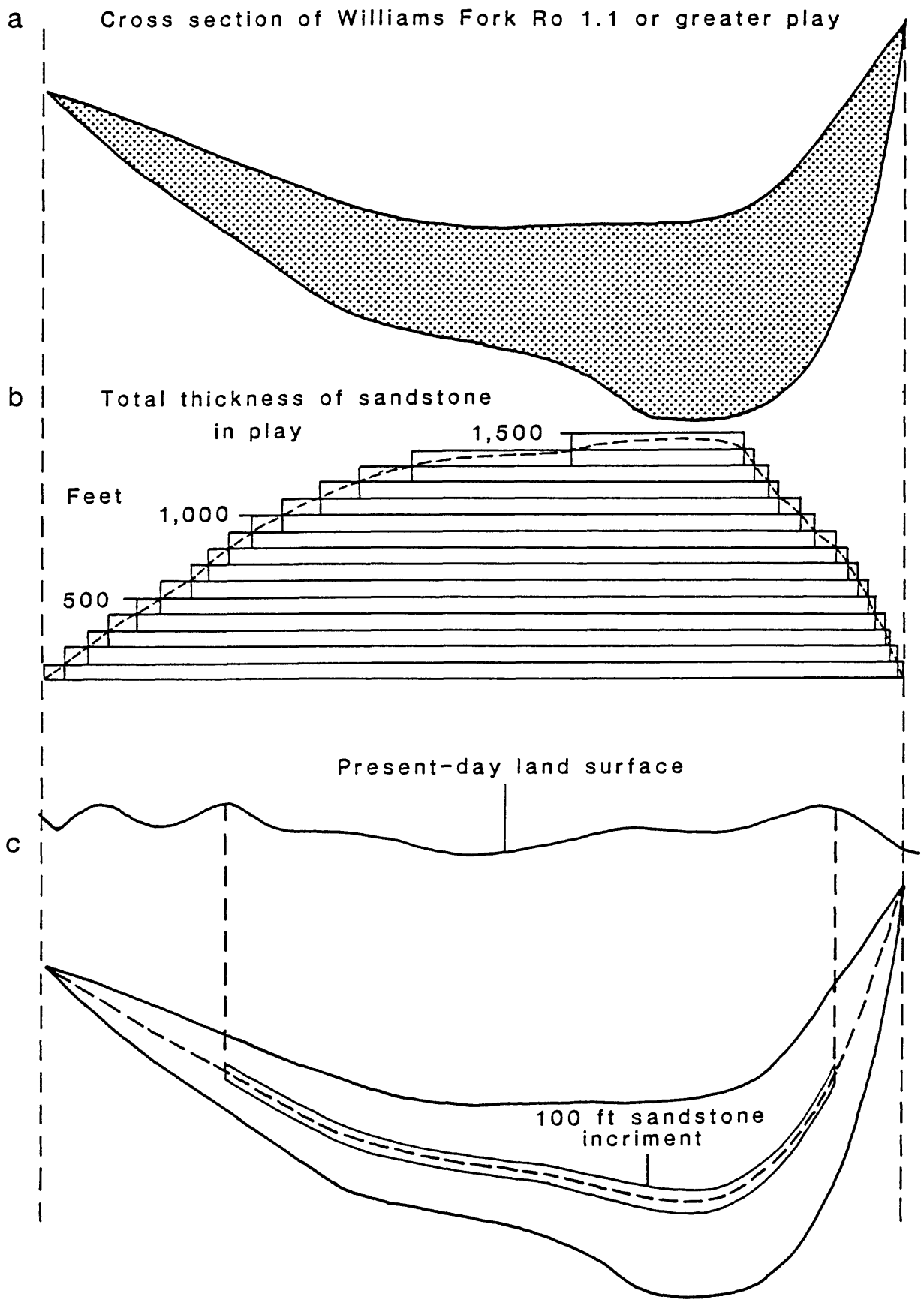


Figure 23. Cross section illustrating volumetric technique of estimating in-place resoures used in this report; a) is cross section of William Fork basin center gas play: b) shows simple integration technique used on sandstone isopach maps; 3) each sandstone isopach interval is placed at the midpoint between the top and the base of the play and an average overburden is estimated.

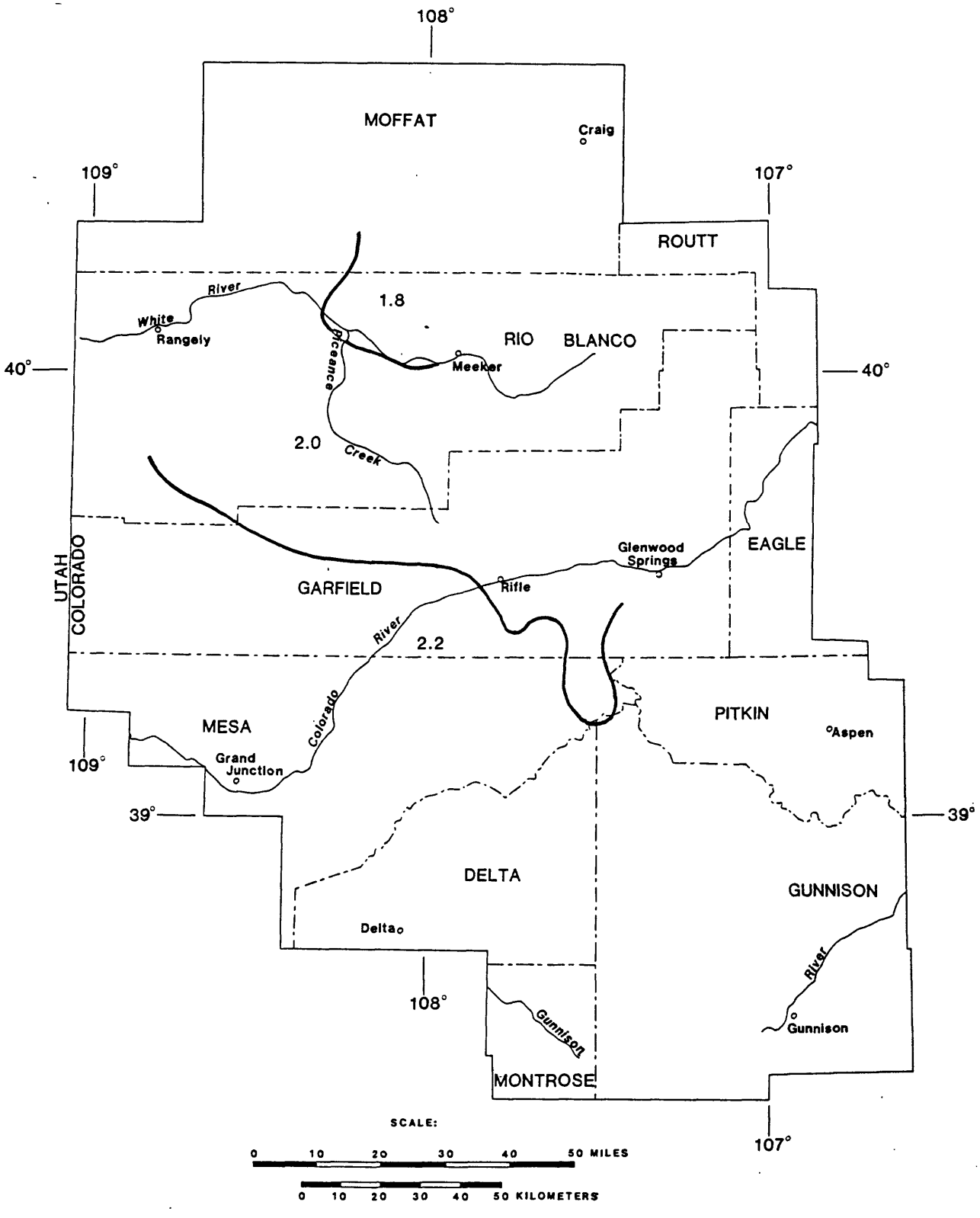


Figure 24. Geothermal gradient map simplified from Johnson and Nuccio

Sandstone isopach (feet)	Area (square mile)	Area (square feet)	Sandstone volume (cubic feet)	Gas volume (using 3.5% of total)	Average overburden (feet)	Average pressure (PSI) using 0.41 pressure gradient	Average temperature gradient (°F/100ft)	Ave. temp. (°F)	Ave. temp. (°K)	Gas volume at standard temperature and pressure (cubic feet)	
1600	18.68	520,880,025	52,088,002,500	1,823,080,088	11,000	4510	2.0	270	405	399,123,936,600	
1500	49.51	1,380,332,068	138,033,206,800	4,831,162,238	10,500	4305	2.0	260	400	1,022,222,167,000	
1400	97.16	2,708,665,344	270,866,534,400	9,480,328,704	10,500	4305	2.0	260	400	2,005,935,980,000	
1300	158.81	4,427,480,218	442,748,021,800	15,496,180,760	10,500	4305	2.0	260	400	3,278,825,818,000	
1200	232.93	6,493,637,652	649,363,765,200	22,727,731,780	10,500	4305	2.0	260	400	4,875,274,803,000	
1100	327.59	9,132,763,116	913,276,311,600	31,964,670,910	10,000	4100	2.0	250	394	6,539,407,187,000	
1000	440.94	12,292,768,600	1,229,276,860,000	43,024,690,100	9,630	3948	2.0	243	390	8,562,701,327,000	
900	577.75	16,106,745,600	1,610,674,560,000	56,373,609,600	9,340	3829	2.0	237	387	10,965,558,420,000	
800	719.33	20,053,880,990	2,005,388,099,000	70,188,583,470	9,060	3715	2.0	231	384	13,349,794,470,000	
700	883.75	24,637,625,210	2,463,762,521,000	86,231,688,240	8,550	3506	2.1	230	383	15,518,885,710,000	
600	1013.30	28,249,060,060	2,824,906,006,000	98,871,710,210	8,310	3407	2.1	226	381	17,381,998,670,000	
500	1127.89	31,443,790,880	3,144,379,088,000	110,053,268,100	8,220	3370	2.1	223	379	19,238,630,010,000	
400	1246.85	34,760,060,380	3,476,006,038,000	121,660,211,300	8,080	3313	2.1	220	378	20,963,254,670,000	
300	1382.62	38,545,121,890	3,854,512,189,000	134,907,926,600	8,060	3305	2.1	219	378	23,189,834,000,000	
200	1519.01	42,347,546,080	4,234,754,608,000	148,216,411,300	7,890	3235	2.1	216	375	25,137,368,930,000	
100	1658.52	46,236,783,610	4,623,678,361,000	161,828,742,600	7,810	3202	2.1	214	374	27,238,669,680,000	
0	1854.08	51,168,866,121	5,116,886,612,100	179,091,031,400	7,810	3202	2.1	214	374	30,144,221,400,000	2 = 15,072,110,700,000
										229,811,707,188,600	(Total)
										-15,072,110,700,000	
										214,739,596,488,600	(Intergrated Total)

tables6:jae:6-22-87

Table 1. Calculation of total in-place gas in the Williams Fork Formation with an Ro of 1.1 or greater.

Sandstone isopach (feet)	Area (square mile)	Area (square feet)	Sandstone volume (cubic feet)	Gas volume (using 3.5% of total)	Average overburden (feet)	Average pressure (PSI) using 0.41 pressure gradient	Average temperature gradient (°F/100ft)	Ave. temp. (°F)	Ave. temp. (°K)	Gas volume at standard temperature and pressure (cubic feet)	
1900	96.54	2,691,380,736	269,138,073,600	9,419,832,576	9,000	3690	2.0	230	383	1,782,429,082,000	
1800	180.00	5,018,112,000	501,811,200,000	17,563,392,000	8,850	3629	2.0	227	381	3,285,578,671,000	
1700	270.93	7,553,094,912	755,309,491,200	26,435,832,190	8,760	3592	2.0	225	380	4,907,803,898,000	
1600	350.03	9,758,276,352	975,827,635,200	34,153,967,230	8,690	3563	2.0	224	380	6,289,481,826,000	
1500	416.06	11,598,950,950	1,159,895,095,000	40,596,328,330	8,600	3526	2.0	222	379	7,417,735,407,000	
1400	521.94	14,550,779,780	1,455,077,978,000	50,927,729,230	8,400	3444	2.0	218	376	9,161,595,092,000	
1300	626.57	17,467,881,210	1,746,788,121,000	61,137,584,240	8,270	3391	2.0	215	375	10,857,791,105,000	
1200	800.97	22,329,716,940	2,232,971,694,000	78,154,009,290	8,040	3296	2.0	211	373	13,563,479,550,000	
1100	1032.04	28,771,649,280	2,877,164,928,000	100,700,772,500	7,790	3194	2.0	206	370	17,072,906,950,000	
1000	1167.82	32,556,935,660	3,255,693,566,000	113,949,274,800	7,670	3145	2.0	203	368	19,126,076,130,000	
900	1278.06	35,630,310,390	3,563,031,039,000	124,706,086,400	7,610	3120	2.0	202	368	20,765,189,990,000	
800	1400.76	39,050,959,100	3,905,095,910,000	136,678,356,900	7,280	2985	2.1	203	368	21,773,976,480,000	
700	1550.86	43,235,610,560	4,323,561,056,000	151,324,637,000	7,150	2931	2.1	200	366	23,800,487,750,000	
600	1747.47	48,716,751,560	4,871,675,156,000	170,508,630,500	7,110	2915	2.1	199	366	26,671,369,950,000	
500	1917.09	53,445,465,590	5,344,546,559,000	187,059,129,600	6,860	2813	2.1	194	363	28,469,739,920,000	
400	2096.47	58,446,210,900	5,844,621,090,000	204,561,738,200	6,790	2784	2.1	193	363	30,812,610,540,000	
300	2288.30	63,794,230,200	6,379,423,020,000	223,279,805,700	6,720	2755	2.1	191	361	33,466,117,400,000	
200	2488.23	69,367,977,590	6,936,797,759,000	242,787,921,600	6,580	2698	2.1	188	360	35,736,169,990,000	
100	2690.03	74,993,816,070	7,499,381,607,000	262,478,356,200	6,430	2636	2.1	185	358	37,957,479,000,000	
0	3066.23	85,481,490,280	8,548,149,028,000	299,185,216,000	6,420	2632	2.1	185	358	43,200,072,040,000	2 = 21,600,036,020,000
										396,118,090,771,000	(Total)
										-21,600,036,020,000	
										374,518,054,751,000	(Intergrated Total)

tables6:jae:6-22-87

Table 2. Calculation of total in-place gas in the Williams Fork Formation with an Ro of .73 or greater.

Sandatone taopach (feet)	Area (square mile)	Area (square feet)	Sandatone volume (cubic feet)	Gas volume (using 3.5% of total)	Average overburden (feet)	Average pressure (PSI) using 0.41 pressure gradient	Average temperature gradient (°F/100ft)	Ave. temp. (°F)	Ave. temp. (°K)	Gas volume at sandard temperature and pressure (cubic feet)	
600	47.96	1,336,925,399	66,846,269,950	2,339,619,448	11,450	4,695	2.0	279	410	526,180,523,800	
550	103.38	2,882,202,808	144,110,140,400	5,043,854,914	11,500	4,719	2.0	280	411	1,137,387,752,000	
500	178.74	4,983,085,578	249,154,278,900	8,720,399,762	11,190	4,588	2.0	274	408	1,925,916,468,000	
450	295.83	8,247,267,072	412,363,353,360	14,432,717,370	11,270	4,621	2.0	278	410	3,194,758,433,000	
400	412.92	11,511,448,570	575,572,428,500	20,145,035,000	11,010	4,514	2.0	270	405	4,409,733,705,000	
350	520.66	14,515,190,050	725,759,502,500	25,401,582,590	10,560	4,330	2.0	262	401	5,386,939,588,000	
300	629.03	17,536,294,200	876,814,710,000	30,688,514,850	10,560	4,330	2.0	262	401	6,508,144,717,000	
250	756.08	21,078,278,370	1,053,913,919,000	36,886,987,170	10,270	4,211	2.0	255	397	7,684,325,017,000	
200	919.25	25,627,297,260	1,281,364,863,000	44,847,770,210	9,700	3,977	2.0	244	391	8,958,957,886,000	
150	1069.97	29,829,062,800	1,491,453,140,000	52,200,859,900	9,050	3,711	2.0	231	384	9,907,753,512,000	
100	1370.16	38,197,868,540	1,909,893,427,000	66,846,269,950	8,690	3,563	2.1	232	384	12,181,466,710,000	
50	1618.03	45,108,210,222	2,255,410,511,000	78,939,367,890	8,510	3,489	2.1	229	383	14,123,217,460,000	
0	2164.85	60,352,169,730	3,017,627,712,000	105,616,969,900	8,350	3,758	2.1	225	380	20,534,654,070,000	2 = 10,267,327,040,000
										96,479,435,841,800	(Total)
										-10,267,327,040,000	
										86,212,108,801,800	(Intergrated Total)

tables6:jae:6-22-87

Table 3. Calculation of total in-place gas in the Iles Formation with an Ro of 1.1 or greater (exclusive of area where only part of the Iles has attained an Ro of 1.1).

Sandstone isopach (feet)	Area (square mile)	Area (square feet)	Sandstone volume (cubic feet)	Gas volume (using 3.5% of total)	Average overburden (feet)	Average pressure (PSI) using 0.41 pressure gradient	Average temperature gradient (°F/100ft)	Ave. temp. (°F)	Ave. temp. (°K)	Gas volume at standard temperature and pressure (cubic feet)	
600	47.96	1,337,004,825	66,850,241,250	2,339,758,440	11,450	4695	2.0	279	410	526,216,239,400	
550	104.01	2,899,737,736	144,986,886,680	5,074,541,035	11,540	4731	2.0	281	411	1,147,227,050,000	
500	191.21	5,330,655,599	266,532,780,000	9,328,647,300	11,340	4649	2.0	277	409	2,082,554,594,000	
450	329.48	9,185,396,782	459,269,839,100	16,074,444,370	11,280	4625	2.0	276	409	3,569,980,817,000	
400	509.48	14,203,505,800	710,175,290,000	24,856,135,150	10,860	4453	2.0	267	404	5,380,794,613,000	
350	752.39	20,975,348,420	1,048,767,421,000	36,706,859,740	10,150	4162	2.0	253	396	7,576,970,662,000	
300	951.69	26,531,732,100	1,326,586,605,000	46,430,531,180	9,230	3784	2.0	235	386	8,939,412,106,000	
250	1144.77	31,914,478,800	1,595,723,940,000	55,850,337,900	9,410	3858	2.0	238	388	10,906,810,970,000	
200	1355.29	37,783,409,070	1,889,170,454,000	66,120,965,890	8,850	3629	2.0	227	381	12,369,230,000,000	
150	1636.46	45,510,255,130	2,275,512,757,000	79,642,946,500	8,330	3415	2.1	225	380	14,071,420,580,000	
100	2024.22	56,432,021,820	2,821,601,091,000	98,756,038,190	8,040	3296	2.1	219	377	16,974,345,010,000	
50	2358.68	65,756,328,190	3,287,816,410,000	115,073,574,400	8,000	3280	2.1	218	376	19,735,362,850,000	
0	3185.80	88,792,704,000	4,439,635,200,000	155,387,233,000	7,800	3198	2.1	214	374	26,121,956,460,000	2 = 13,060,978,230,000
										129,402,281,951,400	(Total)
										-13,060,978,230,000	
										116,341,303,721,400	(Intergrated Total)

tables6:jae:6-22-87

Table 4. Calculation of total in-place gas in the Iles Formation with an Ro of .73 or greater (exclusive of area where only part of the Iles has attained an Ro of .73)

Sandstone isopach (feet)	Area (square mile)	Area (square feet)	Sandstone volume (cubic feet)	Gas volume (using 3.5% of total)	Average overburden (feet)	Average pressure (PSI) using 0.41 pressure gradient	Average temperature gradient (°F/100ft)	Ave. temp. (°F)	Ave. temp. (°K)	Gas volume at sandard temperature and pressure (cubic feet)
0	18.68	520,768,512	26,038,425,600	911,344,896	5,500	2255	2.2	171	350	141,409,264,800
0	14.95	416,782,080	20,839,104,000	729,368,640	4,000	1640	2.0	130	328	71,696,441,160
0	56.67	1,579,868,928	78,993,446,400	2,764,770,624	8,000	3280	2.2	226	381	467,938,181,000
50	33.01	920,265,984	46,013,299,200	1,610,465,472	5,000	2050	2.2	160	344	188,680,641,700
100	41.73	1,163,365,632	58,168,281,600	2,035,889,856	3,500	1435	2.2	127	326	176,185,063,500
150	30.52	850,848,768	42,542,438,400	1,488,985,344	4,000	1640	2.2	138	332	144,602,797,600
200	30.52	850,848,768	42,542,438,400	1,488,985,344	5,000	2050	2.2	160	344	174,448,142,500
250	24.91	694,450,944	34,722,547,200	1,215,289,152	6,000	2460	2.0	170	350	167,929,576,300
300	23.67	659,881,728	32,994,086,400	1,154,793,024	7,500	3075	2.0	200	366	190,743,037,600
350	49.82	1,388,901,888	69,445,094,440	2,430,578,305	8,500	3485	2.0	220	378	440,555,624,800
400	28.03	781,431,552	39,071,577,600	1,367,505,216	10,500	4305	2.0	260	400	289,349,451,900
450	3.11	86,701,824	4,335,091,200	151,728,192	10,500	4305	2.0	260	400	32,104,059,780
450	9.96	277,668,864	13,883,443,200	485,920,512	11,500	4715	2.0	280	411	109,593,706,500
500	9.34	260,384,256	13,019,212,800	455,672,448	10,500	4305	2.0	260	400	96,415,407,820
										2,691,651,396,960 (Total)
										1,345,825,698,000 (One Half of Total)

tables6:jae:6-22-87

Table 5. Calculation of total in-place gas in area where only part of the Iles Formation has attained an Ro of 1.1.

Sandstone isopach (feet)	Area (square mile)	Area (square feet)	Sandstone volume (cubic feet)	Gas volume (using 3.5% of total)	Average overburden (feet)	Average pressure (PSI) using 0.41 pressure gradient	Average temperature gradient (°F/100ft)	Ave. temp. (°F)	Ave. temp. (°K)	Gas volume at standard temperature and pressure (cubic feet)	
0	46.71	1,302,200,064	65,110,003,200	2,278,850,112	7,000	2870	2.2	204	369	348,459,091,200	
50	13.08	363,534,336	18,176,716,800	636,185,088	4,500	1845	2.2	149	338	68,272,163,130	
100	9.34	260,384,256	13,019,212,800	455,672,448	3,000	1230	2.2	116	320	34,434,074,210	
150	53.56	1,493,167,104	74,658,355,200	2,613,042,432	2,500	1025	2.2	105	314	167,695,414,600	
200	23.67	659,881,728	32,994,086,400	1,154,793,024	4,000	1640	2.2	138	332	112,147,713,600	
250	14.32	399,218,688	19,960,934,400	698,632,704	4,000	1640	2.2	138	332	67,847,708,490	
250	14.32	399,218,688	19,960,934,400	698,632,704	5,500	2255	2.2	171	350	88,492,796,940	
300	28.65	798,716,160	39,935,808,000	1,397,753,280	4,000	1640	2.2	138	332	135,742,796,600	
300	5.61	156,397,824	7,819,891,200	273,696,192	5,000	2050	2.0	150	339	32,538,941,850	
300	9.34	260,384,256	13,019,212,800	455,672,448	6,000	2460	2.0	170	350	62,965,164,280	
350	17.44	486,199,296	24,309,964,800	850,848,768	3,500	1435	2.0	120	322	74,546,783,880	
350	29.89	833,285,376	41,664,268,800	1,458,249,408	7,000	2870	2.0	190	361	227,922,401,300	
350	13.70	381,934,080	19,096,704,000	668,384,640	3,000	1230	1.8	104	313	51,637,801,390	
400	6.23	173,682,432	8,684,121,600	303,944,256	2,500	1025	2.0	100	311	19,694,180,990	
400	11.21	312,516,864	15,625,843,200	546,904,512	8,000	3280	1.8	194	363	97,153,674,970	
400	39.86	1,111,233,024	55,561,651,200	1,944,657,792	9,500	3895	1.8	221	378	393,948,415,600	
450	163.17	4,493,161,728	224,658,086,400	7,863,033,024	9,000	3690	1.8	212	373	1,529,283,990,000	
500	9.34	260,384,256	13,019,212,800	455,672,448	8,500	3485	1.8	203	368	84,837,574,150	
										3,597,620,787,180	(Total)
										1,798,810,393,590	(One Half of Total)

tables6:jae:6-22-87

Table 6. Calculation of total in-place gas in area where only part of the Iles Formation has attained an Ro of .73.

Calculation Of Mean In-place Gas Resources

Williams Fork Basin-Center Gas Play

214,739,596,488,600	Uncorrected resource number
199,401,053,800,000	Convert gas porosity to 3.25%
205,568,096,700,000	Divide by Z factor (0.97)

205,568 bcf of gas

Williams Fork Transition Gas Play

374,518,054,751,000	Total uncorrected resource number
214,739,596,488,600	Less basin center uncorrected number
159,778,458,262,400	
151,984,387,100,000	Convert to pressure gradient of 0.39 psi/ft
106,911,067,000,000	Est. 70% of total sandstones gas saturated
116,911,067,000,000	Divide by Z factor (0.91)

116,911 bcf of gas

Table 7a

Table 7. Calculation of total in-place gas in the six plays: a) Williams Fork basin center gas play and transition zone play; b) Iles basin center gas play and transition zone play; c) Rollins or Trout Creek basin center gas play and transition zone play.

Iles Basin-Center Gas Play

86,212,108,801,800 Uncorrected resource number

1,345,825,698,000 Plus resource in 0-100% area

87,557,934,499,800

96,100,172,000,000 Convert to pressure gradient of 0.45 psi/ft

89,235,874,000,000 Convert to gas porosity of 3.25%

71,388,699,200,000 Est. 80% of sandstones producable

67,989,237,330,000 Divide by Z factor (1.05)

X 1.06 to add 500 ft of overburden = 71,950 bcf

71,950 bcf of gas

Iles Transition Play

116,341,303,721,400 Total uncorrected resource number

1,798,810,393,590 Plus resource in 0-100% area

118,140,114,114,990

87,557,934,499,800 Less basin center uncorrected number

30,582,179,615,190

29.090,365,980,000 Convert to pressure gradient of 0.39 psi/ft

22,625,840,210,000 Divide by Z factor (.90)

X 1.07 to add 500 ft of overburden = 24,134 bcf

24,134 bcf of gas

Table 7b

Proceedure For Calculating Mean In-place Resource in Rollins or Trout Creek Basin-Center Gas Play

Area of play- 1854.04 square miles

Average depth- 7810 feet

Sandstone thickness-75 feet

Pressure gradient- .43 psi/ft

Gas saturated porosity- 3.50%

A gross resource of 22,850 bcf was calculated

12,187 bcf Est. 40 ft ave. net gas saturate sandstone

3,290 bcf Est. productive over 27% of total area

3,428 Divided by Z factor (0.96)

3,428 bcf of in-place gas

Table 7c

Preceedure For Calculating Mean In-place Resource in Rollins or Trout Creek Transition Play

Total area of Rollins-Trout Creek > Ro .73

3066.23 square miles

Average depth- 6420 ft

Using a pressure gradient of 0.43, a sandstone thickness of 75 ft, a gross resource number of 34,010 bcf was calculated

22,850	Subtract uncorrected resource in basin center
11,160	gas play
10,100	Change pressure gradient to 0.39 psi/ft
5,398	Est. 40 ft. of ave net gas saturate sandstone
540	Est. 10% total area potentially productive
556	Divide by Z factor (.97)

556 bcf of in-place gas

Table 7c

FASP:TG 87.2 PC Mar. 12, 1987 16:52 WFORKR.DAT Run # 2

TIGHT GAS SANDS

Williams Fork (Ro > 1.1) INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	100.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1000.0	1050.0	1125.0	1190.0	1250.0	1325.0	1360.0
Thickness (feet)	475.00	520.00	590.00	650.00	720.00	800.00	975.00
Porosity (percent)	4.5000	5.2500	6.0000	6.5000	6.9000	7.2500	7.5000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	7.7000	7.9000	8.2000	8.4000	8.6000	8.9000	9.2000
HC Saturation (percent)	40.000	43.000	47.000	50.000	52.000	54.000	55.000
Number of Prospects	1	1	1	1	1	1	1

Williams Fork (Ro > 1.1) GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1187.750	85.887
Thickness	658.500	95.753
Porosity	6.390	0.652
Trap Fill	100.000	0.000
Depth	8.402	0.314
HC Saturation	49.275	3.515
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.4100000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9700000						

Depth Floor (feet) = 50000.00

Table 8. Calculation of mean in-place gas and five fractiles for Williams Fork basin center gas play.

Williams Fork (Ro > 1.1) ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Millions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	200.76	47.565	133.00	166.86	195.35	228.70	286.93
Cond. Prospect Potential	200.76	47.565	133.00	166.86	195.35	228.70	286.93
Cond. (B) Play Potential	200.76	47.565	133.00	166.86	195.35	228.70	286.93
Cond. (A) Play Potential	200.76	47.565	133.00	166.86	195.35	228.70	286.93
Uncond. Play Potential	200.76	47.565	133.00	166.86	195.35	228.70	286.93
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	200.76	47.565	133.00	166.86	195.35	228.70	286.93
Cond. Prospect Potential	200.76	47.565	133.00	166.86	195.35	228.70	286.93
Cond. (B) Play Potential	200.76	47.565	133.00	166.86	195.35	228.70	286.93
Cond. (A) Play Potential	200.76	47.565	133.00	166.86	195.35	228.70	286.93
Uncond. Play Potential	200.76	47.565	133.00	166.86	195.35	228.70	286.93
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0003	0.0000	0.0002	0.0002	0.0003	0.0003	0.0003
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 8

FASP:HE 87.2 PC Mar. 12, 1987 16:13 WFORKT.DAT Run # 3

TIGHT GAS SANDS

Williams Fork Transition INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	100.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1664.0	1792.0	1888.0	1952.0	2016.0	2112.0	2240.0
Thickness (feet)	135.00	185.00	235.00	275.00	325.00	405.00	470.00
Porosity (percent)	5.0000	5.7500	6.5000	7.0000	7.4000	7.7500	8.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	5.4000	5.5000	5.7000	5.9000	6.1000	6.3000	6.4000
HC Saturation (percent)	40.000	43.000	47.000	50.000	53.000	57.000	60.000
Number of Prospects	1	1	1	1	1	1	1

Williams Fork Transition GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1952.000	105.648
Thickness	283.625	69.930
Porosity	6.890	0.652
Trap Fill	100.000	0.000
Depth	5.900	0.254
HC Saturation	50.000	4.397
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.3900000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9100000						

Depth Floor (feet) = 50000.00

Table 9. Calculation of mean in-place gas and five fractiles for the Williams Fork transition zone gas play.

Williams Fork Transition — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Millions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	119.88	37.684	69.025	92.978	114.37	140.68	189.50
Cond. Prospect Potential	119.88	37.684	69.025	92.978	114.37	140.68	189.50
Cond. (B) Play Potential	119.88	37.684	69.025	92.978	114.37	140.68	189.50
Cond. (A) Play Potential	119.88	37.684	69.025	92.978	114.37	140.68	189.50
Uncond. Play Potential	119.88	37.684	69.025	92.978	114.37	140.68	189.50
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	119.88	37.684	69.025	92.978	114.37	140.68	189.50
Cond. Prospect Potential	119.88	37.684	69.025	92.978	114.37	140.68	189.50
Cond. (B) Play Potential	119.88	37.684	69.025	92.978	114.37	140.68	189.50
Cond. (A) Play Potential	119.88	37.684	69.025	92.978	114.37	140.68	189.50
Uncond. Play Potential	119.88	37.684	69.025	92.978	114.37	140.68	189.50
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0002	0.0000	0.0002	0.0002	0.0002	0.0002	0.0003
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 9

FASP:TG 87.2 PC Mar. 12, 1987 14:47 ILESR.DAT Run # 2

TIGHT GAS SANDS

Iles (Ro > 1.1) INPUT SUMMARY

Play Attribute Probabilities					Prospect Attribute Probabilities	
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	100.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1400.0	1450.0	1550.0	1625.0	1700.0	1800.0	1850.0
Thickness (feet)	100.00	110.00	130.00	150.00	175.00	215.00	235.00
Porosity (percent)	4.5000	5.2000	6.0000	6.5000	6.9000	7.3000	7.5000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	8.6000	8.8000	9.1000	9.3000	9.5000	9.8000	10.000
HC Saturation (percent)	40.000	43.000	47.000	50.000	52.000	54.000	55.000
Number of Prospects	1	1	1	1	1	1	1

Iles (Ro > 1.1) GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1625.000	107.432
Thickness	155.125	32.589
Porosity	6.390	0.670
Trap Fill	100.000	0.000
Depth	9.300	0.308
HC Saturation	49.275	3.515
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.4500000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	1.0500000						

Depth Floor (feet) = 50000.00

Table 10. Calculation of mean in-place gas and five fractiles for the Iles basin center gas play.

Iles (Ro > 1.1) ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Millions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	70.705	19.961	43.149	56.453	68.046	82.019	107.31
Cond. Prospect Potential	70.705	19.961	43.149	56.453	68.046	82.019	107.31
Cond. (B) Play Potential	70.705	19.961	43.149	56.453	68.046	82.019	107.31
Cond. (A) Play Potential	70.705	19.961	43.149	56.453	68.046	82.019	107.31
Uncond. Play Potential	70.705	19.961	43.149	56.453	68.046	82.019	107.31
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	70.705	19.961	43.149	56.453	68.046	82.019	107.31
Cond. Prospect Potential	70.705	19.961	43.149	56.453	68.046	82.019	107.31
Cond. (B) Play Potential	70.705	19.961	43.149	56.453	68.046	82.019	107.31
Cond. (A) Play Potential	70.705	19.961	43.149	56.453	68.046	82.019	107.31
Uncond. Play Potential	70.705	19.961	43.149	56.453	68.046	82.019	107.31
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0003	0.0000	0.0002	0.0002	0.0003	0.0003	0.0004
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 10

FASP:TG 87.2 PC Mar. 12, 1987 17:21 ILEST.DAT Run # 2

TIGHT GAS SANDS

Iles Transition INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	100.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1000.0	1025.0	1075.0	1125.0	1175.0	1225.0	1250.0
Thickness (feet)	35.000	50.000	65.000	75.000	85.000	100.00	110.00
Porosity (percent)	5.0000	5.6000	6.4000	7.0000	7.6000	8.4000	9.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	7.6000	7.8000	8.0000	8.2000	8.4000	8.6000	8.8000
HC Saturation (percent)	40.000	43.000	47.000	50.000	54.000	60.000	65.000
Number of Prospects	1	1	1	1	1	1	1

Iles Transition GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1125.000	63.410
Thickness	74.875	15.679
Porosity	7.000	0.879
Trap Fill	100.000	0.000
Depth	8.200	0.263
HC Saturation	50.725	5.366
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.3900000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9000000						

Depth Floor (feet) = 50000.00

Table 11. Calculation of mean in-place gas and five fractiles for the Iles transition zone gas play.

Iles Transition — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Millions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	24.710	7.9566	14.030	19.030	23.520	29.070	39.431
Cond. Prospect Potential	24.710	7.9566	14.030	19.030	23.520	29.070	39.431
Cond. (B) Play Potential	24.710	7.9566	14.030	19.030	23.520	29.070	39.431
Cond. (A) Play Potential	24.710	7.9566	14.030	19.030	23.520	29.070	39.431
Uncond. Play Potential	24.710	7.9566	14.030	19.030	23.520	29.070	39.431
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	24.710	7.9566	14.030	19.030	23.520	29.070	39.431
Cond. Prospect Potential	24.710	7.9566	14.030	19.030	23.520	29.070	39.431
Cond. (B) Play Potential	24.710	7.9566	14.030	19.030	23.520	29.070	39.431
Cond. (A) Play Potential	24.710	7.9566	14.030	19.030	23.520	29.070	39.431
Uncond. Play Potential	24.710	7.9566	14.030	19.030	23.520	29.070	39.431
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0003	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 11

FASP:HE 87.2 PC Mar. 12, 1987 16:20 ROLLINS.DAT Run # 3

TIGHT GAS SANDS

Rollins - Trout Creek (Ro > 1.1) INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	100.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	64.000	112.00	224.00	320.00	416.00	544.00	768.00
Thickness (feet)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Porosity (percent)	5.0000	5.6000	6.4000	7.0000	7.6000	8.4000	9.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	7.3000	7.4000	7.6000	7.8000	8.0000	8.2000	8.3000
HC Saturation (percent)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Number of Prospects	1	1	1	1	1	1	1

Rollins - Trout Creek (Ro > 1.1) GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	326.800	142.363
Thickness	40.000	5.073
Porosity	7.000	0.879
Trap Fill	100.000	0.000
Depth	7.800	0.254
HC Saturation	40.000	5.073
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A
Pe (PSI)	Linear	0.4300000	14.700000					
T (Deg Rankine)	Linear	0.0200000	510.00000					
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000					
Bo (no units)	Linear	1.0000000	1.0000000					
Z (no units)	Linear	0.0000	0.9600000					

Depth Floor (feet) = 50000.00

Table 12. Calculation of mean in-place gas and five fractiles for the Rollins or Trout Creek basin center gas play.

Rollins - Trout Creek (Ro > 1.1) ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Millions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	3.0167	1.6086	1.1690	1.8995	2.6619	3.7302	6.0614
Cond. Prospect Potential	3.0167	1.6086	1.1690	1.8995	2.6619	3.7302	6.0614
Cond. (B) Play Potential	3.0167	1.6086	1.1690	1.8995	2.6619	3.7302	6.0614
Cond. (A) Play Potential	3.0167	1.6086	1.1690	1.8995	2.6619	3.7302	6.0614
Uncond. Play Potential	3.0167	1.6086	1.1690	1.8995	2.6619	3.7302	6.0614
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	3.0167	1.6086	1.1690	1.8995	2.6619	3.7302	6.0614
Cond. Prospect Potential	3.0167	1.6086	1.1690	1.8995	2.6619	3.7302	6.0614
Cond. (B) Play Potential	3.0167	1.6086	1.1690	1.8995	2.6619	3.7302	6.0614
Cond. (A) Play Potential	3.0167	1.6086	1.1690	1.8995	2.6619	3.7302	6.0614
Uncond. Play Potential	3.0167	1.6086	1.1690	1.8995	2.6619	3.7302	6.0614
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0002	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 12

FASP:TG 87.2 PC Mar. 12, 1987 17:30 ROLLINST.DAT Run #

TIGHT GAS SANDS

Rollins - Trout Creek Transition INPUT SUMMARY

Play Attribute Probabilities					Prospect Attribute Probabilities	
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulatio
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	100.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	40.000	45.000	60.000	75.000	95.000	135.00	155.00
Thickness (feet)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Porosity (percent)	5.0000	5.6000	6.4000	7.0000	7.6000	8.4000	9.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	4.2000	4.4000	4.7000	5.0000	5.3000	5.6000	5.8000
HC Saturation (percent)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Number of Prospects	1	1	1	1	1	1	1

Rollins - Trout Creek Transition GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	81.000	27.701
Thickness	40.000	5.073
Porosity	7.000	0.879
Trap Fill	100.000	0.000
Depth	5.000	0.385
HC Saturation	40.000	5.073
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A
Pe (PSI)	Linear	0.3900000	14.700000					
T (Deg Rankine)	Linear	0.0200000	510.00000					
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000					
Bo (no units)	Linear	1.0000000	1.0000000					
Z (no units)	Linear	0.0000	0.9600000					

Depth Floor (feet) = 50000.00

Table 13. Calculation of mean in-place gas and five fractiles for the Rollins or Trout Creek transition zone gas play.

Rollins - Trout Creek Transition — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Millions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.4758	0.2180	0.2109	0.3222	0.4326	0.5806	0.8870
Cond. Prospect Potential	0.4758	0.2180	0.2109	0.3222	0.4326	0.5806	0.8870
Cond. (B) Play Potential	0.4758	0.2180	0.2109	0.3222	0.4326	0.5806	0.8870
Cond. (A) Play Potential	0.4758	0.2180	0.2109	0.3222	0.4326	0.5806	0.8870
Uncond. Play Potential	0.4758	0.2180	0.2109	0.3222	0.4326	0.5806	0.8870
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.4758	0.2180	0.2109	0.3222	0.4326	0.5806	0.8870
Cond. Prospect Potential	0.4758	0.2180	0.2109	0.3222	0.4326	0.5806	0.8870
Cond. (B) Play Potential	0.4758	0.2180	0.2109	0.3222	0.4326	0.5806	0.8870
Cond. (A) Play Potential	0.4758	0.2180	0.2109	0.3222	0.4326	0.5806	0.8870
Uncond. Play Potential	0.4758	0.2180	0.2109	0.3222	0.4326	0.5806	0.8870
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0001	0.0000	0.0001	0.0001	0.0001	0.0002	0.0002
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 13

FASPHE:AG 87.1 PC Mar. 12, 1987 17:40 Run No. 2

This file is 6PLAYSO.AGL

INPUT SUMMARY

Degree of dependency 0.0000	OIL Mean	OIL S.D.	OIL EN/MP	NON-ASSOC GAS Mean	NON-ASSOC GAS S.D.	NON-ASSOC GAS EN/MP	DISSOLVED GAS Mean	DISSOLVED GAS S.D.	DISSOLVED GAS EN/MP	GAS Mean	GAS S.D.	GAS EN/MP
Iles (Ro > 1.1)	1.00	1.00	1.000	70705.20	19960.60	1.000	1.00	1.00	1.000	70705.20	19960.60	1.000
	1.00	1.00	1.000	70705.20	19960.60	1.000	1.00	1.00	1.000	70705.20	19960.60	1.000
Iles Transition	1.00	1.00	1.000	24709.60	7956.60	1.000	1.00	1.00	1.000	24709.60	7956.60	1.000
	1.00	1.00	1.000	24709.60	7956.60	1.000	1.00	1.00	1.000	24709.60	7956.60	1.000
Williams Fork (Ro > 1.1)	1.00	1.00	1.000	200757.00	47565.50	1.000	1.00	1.00	1.000	200757.00	47565.50	1.000
	1.00	1.00	1.000	200757.00	47565.50	1.000	1.00	1.00	1.000	200757.00	47565.50	1.000
Williams Fork Transition	1.00	1.00	1.000	119884.00	37683.80	1.000	1.00	1.00	1.000	119884.00	37683.80	1.000
	1.00	1.00	1.000	119884.00	37683.80	1.000	1.00	1.00	1.000	119884.00	37683.80	1.000
Rollins - Trout Creek (Ro > 1.1)	1.00	1.00	1.000	3016.69	1608.63	1.000	1.00	1.00	1.000	3016.69	1608.63	1.000
	1.00	1.00	1.000	3016.69	1608.63	1.000	1.00	1.00	1.000	3016.69	1608.63	1.000
Rollins - Trout Creek Transition	1.00	1.00	1.000	475.79	218.00	1.000	1.00	1.00	1.000	475.79	218.00	1.000
	1.00	1.00	1.000	475.79	218.00	1.000	1.00	1.00	1.000	475.79	218.00	1.000
TIGHT GAS SANDS - AGGREGATION of 6 PLAYS	1.00	1.00	6.000	69924.71	76490.50	6.000	1.00	1.00	6.000	69924.71	76490.50	6.000
	6.00	2.45	1.000	419548.28	64396.54	1.000	6.00	2.45	1.000	419548.28	64396.54	1.000

Table 14. Calculation of aggregated in-place resource at 0 degree of dependency.

TIGHT GAS SANDS - AGGREGATION of 6 PLAYS ESTIMATED RESOURCES IN PLACE

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Accumulation Size	0.001000	0.001000	0.0002	0.0004	0.0007	0.0012	0.0028
Cond Aggregate Potential	0.006000	0.002449	0.0029	0.0043	0.0056	0.0072	0.0106
Uncond Aggregate Potential	0.006000	0.002449	0.0029	0.0043	0.0056	0.0072	0.0106
NON-ASSOCIATED GAS (Trillions of CuFt)							
Accumulation Size	69.92471	76.49050	10.965	25.936	47.180	85.824	203.00
Cond Aggregate Potential	419.5483	64.39654	322.63	374.13	414.69	459.65	533.02
Uncond Aggregate Potential	419.5483	64.39654	322.63	374.13	414.69	459.65	533.02
DISSOLVED GAS (Trillions of CuFt)							
Accumulation Size	0.001000	0.001000	0.0002	0.0004	0.0007	0.0012	0.0028
Cond Aggregate Potential	0.006000	0.002449	0.0029	0.0043	0.0056	0.0072	0.0106
Uncond Aggregate Potential	0.006000	0.002449	0.0029	0.0043	0.0056	0.0072	0.0106
GAS (Trillions of CuFt)							
Accumulation Size	69.92471	76.49050	10.965	25.936	47.180	85.824	203.00
Cond Aggregate Potential	419.5483	64.39654	322.63	374.13	414.69	459.65	533.02
Uncond Aggregate Potential	419.5483	64.39654	322.63	374.13	414.69	459.65	533.02

Table 14

FASPHE:AG 87.1 PC Mar. 12, 1987 17:45 Run No. 2

This file is 6PLAYS25.AGL

INPUT SUMMARY

Degree of dependency 0.2500	OIL Mean	OIL S.D.	OIL EN/MP	NON-ASSOC GAS Mean	NON-ASSOC GAS S.D.	NON-ASSOC GAS EN/MP	DISSOLVED GAS Mean	DISSOLVED GAS S.D.	DISSOLVED GAS EN/MP	GAS Mean	GAS S.D.	GAS EN/MP
Iles (Ro > 1.1)												
	1.00	1.00	1.000	70705.20	19960.60	1.000	1.00	1.00	1.000	70705.20	19960.60	1.000
	1.00	1.00	1.000	70705.20	19960.60	1.000	1.00	1.00	1.000	70705.20	19960.60	1.000
Iles Transition												
	1.00	1.00	1.000	24709.60	7956.60	1.000	1.00	1.00	1.000	24709.60	7956.60	1.000
	1.00	1.00	1.000	24709.60	7956.60	1.000	1.00	1.00	1.000	24709.60	7956.60	1.000
Williams Fork (Ro > 1.1)												
	1.00	1.00	1.000	200757.00	47565.50	1.000	1.00	1.00	1.000	200757.00	47565.50	1.000
	1.00	1.00	1.000	200757.00	47565.50	1.000	1.00	1.00	1.000	200757.00	47565.50	1.000
Williams Fork Transition												
	1.00	1.00	1.000	119884.00	37683.80	1.000	1.00	1.00	1.000	119884.00	37683.80	1.000
	1.00	1.00	1.000	119884.00	37683.80	1.000	1.00	1.00	1.000	119884.00	37683.80	1.000
Rollins - Trout Creek (Ro > 1.1)												
	1.00	1.00	1.000	3016.69	1608.63	1.000	1.00	1.00	1.000	3016.69	1608.63	1.000
	1.00	1.00	1.000	3016.69	1608.63	1.000	1.00	1.00	1.000	3016.69	1608.63	1.000
Rollins - Trout Creek Transition												
	1.00	1.00	1.000	475.79	218.00	1.000	1.00	1.00	1.000	475.79	218.00	1.000
	1.00	1.00	1.000	475.79	218.00	1.000	1.00	1.00	1.000	475.79	218.00	1.000
TIGHT GAS SANDS - AGGREGATION OF 6 PLAYS	1.00	1.00	6.000	69924.71	76490.50	6.000	1.00	1.00	6.000	69924.71	76490.50	6.000
	6.00	3.34	1.000	419548.28	77045.68	1.000	6.00	3.34	1.000	419548.28	77045.68	1.000

Table 15. Calculation of aggregated in-place resource at .25 degree of dependency.

TIGHT GAS SANDS - AGGREGATION OF 6 PLAYS ESTIMATED RESOURCES IN PLACE

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Accumulation Size	0.001000	0.001000	0.0002	0.0004	0.0007	0.0012	0.0028
Cond Aggregate Potential	0.006000	0.003337	0.0022	0.0037	0.0052	0.0074	0.0123
Uncond Aggregate Potential	0.006000	0.003337	0.0022	0.0037	0.0052	0.0074	0.0123
NON-ASSOCIATED GAS (Trillions of CuFt)							
Accumulation Size	69.92471	76.49050	10.965	25.936	47.180	85.824	203.00
Cond Aggregate Potential	419.5483	77.04568	305.82	364.95	412.65	466.58	556.79
Uncond Aggregate Potential	419.5483	77.04568	305.82	364.95	412.65	466.58	556.79
DISSOLVED GAS (Trillions of CuFt)							
Accumulation Size	0.001000	0.001000	0.0002	0.0004	0.0007	0.0012	0.0028
Cond Aggregate Potential	0.006000	0.003337	0.0022	0.0037	0.0052	0.0074	0.0123
Uncond Aggregate Potential	0.006000	0.003337	0.0022	0.0037	0.0052	0.0074	0.0123
GAS (Trillions of CuFt)							
Accumulation Size	69.92471	76.49050	10.965	25.936	47.180	85.824	203.00
Cond Aggregate Potential	419.5483	77.04568	305.82	364.95	412.65	466.58	556.79
Uncond Aggregate Potential	419.5483	77.04568	305.82	364.95	412.65	466.58	556.79

Table 15

FASPHE:AG 87.1 PC Mar. 12, 1987 17:48 Run No. 2

This file is 6PLAYS50.AGL

INPUT SUMMARY

Degree of dependency 0.5000	OIL Mean	OIL S.D.	OIL EN/MP	NON-ASSOC GAS Mean	NON-ASSOC GAS S.D.	NON-ASSOC GAS EN/MP	DISSOLVED GAS Mean	DISSOLVED GAS S.D.	DISSOLVED GAS EN/MP	GAS Mean	GAS S.D.	GAS EN/MP
Iles (Ro > 1.1)												
	1.00	1.00	1.000	70705.20	19960.60	1.000	1.00	1.00	1.000	70705.20	19960.60	1.000
	1.00	1.00	1.000	70705.20	19960.60	1.000	1.00	1.00	1.000	70705.20	19960.60	1.000
Iles Transition												
	1.00	1.00	1.000	24709.60	7956.60	1.000	1.00	1.00	1.000	24709.60	7956.60	1.000
	1.00	1.00	1.000	24709.60	7956.60	1.000	1.00	1.00	1.000	24709.60	7956.60	1.000
Williams Fork (Ro > 1.1)	1.00	1.00	1.000	200757.00	47565.50	1.000	1.00	1.00	1.000	200757.00	47565.50	1.000
	1.00	1.00	1.000	200757.00	47565.50	1.000	1.00	1.00	1.000	200757.00	47565.50	1.000
Williams Fork Transition	1.00	1.00	1.000	119884.00	37683.80	1.000	1.00	1.00	1.000	119884.00	37683.80	1.000
	1.00	1.00	1.000	119884.00	37683.80	1.000	1.00	1.00	1.000	119884.00	37683.80	1.000
Rollins - Trout Creek (Ro > 1.1)	1.00	1.00	1.000	3016.69	1608.63	1.000	1.00	1.00	1.000	3016.69	1608.63	1.000
	1.00	1.00	1.000	3016.69	1608.63	1.000	1.00	1.00	1.000	3016.69	1608.63	1.000
Rollins - Trout Creek Transition	1.00	1.00	1.000	475.79	218.00	1.000	1.00	1.00	1.000	475.79	218.00	1.000
	1.00	1.00	1.000	475.79	218.00	1.000	1.00	1.00	1.000	475.79	218.00	1.000
TIGHT GAS SANDS - AGGREGATION OF 6 PLAYS	1.00	1.00	6.000	69924.71	76490.50	6.000	1.00	1.00	6.000	69924.71	76490.50	6.000
	6.00	4.22	1.000	419548.28	89694.83	1.000	6.00	4.22	1.000	419548.28	89694.83	1.000

Table 16. Calculation of aggregated in-place resource at .50 degree of dependency.

TIGHT GAS SANDS - AGGREGATION OF 6 PLAYS ESTIMATED RESOURCES IN PLACE

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Accumulation Size	0.001000	0.001000	0.0002	0.0004	0.0007	0.0012	0.0028
Cond Aggregate Potential	0.006000	0.004225	0.0017	0.0032	0.0049	0.0075	0.0139
Uncond Aggregate Potential	0.006000	0.004225	0.0017	0.0032	0.0049	0.0075	0.0139
NON-ASSOCIATED GAS (Trillions of CuFt)							
Accumulation Size	69.92471	76.49050	10.965	25.936	47.180	85.824	203.00
Cond Aggregate Potential	419.5483	89.69483	289.77	355.75	410.28	473.16	580.91
Uncond Aggregate Potential	419.5483	89.69483	289.77	355.75	410.28	473.16	580.91
DISSOLVED GAS (Trillions of CuFt)							
Accumulation Size	0.001000	0.001000	0.0002	0.0004	0.0007	0.0012	0.0028
Cond Aggregate Potential	0.006000	0.004225	0.0017	0.0032	0.0049	0.0075	0.0139
Uncond Aggregate Potential	0.006000	0.004225	0.0017	0.0032	0.0049	0.0075	0.0139
GAS (Trillions of CuFt)							
Accumulation Size	69.92471	76.49050	10.965	25.936	47.180	85.824	203.00
Cond Aggregate Potential	419.5483	89.69483	289.77	355.75	410.28	473.16	580.91
Uncond Aggregate Potential	419.5483	89.69483	289.77	355.75	410.28	473.16	580.91

Table 16

FASPHE:AG 87.1 PC Mar. 12, 1987 17:52 Run No. 2

This file is 6PLAYS75.AGL

INPUT SUMMARY

Degree of dependency 0.7500	OIL Mean	OIL S.D.	OIL EN/MP	NON-ASSOC GAS Mean	NON-ASSOC GAS S.D.	NON-ASSOC GAS EN/MP	DISSOLVED GAS Mean	DISSOLVED GAS S.D.	DISSOLVED GAS EN/MP	GAS Mean	GAS S.D.	GAS EN/MP
Iles (Ro > 1.1)												
	1.00	1.00	1.000	70705.20	19960.60	1.000	1.00	1.00	1.000	70705.20	19960.60	1.000
	1.00	1.00	1.000	70705.20	19960.60	1.000	1.00	1.00	1.000	70705.20	19960.60	1.000
Iles Transition												
	1.00	1.00	1.000	24709.60	7956.60	1.000	1.00	1.00	1.000	24709.60	7956.60	1.000
	1.00	1.00	1.000	24709.60	7956.60	1.000	1.00	1.00	1.000	24709.60	7956.60	1.000
Williams Fork (Ro > 1.1)												
	1.00	1.00	1.000	200757.00	47565.50	1.000	1.00	1.00	1.000	200757.00	47565.50	1.000
	1.00	1.00	1.000	200757.00	47565.50	1.000	1.00	1.00	1.000	200757.00	47565.50	1.000
Williams Fork Transition												
	1.00	1.00	1.000	119884.00	37683.80	1.000	1.00	1.00	1.000	119884.00	37683.80	1.000
	1.00	1.00	1.000	119884.00	37683.80	1.000	1.00	1.00	1.000	119884.00	37683.80	1.000
Rollins - Trout Creek (Ro > 1.1)												
	1.00	1.00	1.000	3016.69	1608.63	1.000	1.00	1.00	1.000	3016.69	1608.63	1.000
	1.00	1.00	1.000	3016.69	1608.63	1.000	1.00	1.00	1.000	3016.69	1608.63	1.000
Rollins - Trout Creek Transition												
	1.00	1.00	1.000	475.79	218.00	1.000	1.00	1.00	1.000	475.79	218.00	1.000
	1.00	1.00	1.000	475.79	218.00	1.000	1.00	1.00	1.000	475.79	218.00	1.000
TIGHT GAS SANDS - AGGREGATION OF 6 PLAYS	1.00	1.00	6.000	69924.71	76490.50	6.000	1.00	1.00	6.000	69924.71	76490.50	6.000
	6.00	5.11	1.000	419548.28	102343.98	1.000	6.00	5.11	1.000	419548.28	102343.98	1.000

Table 17. Calculation of aggragated in-place resource at .75 degree of dependency.

TIGHT GAS SANDS - AGGREGATION OF 6 PLAYS ESTIMATED RESOURCES IN PLACE

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Accumulation Size	0.001000	0.001000	0.0002	0.0004	0.0007	0.0012	0.0028
Cond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
Uncond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
NON-ASSOCIATED GAS (Trillions of CuFt)							
Accumulation Size	69.92471	76.49050	10.965	25.936	47.180	85.824	203.00
Cond Aggregate Potential	419.5483	102.3440	274.45	346.58	407.60	479.36	605.33
Uncond Aggregate Potential	419.5483	102.3440	274.45	346.58	407.60	479.36	605.33
DISSOLVED GAS (Trillions of CuFt)							
Accumulation Size	0.001000	0.001000	0.0002	0.0004	0.0007	0.0012	0.0028
Cond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
Uncond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
GAS (Trillions of CuFt)							
Accumulation Size	69.92471	76.49050	10.965	25.936	47.180	85.824	203.00
Cond Aggregate Potential	419.5483	102.3440	274.45	346.58	407.60	479.36	605.33
Uncond Aggregate Potential	419.5483	102.3440	274.45	346.58	407.60	479.36	605.33

Table 17

FASPHE:AG 87.1 PC Mar. 12, 1987 17:55 Run No. 2

This file is 6PLAYS1.AGL

INPUT SUMMARY

Degree of dependency 1.0000	OIL			NON-ASSOC GAS			DISSOLVED GAS			GAS		
	Mean	S.D.	EN/MP	Mean	S.D.	EN/MP	Mean	S.D.	EN/MP	Mean	S.D.	EN/MP
Iles (Ro > 1.1)												
	1.00	1.00	1.000	70705.20	19960.60	1.000	1.00	1.00	1.000	70705.20	19960.60	1.000
	1.00	1.00	1.000	70705.20	19960.60	1.000	1.00	1.00	1.000	70705.20	19960.60	1.000
Iles Transition												
	1.00	1.00	1.000	24709.60	7956.60	1.000	1.00	1.00	1.000	24709.60	7956.60	1.000
	1.00	1.00	1.000	24709.60	7956.60	1.000	1.00	1.00	1.000	24709.60	7956.60	1.000
Williams Fork (Ro > 1.1)	1.00	1.00	1.000	200757.00	47565.50	1.000	1.00	1.00	1.000	200757.00	47565.50	1.000
	1.00	1.00	1.000	200757.00	47565.50	1.000	1.00	1.00	1.000	200757.00	47565.50	1.000
Williams Fork Transition	1.00	1.00	1.000	119884.00	37683.80	1.000	1.00	1.00	1.000	119884.00	37683.80	1.000
	1.00	1.00	1.000	119884.00	37683.80	1.000	1.00	1.00	1.000	119884.00	37683.80	1.000
Rollins - Trout Creek (Ro > 1.1)	1.00	1.00	1.000	3016.69	1608.63	1.000	1.00	1.00	1.000	3016.69	1608.63	1.000
	1.00	1.00	1.000	3016.69	1608.63	1.000	1.00	1.00	1.000	3016.69	1608.63	1.000
Rollins - Trout Creek Transition	1.00	1.00	1.000	475.79	218.00	1.000	1.00	1.00	1.000	475.79	218.00	1.000
	1.00	1.00	1.000	475.79	218.00	1.000	1.00	1.00	1.000	475.79	218.00	1.000
TIGHT GAS SANDS - AGGREGATION OF 6 PLAYS	1.00	1.00	6.000	69924.71	76490.50	6.000	1.00	1.00	6.000	69924.71	76490.50	6.000
	6.00	6.00	1.000	419548.28	114993.13	1.000	6.00	6.00	1.000	419548.28	114993.13	1.000

Table 18. Calculation of aggregated in-place resource at 1.00 degree of dependency.

TIGHT GAS SANDS - AGGREGATION OF 6 PLAYS ESTIMATED RESOURCES IN PLACE

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Accumulation Size	0.001000	0.001000	0.0002	0.0004	0.0007	0.0012	0.0028
Cond Aggregate Potential	0.006000	0.006000	0.0011	0.0024	0.0042	0.0074	0.0167
Uncond Aggregate Potential	0.006000	0.006000	0.0011	0.0024	0.0042	0.0074	0.0167
NON-ASSOCIATED GAS (Trillions of CuFt)							
Accumulation Size	69.92471	76.49050	10.965	25.936	47.180	85.824	203.00
Cond Aggregate Potential	419.5483	114.9931	259.88	337.45	404.62	485.17	629.98
Uncond Aggregate Potential	419.5483	114.9931	259.88	337.45	404.62	485.17	629.98
DISSOLVED GAS (Trillions of CuFt)							
Accumulation Size	0.001000	0.001000	0.0002	0.0004	0.0007	0.0012	0.0028
Cond Aggregate Potential	0.006000	0.006000	0.0011	0.0024	0.0042	0.0074	0.0167
Uncond Aggregate Potential	0.006000	0.006000	0.0011	0.0024	0.0042	0.0074	0.0167
GAS (Trillions of CuFt)							
Accumulation Size	69.92471	76.49050	10.965	25.936	47.180	85.824	203.00
Cond Aggregate Potential	419.5483	114.9931	259.88	337.45	404.62	485.17	629.98
Uncond Aggregate Potential	419.5483	114.9931	259.88	337.45	404.62	485.17	629.98

Table 18

	Present			Future		
	Low	ML	High	Low	ML	High
Williams Fork basin center	1%	3%	10%	4%	15%	45%
Williams Fork transition	1%	3%	10%	4%	18%	50%
Iles basin center	1%	3%	10%	4%	15%	45%
Iles transition	2%	6%	20%	8%	20%	50%
Rlns.-Trout Cr. basin cen.	2%	5%	10%	6%	20%	50%
Rlns.-Trout Cr. transition	3%	10%	15%	8%	22%	55%

Table 19. List of recovery factors used.

FASP:TG 87.2 PC Mar. 19, 1987 10:12 WFORKRCL.DAT Run # 1

TIGHT GAS SANDS

Williams Fork (Ro > 1.1) Current Low INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	1.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1000.0	1050.0	1125.0	1190.0	1250.0	1325.0	1360.0
Thickness (feet)	475.00	520.00	590.00	650.00	720.00	800.00	975.00
Porosity (percent)	4.5000	5.2500	6.0000	6.5000	6.9000	7.2500	7.5000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	7.7000	7.9000	8.2000	8.4000	8.6000	8.9000	9.2000
HC Saturation (percent)	40.000	43.000	47.000	50.000	52.000	54.000	55.000
Number of Prospects	1	1	1	1	1	1	1

Williams Fork (Ro > 1.1) Current Low GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1187.750	85.887
Thickness	658.500	95.753
Porosity	6.390	0.652
Trap Fill	100.000	0.000
Depth	8.402	0.314
HC Saturation	49.275	3.515
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE			
	Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.4100000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9700000						

Depth Floor (feet) = 50000.00

Table 20. Calculation of low estimate of recoverable gas in the Williams Fork basin center gas play using current technology.

Williams Fork (Ro > 1.1) Current Low — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	2.0076	0.4757	1.3300	1.6686	1.9535	2.2870	2.8693
Cond. Prospect Potential	2.0076	0.4757	1.3300	1.6686	1.9535	2.2870	2.8693
Cond. (B) Play Potential	2.0076	0.4757	1.3300	1.6686	1.9535	2.2870	2.8693
Cond. (A) Play Potential	2.0076	0.4757	1.3300	1.6686	1.9535	2.2870	2.8693
Uncond. Play Potential	2.0076	0.4757	1.3300	1.6686	1.9535	2.2870	2.8693
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	2.0076	0.4757	1.3300	1.6686	1.9535	2.2870	2.8693
Cond. Prospect Potential	2.0076	0.4757	1.3300	1.6686	1.9535	2.2870	2.8693
Cond. (B) Play Potential	2.0076	0.4757	1.3300	1.6686	1.9535	2.2870	2.8693
Cond. (A) Play Potential	2.0076	0.4757	1.3300	1.6686	1.9535	2.2870	2.8693
Uncond. Play Potential	2.0076	0.4757	1.3300	1.6686	1.9535	2.2870	2.8693
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0003	0.0000	0.0002	0.0002	0.0003	0.0003	0.0003
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 20

FASP:TG 87.2 PC Mar. 19, 1987 10:19 WFORKTCL.DAT Run # 1

TIGHT GAS SANDS

Williams Fork Transition Current Low INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	1.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1664.0	1792.0	1888.0	1952.0	2016.0	2112.0	2240.0
Thickness (feet)	135.00	185.00	235.00	275.00	325.00	405.00	470.00
Porosity (percent)	5.0000	5.7500	6.5000	7.0000	7.4000	7.7500	8.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	5.4000	5.5000	5.7000	5.9000	6.1000	6.3000	6.4000
HC Saturation (percent)	40.000	43.000	47.000	50.000	53.000	57.000	60.000
Number of Prospects	1	1	1	1	1	1	1

Williams Fork Transition Current Low GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1952.000	105.648
Thickness	283.625	69.930
Porosity	6.890	0.652
Trap Fill	100.000	0.000
Depth	5.900	0.254
HC Saturation	50.000	4.397
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.3900000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9100000						

Depth Floor (feet) = 50000.00

Table 21. Calculation of low estimate of recoverable gas in the Williams Fork transition zone gas play using current tchnology.

Williams Fork Transition Current Low — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	1.1988	0.3768	0.6902	0.9298	1.1437	1.4068	1.8950
Cond. Prospect Potential	1.1988	0.3768	0.6902	0.9298	1.1437	1.4068	1.8950
Cond. (B) Play Potential	1.1988	0.3768	0.6902	0.9298	1.1437	1.4068	1.8950
Cond. (A) Play Potential	1.1988	0.3768	0.6902	0.9298	1.1437	1.4068	1.8950
Uncond. Play Potential	1.1988	0.3768	0.6902	0.9298	1.1437	1.4068	1.8950
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	1.1988	0.3768	0.6902	0.9298	1.1437	1.4068	1.8950
Cond. Prospect Potential	1.1988	0.3768	0.6902	0.9298	1.1437	1.4068	1.8950
Cond. (B) Play Potential	1.1988	0.3768	0.6902	0.9298	1.1437	1.4068	1.8950
Cond. (A) Play Potential	1.1988	0.3768	0.6902	0.9298	1.1437	1.4068	1.8950
Uncond. Play Potential	1.1988	0.3768	0.6902	0.9298	1.1437	1.4068	1.8950
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0002	0.0000	0.0002	0.0002	0.0002	0.0002	0.0003
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 21

FASP:TG 87.2 PC Mar. 19, 1987 9:55 ILESRCL.DAT Run # 1

TIGHT GAS SANDS

Iles (Ro > 1.1) Current Low INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	1.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1400.0	1450.0	1550.0	1625.0	1700.0	1800.0	1850.0
Thickness (feet)	100.00	110.00	130.00	150.00	175.00	215.00	235.00
Porosity (percent)	4.5000	5.2000	6.0000	6.5000	6.9000	7.3000	7.5000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	8.6000	8.8000	9.1000	9.3000	9.5000	9.8000	10.000
HC Saturation (percent)	40.000	43.000	47.000	50.000	52.000	54.000	55.000
Number of Prospects	1	1	1	1	1	1	1

Iles (Ro > 1.1) Current Low GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1625.000	107.432
Thickness	155.125	32.589
Porosity	6.390	0.670
Trap Fill	100.000	0.000
Depth	9.300	0.308
HC Saturation	49.275	3.515
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.4500000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	1.0500000						

Depth Floor (feet) = 50000.00

Table 22. Calculation of low estimate of recoverable gas in the Iles basin center gas play using current technology.

Iles (Ro > 1.1) Current Low — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.7071	0.1996	0.4315	0.5645	0.6805	0.8202	1.0731
Cond. Prospect Potential	0.7071	0.1996	0.4315	0.5645	0.6805	0.8202	1.0731
Cond. (B) Play Potential	0.7071	0.1996	0.4315	0.5645	0.6805	0.8202	1.0731
Cond. (A) Play Potential	0.7071	0.1996	0.4315	0.5645	0.6805	0.8202	1.0731
Uncond. Play Potential	0.7071	0.1996	0.4315	0.5645	0.6805	0.8202	1.0731
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.7071	0.1996	0.4315	0.5645	0.6805	0.8202	1.0731
Cond. Prospect Potential	0.7071	0.1996	0.4315	0.5645	0.6805	0.8202	1.0731
Cond. (B) Play Potential	0.7071	0.1996	0.4315	0.5645	0.6805	0.8202	1.0731
Cond. (A) Play Potential	0.7071	0.1996	0.4315	0.5645	0.6805	0.8202	1.0731
Uncond. Play Potential	0.7071	0.1996	0.4315	0.5645	0.6805	0.8202	1.0731
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0003	0.0000	0.0002	0.0002	0.0003	0.0003	0.0004
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 22

FASP:TG 87.2 PC Mar.19, 1987 10:06 ILESTCL.DAT Run # 1

TIGHT GAS SANDS

Iles Transition Current Low INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	2.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1000.0	1025.0	1075.0	1125.0	1175.0	1225.0	1250.0
Thickness (feet)	35.000	50.000	65.000	75.000	85.000	100.00	110.00
Porosity (percent)	5.0000	5.6000	6.4000	7.0000	7.6000	8.4000	9.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	7.6000	7.8000	8.0000	8.2000	8.4000	8.6000	8.8000
HC Saturation (percent)	40.000	43.000	47.000	50.000	54.000	60.000	65.000
Number of Prospects	1	1	1	1	1	1	1

Iles Transition Current Low GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1125.000	63.410
Thickness	74.875	15.679
Porosity	7.000	0.879
Trap Fill	100.000	0.000
Depth	8.200	0.263
HC Saturation	50.725	5.366
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.3900000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9000000						

Depth Floor (feet) = 50000.00

Table 23. Calculation of low estimate of recoverable gas in the Iles transition zone gas play using current technology.

Iles Transition Current Low — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.4942	0.1591	0.2806	0.3806	0.4704	0.5814	0.7886
Cond. Prospect Potential	0.4942	0.1591	0.2806	0.3806	0.4704	0.5814	0.7886
Cond. (B) Play Potential	0.4942	0.1591	0.2806	0.3806	0.4704	0.5814	0.7886
Cond. (A) Play Potential	0.4942	0.1591	0.2806	0.3806	0.4704	0.5814	0.7886
Uncond. Play Potential	0.4942	0.1591	0.2806	0.3806	0.4704	0.5814	0.7886
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.4942	0.1591	0.2806	0.3806	0.4704	0.5814	0.7886
Cond. Prospect Potential	0.4942	0.1591	0.2806	0.3806	0.4704	0.5814	0.7886
Cond. (B) Play Potential	0.4942	0.1591	0.2806	0.3806	0.4704	0.5814	0.7886
Cond. (A) Play Potential	0.4942	0.1591	0.2806	0.3806	0.4704	0.5814	0.7886
Uncond. Play Potential	0.4942	0.1591	0.2806	0.3806	0.4704	0.5814	0.7886
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0003	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 23

FASP:TG 87.2 PC Mar. 19, 1987 10:26 ROLLSRCL.DAT Run # 1

TIGHT GAS SANDS

Rollins/Trout Cr. (Ro>1.1) Current Low INPUT SUMMARY

Play Attribute Probabilities					Prospect Attribute Probabilities	
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	2.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	64.000	112.00	224.00	320.00	416.00	544.00	768.00
Thickness (feet)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Porosity (percent)	5.0000	5.6000	6.4000	7.0000	7.6000	8.4000	9.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	7.3000	7.4000	7.6000	7.8000	8.0000	8.2000	8.3000
HC Saturation (percent)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Number of Prospects	1	1	1	1	1	1	1

Rollins/Trout Cr. (Ro>1.1) Current Low GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	326.800	142.363
Thickness	40.000	5.073
Porosity	7.000	0.879
Trap Fill	100.000	0.000
Depth	7.800	0.254
HC Saturation	40.000	5.073
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.4300000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9600000						

Depth Floor (feet) = 50000.00

Table 24. Calculation of low estimate of recoverable gas in the Rollins or Trout Creek basin center gas play using current technology.

Rollins/Trout Cr. (Ro>1.1) Current Low — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.0603	0.0322	0.0234	0.0380	0.0532	0.0746	0.1212
Cond. Prospect Potential	0.0603	0.0322	0.0234	0.0380	0.0532	0.0746	0.1212
Cond. (B) Play Potential	0.0603	0.0322	0.0234	0.0380	0.0532	0.0746	0.1212
Cond. (A) Play Potential	0.0603	0.0322	0.0234	0.0380	0.0532	0.0746	0.1212
Uncond. Play Potential	0.0603	0.0322	0.0234	0.0380	0.0532	0.0746	0.1212
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.0603	0.0322	0.0234	0.0380	0.0532	0.0746	0.1212
Cond. Prospect Potential	0.0603	0.0322	0.0234	0.0380	0.0532	0.0746	0.1212
Cond. (B) Play Potential	0.0603	0.0322	0.0234	0.0380	0.0532	0.0746	0.1212
Cond. (A) Play Potential	0.0603	0.0322	0.0234	0.0380	0.0532	0.0746	0.1212
Uncond. Play Potential	0.0603	0.0322	0.0234	0.0380	0.0532	0.0746	0.1212
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0002	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 24

FASP:TG 87.2 PC Mar. 19, 1987 10:34 ROLLSTCL.DAT Run # 1

TIGHT GAS SANDS

Rollins/Trout Cr. Trans. Current Low INPUT SUMMARY

Play Attribute Probabilities					Prospect Attribute Probabilities	
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	3.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	40.000	45.000	60.000	75.000	95.000	135.00	155.00
Thickness (feet)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Porosity (percent)	5.0000	5.6000	6.4000	7.0000	7.6000	8.4000	9.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	4.2000	4.4000	4.7000	5.0000	5.3000	5.6000	5.8000
HC Saturation (percent)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Number of Prospects	1	1	1	1	1	1	1

Rollins/Trout Cr. Trans. Current Low GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	81.000	27.701
Thickness	40.000	5.073
Porosity	7.000	0.879
Trap Fill	100.000	0.000
Depth	5.000	0.385
HC Saturation	40.000	5.073
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE			
	Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.3900000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9600000						

Depth Floor (feet) = 50000.00

Table 25. Calculation of low estimate of recoverable gas in the Rollins or Trout Creek transition zone play using current technology.

Rollins/Trout Cr. Trans. Current Low — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.0143	0.0065	0.0063	0.0097	0.0130	0.0174	0.0266
Cond. Prospect Potential	0.0143	0.0065	0.0063	0.0097	0.0130	0.0174	0.0266
Cond. (B) Play Potential	0.0143	0.0065	0.0063	0.0097	0.0130	0.0174	0.0266
Cond. (A) Play Potential	0.0143	0.0065	0.0063	0.0097	0.0130	0.0174	0.0266
Uncond. Play Potential	0.0143	0.0065	0.0063	0.0097	0.0130	0.0174	0.0266
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.0143	0.0065	0.0063	0.0097	0.0130	0.0174	0.0266
Cond. Prospect Potential	0.0143	0.0065	0.0063	0.0097	0.0130	0.0174	0.0266
Cond. (B) Play Potential	0.0143	0.0065	0.0063	0.0097	0.0130	0.0174	0.0266
Cond. (A) Play Potential	0.0143	0.0065	0.0063	0.0097	0.0130	0.0174	0.0266
Uncond. Play Potential	0.0143	0.0065	0.0063	0.0097	0.0130	0.0174	0.0266
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0001	0.0000	0.0001	0.0001	0.0001	0.0002	0.0002
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 25

FASPHE:AG 87.1 PC Mar. 19, 1987 12:55 Run No. 1

This file is TGCL.AGL

INPUT SUMMARY

Degree of dependency 0.7500	OIL Mean	OIL S.D.	OIL EN/MP	NON-ASSOC GAS Mean	NON-ASSOC GAS S.D.	NON-ASSOC GAS EN/MP	DISSOLVED GAS Mean	DISSOLVED GAS S.D.	DISSOLVED GAS EN/MP	GAS Mean	GAS S.D.	GAS EN/MP
Williams Fork (Ro > 1.1) Current Low	1.00	1.00	1.000	2007.57	475.65	1.000	1.00	1.00	1.000	2007.57	475.65	1.000
	1.00	1.00	1.000	2007.57	475.65	1.000	1.00	1.00	1.000	2007.57	475.65	1.000
Williams Fork Transition Current Low	1.00	1.00	1.000	1198.84	376.84	1.000	1.00	1.00	1.000	1198.84	376.84	1.000
	1.00	1.00	1.000	1198.84	376.84	1.000	1.00	1.00	1.000	1198.84	376.84	1.000
Iles (Ro > 1.1) Current Low	1.00	1.00	1.000	707.05	199.61	1.000	1.00	1.00	1.000	707.05	199.61	1.000
	1.00	1.00	1.000	707.05	199.61	1.000	1.00	1.00	1.000	707.05	199.61	1.000
Iles Transition Current Low	1.00	1.00	1.000	494.19	159.13	1.000	1.00	1.00	1.000	494.19	159.13	1.000
	1.00	1.00	1.000	494.19	159.13	1.000	1.00	1.00	1.000	494.19	159.13	1.000
Rollins/Trout Cr. (Ro>1.1) Current Low	1.00	1.00	1.000	60.33	32.17	1.000	1.00	1.00	1.000	60.33	32.17	1.000
	1.00	1.00	1.000	60.33	32.17	1.000	1.00	1.00	1.000	60.33	32.17	1.000
Rollins/Trout Cr. Trans. Current Low	1.00	1.00	1.000	14.27	6.54	1.000	1.00	1.00	1.000	14.27	6.54	1.000
	1.00	1.00	1.000	14.27	6.54	1.000	1.00	1.00	1.000	14.27	6.54	1.000
TIGHT GAS SANDS - Current Low	1.00	1.00	6.000	747.04	741.80	6.000	1.00	1.00	6.000	747.04	741.80	6.000
	6.00	5.11	1.000	4482.26	1102.25	1.000	6.00	5.11	1.000	4482.26	1102.25	1.000

Table 26. Calculation of aggragated in-place recoverable gas using the low current technology recovery factor and a .75 degree of dependency.

TIGHT GAS SANDS - Current Low ESTIMATED RESOURCES IN PLACE

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Accumulation Size	0.001000	0.001000	0.0002	0.0004	0.0007	0.0012	0.0023
Cond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
Uncond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
NON-ASSOCIATED GAS (Trillions of CuFt)							
Accumulation Size	0.747043	0.741800	0.1357	0.3032	0.5301	0.9268	2.0707
Cond Aggregate Potential	4.482261	1.102249	2.9217	3.6963	4.3526	5.1254	6.4842
Uncond Aggregate Potential	4.482261	1.102249	2.9217	3.6963	4.3526	5.1254	6.4842
DISSOLVED GAS (Trillions of CuFt)							
Accumulation Size	0.001000	0.001000	0.0002	0.0004	0.0007	0.0012	0.0023
Cond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
Uncond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
GAS (Trillions of CuFt)							
Accumulation Size	0.747043	0.741800	0.1357	0.3032	0.5301	0.9268	2.0707
Cond Aggregate Potential	4.482261	1.102249	2.9217	3.6963	4.3526	5.1254	6.4842
Uncond Aggregate Potential	4.482261	1.102249	2.9217	3.6963	4.3526	5.1254	6.4842

Table 26

FASP:TG 87.2 PC Mar. 19, 1987 10:14 WFORKRCM.DAT Run # 1

TIGHT GAS SANDS

Williams Fork (Ro > 1.1) Current M. L. INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	3.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1000.0	1050.0	1125.0	1190.0	1250.0	1325.0	1360.0
Thickness (feet)	475.00	520.00	590.00	650.00	720.00	800.00	975.00
Porosity (percent)	4.5000	5.2500	6.0000	6.5000	6.9000	7.2500	7.5000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	7.7000	7.9000	8.2000	8.4000	8.6000	8.9000	9.2000
HC Saturation (percent)	40.000	43.000	47.000	50.000	52.000	54.000	55.000
Number of Prospects	1	1	1	1	1	1	1

Williams Fork (Ro > 1.1) Current M. L. GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1187.750	85.887
Thickness	658.500	95.753
Porosity	6.390	0.652
Trap Fill	100.000	0.000
Depth	8.402	0.314
HC Saturation	49.275	3.515
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.4100000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9700000						

Depth Floor (feet) = 50000.00

Table 27. Calculation of most likely estimate of recoverable gas in the Williams Fork basin center gas play using current technology.

Williams Fork (Ro > 1.1) Current M. L. — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	6.0227	1.4270	3.9900	5.0058	5.8605	6.8610	8.6078
Cond. Prospect Potential	6.0227	1.4270	3.9900	5.0058	5.8605	6.8610	8.6078
Cond. (B) Play Potential	6.0227	1.4270	3.9900	5.0058	5.8605	6.8610	8.6078
Cond. (A) Play Potential	6.0227	1.4270	3.9900	5.0058	5.8605	6.8610	8.6078
Uncond. Play Potential	6.0227	1.4270	3.9900	5.0058	5.8605	6.8610	8.6078
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	6.0227	1.4270	3.9900	5.0058	5.8605	6.8610	8.6078
Cond. Prospect Potential	6.0227	1.4270	3.9900	5.0058	5.8605	6.8610	8.6078
Cond. (B) Play Potential	6.0227	1.4270	3.9900	5.0058	5.8605	6.8610	8.6078
Cond. (A) Play Potential	6.0227	1.4270	3.9900	5.0058	5.8605	6.8610	8.6078
Uncond. Play Potential	6.0227	1.4270	3.9900	5.0058	5.8605	6.8610	8.6078
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0003	0.0000	0.0002	0.0002	0.0003	0.0003	0.0003
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 27

FASP:TG 87.2 PC Mar. 19, 1987 10:20 WFORKTCM.DAT Run # 1

TIGHT GAS SANDS

Williams Fork Transition Current M.L. INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	3.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1664.0	1792.0	1888.0	1952.0	2016.0	2112.0	2240.0
Thickness (feet)	135.00	185.00	235.00	275.00	325.00	405.00	470.00
Porosity (percent)	5.0000	5.7500	6.5000	7.0000	7.4000	7.7500	8.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	5.4000	5.5000	5.7000	5.9000	6.1000	6.3000	6.4000
HC Saturation (percent)	40.000	43.000	47.000	50.000	53.000	57.000	60.000
Number of Prospects	1	1	1	1	1	1	1

Williams Fork Transition Current M.L. GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1952.000	105.648
Thickness	283.625	69.930
Porosity	6.890	0.652
Trap Fill	100.000	0.000
Depth	5.900	0.254
HC Saturation	50.000	4.397
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.3900000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9100000						

Depth Floor (feet) = 50000.00

Table 28. Calculation of most likely estimate of recoverable gas in the Williams Fork transition zone gas play using current technology.

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	3.5965	1.1305	2.0707	2.7894	3.4310	4.2203	5.6849
Cond. Prospect Potential	3.5965	1.1305	2.0707	2.7894	3.4310	4.2203	5.6849
Cond. (B) Play Potential	3.5965	1.1305	2.0707	2.7894	3.4310	4.2203	5.6849
Cond. (A) Play Potential	3.5965	1.1305	2.0707	2.7894	3.4310	4.2203	5.6849
Uncond. Play Potential	3.5965	1.1305	2.0707	2.7894	3.4310	4.2203	5.6849
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	3.5965	1.1305	2.0707	2.7894	3.4310	4.2203	5.6849
Cond. Prospect Potential	3.5965	1.1305	2.0707	2.7894	3.4310	4.2203	5.6849
Cond. (B) Play Potential	3.5965	1.1305	2.0707	2.7894	3.4310	4.2203	5.6849
Cond. (A) Play Potential	3.5965	1.1305	2.0707	2.7894	3.4310	4.2203	5.6849
Uncond. Play Potential	3.5965	1.1305	2.0707	2.7894	3.4310	4.2203	5.6849
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0002	0.0000	0.0002	0.0002	0.0002	0.0002	0.0003
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 28

FASP:TG 87.2 PC Mar. 19, 1987 10:00 ILESRCM.DAT Run # 1

TIGHT GAS SANDS

Iles (Ro > 1.1) Current Most Likely INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	3.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1400.0	1450.0	1550.0	1625.0	1700.0	1800.0	1850.0
Thickness (feet)	100.00	110.00	130.00	150.00	175.00	215.00	235.00
Porosity (percent)	4.5000	5.2000	6.0000	6.5000	6.9000	7.3000	7.5000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	8.6000	8.8000	9.1000	9.3000	9.5000	9.8000	10.000
HC Saturation (percent)	40.000	43.000	47.000	50.000	52.000	54.000	55.000
Number of Prospects	1	1	1	1	1	1	1

Iles (Ro > 1.1) Current Most Likely GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1625.000	107.432
Thickness	155.125	32.589
Porosity	6.390	0.670
Trap Fill	100.000	0.000
Depth	9.300	0.308
HC Saturation	49.275	3.515
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.4500000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	1.0500000						

Depth Floor (feet) = 50000.00

Table 29. Calculation of most likely estimate of recoverable gas in the Iles basin center gas play using current technology.

Iles (Ro > 1.1) Current Most Likely — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	2.1212	0.5988	1.2945	1.6936	2.0414	2.4606	3.2192
Cond. Prospect Potential	2.1212	0.5988	1.2945	1.6936	2.0414	2.4606	3.2192
Cond. (B) Play Potential	2.1212	0.5988	1.2945	1.6936	2.0414	2.4606	3.2192
Cond. (A) Play Potential	2.1212	0.5988	1.2945	1.6936	2.0414	2.4606	3.2192
Uncond. Play Potential	2.1212	0.5988	1.2945	1.6936	2.0414	2.4606	3.2192
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	2.1212	0.5988	1.2945	1.6936	2.0414	2.4606	3.2192
Cond. Prospect Potential	2.1212	0.5988	1.2945	1.6936	2.0414	2.4606	3.2192
Cond. (B) Play Potential	2.1212	0.5988	1.2945	1.6936	2.0414	2.4606	3.2192
Cond. (A) Play Potential	2.1212	0.5988	1.2945	1.6936	2.0414	2.4606	3.2192
Uncond. Play Potential	2.1212	0.5988	1.2945	1.6936	2.0414	2.4606	3.2192
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0003	0.0000	0.0002	0.0002	0.0003	0.0003	0.0004
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 29

FASP:TG 87.2 PC Mar. 19, 1987 10:07 ILESTCM.DAT Run # 1

TIGHT GAS SANDS

Iles Transition Current Most Likely INPUT SUMMARY

Play Attribute Probabilities					Prospect Attribute Probabilities	
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	6.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1000.0	1025.0	1075.0	1125.0	1175.0	1225.0	1250.0
Thickness (feet)	35.000	50.000	65.000	75.000	85.000	100.00	110.00
Porosity (percent)	5.0000	5.6000	6.4000	7.0000	7.6000	8.4000	9.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	7.6000	7.8000	8.0000	8.2000	8.4000	8.6000	8.8000
HC Saturation (percent)	40.000	43.000	47.000	50.000	54.000	60.000	65.000
Number of Prospects	1	1	1	1	1	1	1

Iles Transition Current Most Likely GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1125.000	63.410
Thickness	74.875	15.679
Porosity	7.000	0.879
Trap Fill	100.000	0.000
Depth	8.200	0.263
HC Saturation	50.725	5.366
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.3900000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9000000						

Depth Floor (feet) = 50000.00

Table 30. Calculation of most likely estimate of recoverable gas in the Iles transition zone gas play using current technology.

Iles Transition Current Most Likely — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	1.4826	0.4774	0.8418	1.1418	1.4112	1.7442	2.3659
Cond. Prospect Potential	1.4826	0.4774	0.8418	1.1418	1.4112	1.7442	2.3659
Cond. (B) Play Potential	1.4826	0.4774	0.8418	1.1418	1.4112	1.7442	2.3659
Cond. (A) Play Potential	1.4826	0.4774	0.8418	1.1418	1.4112	1.7442	2.3659
Uncond. Play Potential	1.4826	0.4774	0.8418	1.1418	1.4112	1.7442	2.3659
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	1.4826	0.4774	0.8418	1.1418	1.4112	1.7442	2.3659
Cond. Prospect Potential	1.4826	0.4774	0.8418	1.1418	1.4112	1.7442	2.3659
Cond. (B) Play Potential	1.4826	0.4774	0.8418	1.1418	1.4112	1.7442	2.3659
Cond. (A) Play Potential	1.4826	0.4774	0.8418	1.1418	1.4112	1.7442	2.3659
Uncond. Play Potential	1.4826	0.4774	0.8418	1.1418	1.4112	1.7442	2.3659
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0003	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 30

FASP:TG 87.2 PC Mar.19, 1987 10:27 ROLLSRCM.DAT Run # 1

TIGHT GAS SANDS

RollinsTrout Cr. (Ro>1.1) Current M.L. INPUT SUMMARY

Play Attribute Probabilities					Prospect Attribute Probabilities	
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	5.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	64.000	112.00	224.00	320.00	416.00	544.00	768.00
Thickness (feet)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Porosity (percent)	5.0000	5.6000	6.4000	7.0000	7.6000	8.4000	9.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	7.3000	7.4000	7.6000	7.8000	8.0000	8.2000	8.3000
HC Saturation (percent)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Number of Prospects	1	1	1	1	1	1	1

RollinsTrout Cr. (Ro>1.1) Current M.L. GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	326.800	142.363
Thickness	40.000	5.073
Porosity	7.000	0.879
Trap Fill	100.000	0.000
Depth	7.800	0.254
HC Saturation	40.000	5.073
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.4300000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9600000						

Depth Floor (feet) = 50000.00

Table 31. Calculation of most likely estimate of recoverable gas in the Rollins or Trout Creek basin center gas play using current technology.

RollinsTrout Cr. (Ro>1.1) Current M.L. ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.1508	0.0804	0.0584	0.0950	0.1331	0.1865	0.3031
Cond. Prospect Potential	0.1508	0.0804	0.0584	0.0950	0.1331	0.1865	0.3031
Cond. (B) Play Potential	0.1508	0.0804	0.0584	0.0950	0.1331	0.1865	0.3031
Cond. (A) Play Potential	0.1508	0.0804	0.0584	0.0950	0.1331	0.1865	0.3031
Uncond. Play Potential	0.1508	0.0804	0.0584	0.0950	0.1331	0.1865	0.3031
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.1508	0.0804	0.0584	0.0950	0.1331	0.1865	0.3031
Cond. Prospect Potential	0.1508	0.0804	0.0584	0.0950	0.1331	0.1865	0.3031
Cond. (B) Play Potential	0.1508	0.0804	0.0584	0.0950	0.1331	0.1865	0.3031
Cond. (A) Play Potential	0.1508	0.0804	0.0584	0.0950	0.1331	0.1865	0.3031
Uncond. Play Potential	0.1508	0.0804	0.0584	0.0950	0.1331	0.1865	0.3031
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0002	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 31

FASP:TG 87.2 PC Mar. 19, 1987 10:34 ROLLSTCM.DAT Run # 1

TIGHT GAS SANDS

Rollins/Trout Cr. Trans. Current M.L. INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	10.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	40.000	45.000	60.000	75.000	95.000	135.00	155.00
Thickness (feet)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Porosity (percent)	5.0000	5.6000	6.4000	7.0000	7.6000	8.4000	9.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	4.2000	4.4000	4.7000	5.0000	5.3000	5.6000	5.8000
HC Saturation (percent)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Number of Prospects	1	1	1	1	1	1	1

Rollins/Trout Cr. Trans. Current M.L. GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	81.000	27.701
Thickness	40.000	5.073
Porosity	7.000	0.879
Trap Fill	100.000	0.000
Depth	5.000	0.385
HC Saturation	40.000	5.073
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.3900000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9600000						

Depth Floor (feet) = 50000.00

Table 32. Calculation of the most likely estimate of recoverable gas in the Rollins or Trout Creek transition zone gas play using current technology.

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.0476	0.0218	0.0211	0.0322	0.0433	0.0581	0.0887
Cond. Prospect Potential	0.0476	0.0218	0.0211	0.0322	0.0433	0.0581	0.0887
Cond. (B) Play Potential	0.0476	0.0218	0.0211	0.0322	0.0433	0.0581	0.0887
Cond. (A) Play Potential	0.0476	0.0218	0.0211	0.0322	0.0433	0.0581	0.0887
Uncond. Play Potential	0.0476	0.0218	0.0211	0.0322	0.0433	0.0581	0.0887
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.0476	0.0218	0.0211	0.0322	0.0433	0.0581	0.0887
Cond. Prospect Potential	0.0476	0.0218	0.0211	0.0322	0.0433	0.0581	0.0887
Cond. (B) Play Potential	0.0476	0.0218	0.0211	0.0322	0.0433	0.0581	0.0887
Cond. (A) Play Potential	0.0476	0.0218	0.0211	0.0322	0.0433	0.0581	0.0887
Uncond. Play Potential	0.0476	0.0218	0.0211	0.0322	0.0433	0.0581	0.0887
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0001	0.0000	0.0001	0.0001	0.0001	0.0002	0.0002
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 32

FASPHE:AG 87.1 PC Mar. 19; 1987 13:00 Run No. 1

This file is TGCM:AGL

INPUT SUMMARY

Degree of dependency 0.7500	OIL Mean	OIL S.D.	OIL EN/MP	NON-ASSOC GAS Mean	NON-ASSOC GAS S.D.	NON-ASSOC GAS EN/MP	DISSOLVED GAS Mean	DISSOLVED GAS S.D.	DISSOLVED GAS EN/MP	GAS Mean	GAS S.D.	GAS EN/MP
Williams Fork (Ro > 1.1) Current M. L.	1.00	1.00	1.000	6022.70	1426.96	1.000	1.00	1.00	1.000	6022.70	1426.96	1.000
	1.00	1.00	1.000	6022.70	1426.96	1.000	1.00	1.00	1.000	6022.70	1426.96	1.000
Williams Fork Transition Current M.L.	1.00	1.00	1.000	3596.52	1130.51	1.000	1.00	1.00	1.000	3596.52	1130.51	1.000
	1.00	1.00	1.000	3596.52	1130.51	1.000	1.00	1.00	1.000	3596.52	1130.51	1.000
Iles (Ro > 1.1) Current Most Likely	1.00	1.00	1.000	2121.16	598.82	1.000	1.00	1.00	1.000	2121.16	598.82	1.000
	1.00	1.00	1.000	2121.16	598.82	1.000	1.00	1.00	1.000	2121.16	598.82	1.000
Iles Transition Current Most Likely	1.00	1.00	1.000	1482.57	477.40	1.000	1.00	1.00	1.000	1482.57	477.40	1.000
	1.00	1.00	1.000	1482.57	477.40	1.000	1.00	1.00	1.000	1482.57	477.40	1.000
RollinsTrout Cr. (Ro >1.1) Current M.L.	1.00	1.00	1.000	150.84	80.43	1.000	1.00	1.00	1.000	150.84	80.43	1.000
	1.00	1.00	1.000	150.84	80.43	1.000	1.00	1.00	1.000	150.84	80.43	1.000
Rollins/Trout Cr. Trans. Current M.L.	1.00	1.00	1.000	47.58	21.80	1.000	1.00	1.00	1.000	47.58	21.80	1.000
	1.00	1.00	1.000	47.58	21.80	1.000	1.00	1.00	1.000	47.58	21.80	1.000
TIGHT GAS SANDS - Current Most Likely	1.00	1.00	6.000	2236.89	2229.19	6.000	1.00	1.00	6.000	2236.89	2229.19	6.000
	6.00	5.11	1.000	13421.36	3296.13	1.000	6.00	5.11	1.000	13421.36	3296.13	1.000

Table 33. Calculation of aggregated recoverable gas using the most likely current technology recovery factor and a .75 degree of dependence.

TIGHT GAS SANDS - Current Most Likely ESTIMATED RESOURCES IN PLACE

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Accumulation Size	0.001000	0.001000	0.0002	0.0004	0.0007	0.0012	0.0028
Cond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
Uncond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
NON-ASSOCIATED GAS (Trillions of CuFt)							
Accumulation Size	2.236894	2.229191	0.4042	0.9049	1.5844	2.7743	6.2114
Cond Aggregate Potential	13.42136	3.296134	8.7537	11.071	13.034	15.345	19.407
Uncond Aggregate Potential	13.42136	3.296134	8.7537	11.071	13.034	15.345	19.407
DISSOLVED GAS (Trillions of CuFt)							
Accumulation Size	0.001000	0.001000	0.0002	0.0004	0.0007	0.0012	0.0028
Cond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
Uncond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
GAS (Trillions of CuFt)							
Accumulation Size	2.236894	2.229191	0.4042	0.9049	1.5844	2.7743	6.2114
Cond Aggregate Potential	13.42136	3.296134	8.7537	11.071	13.034	15.345	19.407
Uncond Aggregate Potential	13.42136	3.296134	8.7537	11.071	13.034	15.345	19.407

Table 33

FASP:TG 87.2 PC Mar. 19, 1987 10:15 WFORKRCH.DAT Run # 1

TIGHT GAS SANDS

Williams Fork (Ro > 1.1) Current High INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	10.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1000.0	1050.0	1125.0	1190.0	1250.0	1325.0	1360.0
Thickness (feet)	475.00	520.00	590.00	650.00	720.00	800.00	975.00
Porosity (percent)	4.5000	5.2500	6.0000	6.5000	6.9000	7.2500	7.5000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	7.7000	7.9000	8.2000	8.4000	8.6000	8.9000	9.2000
HC Saturation (percent)	40.000	43.000	47.000	50.000	52.000	54.000	55.000
Number of Prospects	1	1	1	1	1	1	1

Williams Fork (Ro > 1.1) Current High GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1187.750	85.887
Thickness	658.500	95.753
Porosity	6.390	0.652
Trap Fill	100.000	0.000
Depth	8.402	0.314
HC Saturation	49.275	3.515
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.4100000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9700000						

Depth Floor (feet) = 50000.00

Table 34. Calculation of high estimate of recoverable gas in the Williams Fork basin center gas play using current technology.

Williams Fork (Ro > 1.1) Current High — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	20.076	4.7565	13.300	16.686	19.535	22.870	28.693
Cond. Prospect Potential	20.076	4.7565	13.300	16.686	19.535	22.870	28.693
Cond. (B) Play Potential	20.076	4.7565	13.300	16.686	19.535	22.870	28.693
Cond. (A) Play Potential	20.076	4.7565	13.300	16.686	19.535	22.870	28.693
Uncond. Play Potential	20.076	4.7565	13.300	16.686	19.535	22.870	28.693
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	20.076	4.7565	13.300	16.686	19.535	22.870	28.693
Cond. Prospect Potential	20.076	4.7565	13.300	16.686	19.535	22.870	28.693
Cond. (B) Play Potential	20.076	4.7565	13.300	16.686	19.535	22.870	28.693
Cond. (A) Play Potential	20.076	4.7565	13.300	16.686	19.535	22.870	28.693
Uncond. Play Potential	20.076	4.7565	13.300	16.686	19.535	22.870	28.693
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0003	0.0000	0.0002	0.0002	0.0003	0.0003	0.0003
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 34

FASP:TG 87.2 PC Mar. 19, 1987 10:21 WFORKTCH.DAT Run # 1

TIGHT GAS SANDS

Williams Fork Transition Current High INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	10.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1664.0	1792.0	1888.0	1952.0	2016.0	2112.0	2240.0
Thickness (feet)	135.00	185.00	235.00	275.00	325.00	405.00	470.00
Porosity (percent)	5.0000	5.7500	6.5000	7.0000	7.4000	7.7500	8.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	5.4000	5.5000	5.7000	5.9000	6.1000	6.3000	6.4000
HC Saturation (percent)	40.000	43.000	47.000	50.000	53.000	57.000	60.000
Number of Prospects	1	1	1	1	1	1	1

Williams Fork Transition Current High GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1952.000	105.648
Thickness	283.625	69.930
Porosity	6.890	0.652
Trap Fill	100.000	0.000
Depth	5.900	0.254
HC Saturation	50.000	4.397
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.3900000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9100000						

Depth Floor (feet) = 50000.00

Table 35. Calculation of high estimate of recoverable gas in the Williams Fork transition zone gas play using current technology.

Williams Fork Transition Current High — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	11.988	3.7684	6.9025	9.2978	11.437	14.068	18.950
Cond. Prospect Potential	11.988	3.7684	6.9025	9.2978	11.437	14.068	18.950
Cond. (B) Play Potential	11.988	3.7684	6.9025	9.2978	11.437	14.068	18.950
Cond. (A) Play Potential	11.988	3.7684	6.9025	9.2978	11.437	14.068	18.950
Uncond. Play Potential	11.988	3.7684	6.9025	9.2978	11.437	14.068	18.950
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	11.988	3.7684	6.9025	9.2978	11.437	14.068	18.950
Cond. Prospect Potential	11.988	3.7684	6.9025	9.2978	11.437	14.068	18.950
Cond. (B) Play Potential	11.988	3.7684	6.9025	9.2978	11.437	14.068	18.950
Cond. (A) Play Potential	11.988	3.7684	6.9025	9.2978	11.437	14.068	18.950
Uncond. Play Potential	11.988	3.7684	6.9025	9.2978	11.437	14.068	18.950
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0002	0.0000	0.0002	0.0002	0.0002	0.0002	0.0003
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 35

FASP:TG 87.2 PC Mar. 19, 1987 10:02 ILESRCH.DAT Run # 1

TIGHT GAS SANDS

Iles (Ro > 1.1) Current High INPUT SUMMARY

Play Attribute Probabilities

Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Prospect Attribute Probabilities

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	10.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1400.0	1450.0	1550.0	1625.0	1700.0	1800.0	1850.0
Thickness (feet)	100.00	110.00	130.00	150.00	175.00	215.00	235.00
Porosity (percent)	4.5000	5.2000	6.0000	6.5000	6.9000	7.3000	7.5000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	8.6000	8.8000	9.1000	9.3000	9.5000	9.8000	10.000
HC Saturation (percent)	40.000	43.000	47.000	50.000	52.000	54.000	55.000
Number of Prospects	1	1	1	1	1	1	1

Iles (Ro > 1.1) Current High GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1625.000	107.432
Thickness	155.125	32.589
Porosity	6.390	0.670
Trap Fill	100.000	0.000
Depth	9.300	0.308
HC Saturation	49.275	3.515
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.4500000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	1.0500000						

Depth Floor (feet) = 50000.00

Table 36. Calculation of high estimate of recoverable gas in the Iles basin center gas play using current technology.

Iles (Ro > 1.1) Current High — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	7.0705	1.9961	4.3149	5.6453	6.8046	8.2019	10.731
Cond. Prospect Potential	7.0705	1.9961	4.3149	5.6453	6.8046	8.2019	10.731
Cond. (B) Play Potential	7.0705	1.9961	4.3149	5.6453	6.8046	8.2019	10.731
Cond. (A) Play Potential	7.0705	1.9961	4.3149	5.6453	6.8046	8.2019	10.731
Uncond. Play Potential	7.0705	1.9961	4.3149	5.6453	6.8046	8.2019	10.731
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	7.0705	1.9961	4.3149	5.6453	6.8046	8.2019	10.731
Cond. Prospect Potential	7.0705	1.9961	4.3149	5.6453	6.8046	8.2019	10.731
Cond. (B) Play Potential	7.0705	1.9961	4.3149	5.6453	6.8046	8.2019	10.731
Cond. (A) Play Potential	7.0705	1.9961	4.3149	5.6453	6.8046	8.2019	10.731
Uncond. Play Potential	7.0705	1.9961	4.3149	5.6453	6.8046	8.2019	10.731
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0003	0.0000	0.0002	0.0002	0.0003	0.0003	0.0004
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 36

FASP:TG 87.2 PC Mar. 19, 1987 10:08 ILESTCH.DAT Run # 1

TIGHT GAS SANDS

Iles Transittion Current High INPUT SUMMARY

Play Attribute Probabilities					Prospect Attribute Probabilities	
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	20.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1000.0	1025.0	1075.0	1125.0	1175.0	1225.0	1250.0
Thickness (feet)	35.000	50.000	65.000	75.000	85.000	100.00	110.00
Porosity (percent)	5.0000	5.6000	6.4000	7.0000	7.6000	8.4000	9.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	7.6000	7.8000	8.0000	8.2000	8.4000	8.6000	8.8000
HC Saturation (percent)	40.000	43.000	47.000	50.000	54.000	60.000	65.000
Number of Prospects	1	1	1	1	1	1	1

Iles Transittion Current High GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1125.000	63.410
Thickness	74.875	15.679
Porosity	7.000	0.879
Trap Fill	100.000	0.000
Depth	8.200	0.263
HC Saturation	50.725	5.366
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.3900000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9000000						

Depth Floor (feet) = 50000.00

Table 37. Calculation of high estimate of recoverable gas in the Iles transition zone gas play using current technology.

Iles Transittion Current High — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	4.9419	1.5913	2.8059	3.8060	4.7041	5.8141	7.8862
Cond. Prospect Potential	4.9419	1.5913	2.8059	3.8060	4.7041	5.8141	7.8862
Cond. (B) Play Potential	4.9419	1.5913	2.8059	3.8060	4.7041	5.8141	7.8862
Cond. (A) Play Potential	4.9419	1.5913	2.8059	3.8060	4.7041	5.8141	7.8862
Uncond. Play Potential	4.9419	1.5913	2.8059	3.8060	4.7041	5.8141	7.8862
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	4.9419	1.5913	2.8059	3.8060	4.7041	5.8141	7.8862
Cond. Prospect Potential	4.9419	1.5913	2.8059	3.8060	4.7041	5.8141	7.8862
Cond. (B) Play Potential	4.9419	1.5913	2.8059	3.8060	4.7041	5.8141	7.8862
Cond. (A) Play Potential	4.9419	1.5913	2.8059	3.8060	4.7041	5.8141	7.8862
Uncond. Play Potential	4.9419	1.5913	2.8059	3.8060	4.7041	5.8141	7.8862
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0003	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 37

FASP:TG 87.2 PC Mar. 19, 1987 10:28 ROLLSRCH.DAT Run # 1

TIGHT GAS SANDS

RollinsTrout Cr. (Ro>1.1) Current High INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	10.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	64.000	112.00	224.00	320.00	416.00	544.00	768.00
Thickness (feet)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Porosity (percent)	5.0000	5.6000	6.4000	7.0000	7.6000	8.4000	9.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	7.3000	7.4000	7.6000	7.8000	8.0000	8.2000	8.3000
HC Saturation (percent)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Number of Prospects	1	1	1	1	1	1	1

RollinsTrout Cr. (Ro>1.1) Current High GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	326.800	142.363
Thickness	40.000	5.073
Porosity	7.000	0.879
Trap Fill	100.000	0.000
Depth	7.800	0.254
HC Saturation	40.000	5.073
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE			
	Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.4300000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9600000						

Depth Floor (feet) = 50000.00

Table 38. Calculation of high estimate of recoverable gas in the Rollins or Trout Creek basin center gas play using current technology.

RollinsTrout Cr. (Ro>1.1) Current High — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.3017	0.1609	0.1169	0.1900	0.2662	0.3730	0.6061
Cond. Prospect Potential	0.3017	0.1609	0.1169	0.1900	0.2662	0.3730	0.6061
Cond. (B) Play Potential	0.3017	0.1609	0.1169	0.1900	0.2662	0.3730	0.6061
Cond. (A) Play Potential	0.3017	0.1609	0.1169	0.1900	0.2662	0.3730	0.6061
Uncond. Play Potential	0.3017	0.1609	0.1169	0.1900	0.2662	0.3730	0.6061
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.3017	0.1609	0.1169	0.1900	0.2662	0.3730	0.6061
Cond. Prospect Potential	0.3017	0.1609	0.1169	0.1900	0.2662	0.3730	0.6061
Cond. (B) Play Potential	0.3017	0.1609	0.1169	0.1900	0.2662	0.3730	0.6061
Cond. (A) Play Potential	0.3017	0.1609	0.1169	0.1900	0.2662	0.3730	0.6061
Uncond. Play Potential	0.3017	0.1609	0.1169	0.1900	0.2662	0.3730	0.6061
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0002	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 38

FASP:TG 87.2 PC Mar.19, 1987 10:36 ROLLSTCH.DAT Run # 1

TIGHT GAS SANDS

Rollins/Trout Cr. Trans. Current High INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	15.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	40.000	45.000	60.000	75.000	95.000	135.00	155.00
Thickness (feet)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Porosity (percent)	5.0000	5.6000	6.4000	7.0000	7.6000	8.4000	9.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	4.2000	4.4000	4.7000	5.0000	5.3000	5.6000	5.8000
HC Saturation (percent)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Number of Prospects	1	1	1	1	1	1	1

Rollins/Trout Cr. Trans. Current High GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	81.000	27.701
Thickness	40.000	5.073
Porosity	7.000	0.879
Trap Fill	100.000	0.000
Depth	5.000	0.385
HC Saturation	40.000	5.073
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.3900000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9600000						

Depth Floor (feet) = 50000.00

Table 39. Calculation of high estimate of recoverable gas the Rollins or Trout Creek transition zone gas play using current technology.

Rollins/Trout Cr. Trans. Current High — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.0714	0.0327	0.0316	0.0483	0.0649	0.0871	0.1330
Cond. Prospect Potential	0.0714	0.0327	0.0316	0.0483	0.0649	0.0871	0.1330
Cond. (B) Play Potential	0.0714	0.0327	0.0316	0.0483	0.0649	0.0871	0.1330
Cond. (A) Play Potential	0.0714	0.0327	0.0316	0.0483	0.0649	0.0871	0.1330
Uncond. Play Potential	0.0714	0.0327	0.0316	0.0483	0.0649	0.0871	0.1330
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.0714	0.0327	0.0316	0.0483	0.0649	0.0871	0.1330
Cond. Prospect Potential	0.0714	0.0327	0.0316	0.0483	0.0649	0.0871	0.1330
Cond. (B) Play Potential	0.0714	0.0327	0.0316	0.0483	0.0649	0.0871	0.1330
Cond. (A) Play Potential	0.0714	0.0327	0.0316	0.0483	0.0649	0.0871	0.1330
Uncond. Play Potential	0.0714	0.0327	0.0316	0.0483	0.0649	0.0871	0.1330
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0001	0.0000	0.0001	0.0001	0.0001	0.0002	0.0002
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 39

FASPHE:AG 87.1 PC Mar. 19, 1987 13:04

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INPUT SUMMARY

Degree of dependency 0.7500	OIL			NON-ASSOC GAS			DISSOLVED GAS			GAS		
	Mean	S.D.	EN/MP	Mean	S.D.	EN/MP	Mean	S.D.	EN/MP	Mean	S.D.	EN/MP
Williams Fork (Ro > 1.1) Current High	1.00	1.00	1.000	20075.70	4756.55	1.000	1.00	1.00	1.000	20075.70	4756.55	1.000
	1.00	1.00	1.000	20075.70	4756.55	1.000	1.00	1.00	1.000	20075.70	4756.55	1.000
Williams Fork Transition Current High	1.00	1.00	1.000	11988.40	3768.38	1.000	1.00	1.00	1.000	11988.40	3768.38	1.000
	1.00	1.00	1.000	11988.40	3768.38	1.000	1.00	1.00	1.000	11988.40	3768.38	1.000
Iles (Ro > 1.1) Current High	1.00	1.00	1.000	7070.52	1996.06	1.000	1.00	1.00	1.000	7070.52	1996.06	1.000
	1.00	1.00	1.000	7070.52	1996.06	1.000	1.00	1.00	1.000	7070.52	1996.06	1.000
Iles Transittion Current High	1.00	1.00	1.000	4941.91	1591.32	1.000	1.00	1.00	1.000	4941.91	1591.32	1.000
	1.00	1.00	1.000	4941.91	1591.32	1.000	1.00	1.00	1.000	4941.91	1591.32	1.000
RollinsTrout Cr. (Ro >1.1) Current High	1.00	1.00	1.000	301.67	160.86	1.000	1.00	1.00	1.000	301.67	160.86	1.000
	1.00	1.00	1.000	301.67	160.86	1.000	1.00	1.00	1.000	301.67	160.86	1.000
Rollins/Trout Cr. Trans. Current High	1.00	1.00	1.000	71.37	32.70	1.000	1.00	1.00	1.000	71.37	32.70	1.000
	1.00	1.00	1.000	71.37	32.70	1.000	1.00	1.00	1.000	71.37	32.70	1.000
TIGHT GAS SANDS - Current High	1.00	1.00	6.000	7408.26	7475.98	6.000	1.00	1.00	6.000	7408.26	7475.98	6.000
	6.00	5.11	1.000	44449.57	10875.78	1.000	6.00	5.11	1.000	44449.57	10875.78	1.000

Table 40. Calculation of aggregated recoverable gas using the high current technology recovery factor and a .75 degree of dependency.

TIGHT GAS SANDS - Current High ESTIMATED RESOURCES IN PLACE

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Accumulation Size	0.001000	0.001000	0.0002	0.0004	0.0007	0.0012	0.0028
Cond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
Uncond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
NON-ASSOCIATED GAS (Trillions of CuFt)							
Accumulation Size	7.408261	7.475975	1.3138	2.9630	5.2145	9.1770	20.697
Cond Aggregate Potential	44.44957	10.87578	29.039	36.695	43.176	50.801	64.196
Uncond Aggregate Potential	44.44957	10.87578	29.039	36.695	43.176	50.801	64.196
DISSOLVED GAS (Trillions of CuFt)							
Accumulation Size	0.001000	0.001000	0.0002	0.0004	0.0007	0.0012	0.0028
Cond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
Uncond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
GAS (Trillions of CuFt)							
Accumulation Size	7.408261	7.475975	1.3138	2.9630	5.2145	9.1770	20.697
Cond Aggregate Potential	44.44957	10.87578	29.039	36.695	43.176	50.801	64.196
Uncond Aggregate Potential	44.44957	10.87578	29.039	36.695	43.176	50.801	64.196

Table 40

FASP:TG 87.2 PC Mar. 19, 1987 10:16 WFORKRAL.DAT Run # 1

TIGHT GAS SANDS

Williams Fork (Ro > 1.1) Advanced Low INPUT SUMMARY

Play Attribute Probabilities					Prospect Attribute Probabilities	
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	4.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1000.0	1050.0	1125.0	1190.0	1250.0	1325.0	1360.0
Thickness (feet)	475.00	520.00	590.00	650.00	720.00	800.00	975.00
Porosity (percent)	4.5000	5.2500	6.0000	6.5000	6.9000	7.2500	7.5000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	7.7000	7.9000	8.2000	8.4000	8.6000	8.9000	9.2000
HC Saturation (percent)	40.000	43.000	47.000	50.000	52.000	54.000	55.000
Number of Prospects	1	1	1	1	1	1	1

Williams Fork (Ro > 1.1) Advanced Low GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1187.750	85.887
Thickness	658.500	95.753
Porosity	6.390	0.652
Trap Fill	100.000	0.000
Depth	8.402	0.314
HC Saturation	49.275	3.515
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.4100000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9700000						

Depth Floor (feet) = 50000.00

Table 41. Calculation of low estimate of recoverable gas in the Williams Fork basin center gas play using future advanced technology.

Williams Fork (Ro > 1.1) Advanced Low — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	8.0303	1.9026	5.3200	6.6744	7.8139	9.1481	11.477
Cond. Prospect Potential	8.0303	1.9026	5.3200	6.6744	7.8139	9.1481	11.477
Cond. (B) Play Potential	8.0303	1.9026	5.3200	6.6744	7.8139	9.1481	11.477
Cond. (A) Play Potential	8.0303	1.9026	5.3200	6.6744	7.8139	9.1481	11.477
Uncond. Play Potential	8.0303	1.9026	5.3200	6.6744	7.8139	9.1481	11.477
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	8.0303	1.9026	5.3200	6.6744	7.8139	9.1481	11.477
Cond. Prospect Potential	8.0303	1.9026	5.3200	6.6744	7.8139	9.1481	11.477
Cond. (B) Play Potential	8.0303	1.9026	5.3200	6.6744	7.8139	9.1481	11.477
Cond. (A) Play Potential	8.0303	1.9026	5.3200	6.6744	7.8139	9.1481	11.477
Uncond. Play Potential	8.0303	1.9026	5.3200	6.6744	7.8139	9.1481	11.477
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0003	0.0000	0.0002	0.0002	0.0003	0.0003	0.0003
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 41

FASP:TG 87.2 PC Mar. 19, 1987 10:22 WFORKTAL.DAT Run # 1

TIGHT GAS SANDS

Williams Fork Transition Advanced Low INPUT SUMMARY

Play Attribute Probabilities

Hydrocarbon Source	Timing	Migration	Potential Res. Facies
1.000	1.000	1.000	1.000

Prospect Attribute Probabilities

Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	4.00

Geolcgic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1664.0	1792.0	1888.0	1952.0	2016.0	2112.0	2240.0
Thickness (feet)	135.00	185.00	235.00	275.00	325.00	405.00	470.00
Porosity (percent)	5.0000	5.7500	6.5000	7.0000	7.4000	7.7500	8.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	5.4000	5.5000	5.7000	5.9000	6.1000	6.3000	6.4000
HC Saturation (percent)	40.000	43.000	47.000	50.000	53.000	57.000	60.000
Number of Prospects	1	1	1	1	1	1	1

Williams Fork Transition Advanced Low GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1952.000	105.648
Thickness	283.625	69.930
Porosity	6.890	0.652
Trap Fill	100.000	0.000
Depth	5.900	0.254
HC Saturation	50.000	4.397
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.3900000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9100000						

Depth Floor (feet) = 50000.00

Table 42. Calculation of low estimate of recoverable gas in the Williams Fork transition zone gas play using future advanced tachnology.

Williams Fork Transition Advanced Low — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	4.7954	1.5074	2.7610	3.7191	4.5747	5.6270	7.5798
Cond. Prospect Potential	4.7954	1.5074	2.7610	3.7191	4.5747	5.6270	7.5798
Cond. (B) Play Potential	4.7954	1.5074	2.7610	3.7191	4.5747	5.6270	7.5798
Cond. (A) Play Potential	4.7954	1.5074	2.7610	3.7191	4.5747	5.6270	7.5798
Uncond. Play Potential	4.7954	1.5074	2.7610	3.7191	4.5747	5.6270	7.5798
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	4.7954	1.5074	2.7610	3.7191	4.5747	5.6270	7.5798
Cond. Prospect Potential	4.7954	1.5074	2.7610	3.7191	4.5747	5.6270	7.5798
Cond. (B) Play Potential	4.7954	1.5074	2.7610	3.7191	4.5747	5.6270	7.5798
Cond. (A) Play Potential	4.7954	1.5074	2.7610	3.7191	4.5747	5.6270	7.5798
Uncond. Play Potential	4.7954	1.5074	2.7610	3.7191	4.5747	5.6270	7.5798
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0002	0.0000	0.0002	0.0002	0.0002	0.0002	0.0003
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 42

FASP:TG 87.2 PC Mar.19, 1987 10:03 ILESRAL.DAT Run # 1

TIGHT GAS SANDS

Iles (Ro > 1.1) Advanced Low INPUT SUMMARY

Play Attribute Probabilities					Prospect Attribute Probabilities	
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	4.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1400.0	1450.0	1550.0	1625.0	1700.0	1800.0	1850.0
Thickness (feet)	100.00	110.00	130.00	150.00	175.00	215.00	235.00
Porosity (percent)	4.5000	5.2000	6.0000	6.5000	6.9000	7.3000	7.5000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	8.6000	8.8000	9.1000	9.3000	9.5000	9.8000	10.000
HC Saturation (percent)	40.000	43.000	47.000	50.000	52.000	54.000	55.000
Number of Prospects	1	1	1	1	1	1	1

Iles (Ro > 1.1) Advanced Low GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1625.000	107.432
Thickness	155.125	32.589
Porosity	6.390	0.670
Trap Fill	100.000	0.000
Depth	9.300	0.308
HC Saturation	49.275	3.515
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.4500000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	1.0500000						

Depth Floor (feet) = 50000.00

Table 43. Calculation of low estimate of recoverable gas in the Iles basin center gas play using future advanced technology.

Iles (Ro > 1.1) Advanced Low — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	2.8282	0.7984	1.7260	2.2581	2.7218	3.2808	4.2923
Cond. Prospect Potential	2.8282	0.7984	1.7260	2.2581	2.7218	3.2808	4.2923
Cond. (B) Play Potential	2.8282	0.7984	1.7260	2.2581	2.7218	3.2808	4.2923
Cond. (A) Play Potential	2.8282	0.7984	1.7260	2.2581	2.7218	3.2808	4.2923
Uncond. Play Potential	2.8282	0.7984	1.7260	2.2581	2.7218	3.2808	4.2923
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	2.8282	0.7984	1.7260	2.2581	2.7218	3.2808	4.2923
Cond. Prospect Potential	2.8282	0.7984	1.7260	2.2581	2.7218	3.2808	4.2923
Cond. (B) Play Potential	2.8282	0.7984	1.7260	2.2581	2.7218	3.2808	4.2923
Cond. (A) Play Potential	2.8282	0.7984	1.7260	2.2581	2.7218	3.2808	4.2923
Uncond. Play Potential	2.8282	0.7984	1.7260	2.2581	2.7218	3.2808	4.2923
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0003	0.0000	0.0002	0.0002	0.0003	0.0003	0.0004
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 43

FASP:TG 87.2 PC Mar. 19, 1987 10:10 ILESTAL.DAT Run # 1

TIGHT GAS SANDS

Iles Transition Advanced Low INPUT SUMMARY

Play Attribute Probabilities					Prospect Attribute Probabilities	
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	8.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1000.0	1025.0	1075.0	1125.0	1175.0	1225.0	1250.0
Thickness (feet)	35.000	50.000	65.000	75.000	85.000	100.00	110.00
Porosity (percent)	5.0000	5.6000	6.4000	7.0000	7.6000	8.4000	9.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	7.6000	7.8000	8.0000	8.2000	8.4000	8.6000	8.8000
HC Saturation (percent)	40.000	43.000	47.000	50.000	54.000	60.000	65.000
Number of Prospects	1	1	1	1	1	1	1

Iles Transition Advanced Low GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1125.000	63.410
Thickness	74.875	15.679
Porosity	7.000	0.879
Trap Fill	100.000	0.000
Depth	8.200	0.263
HC Saturation	50.725	5.366
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	RESOURCE NA Gas	RESOURCE AD Gas	RESOURCE Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.3900000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9000000						

Depth Floor (feet) = 50000.00

Table 44. Calculation of low estimate of recoverable gas in the Iles transition zone gas play using future advanced technology.

Iles Transition Advanced Low — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	1.9768	0.6365	1.1224	1.5224	1.8816	2.3256	3.1545
Cond. Prospect Potential	1.9768	0.6365	1.1224	1.5224	1.8816	2.3256	3.1545
Cond. (B) Play Potential	1.9768	0.6365	1.1224	1.5224	1.8816	2.3256	3.1545
Cond. (A) Play Potential	1.9768	0.6365	1.1224	1.5224	1.8816	2.3256	3.1545
Uncond. Play Potential	1.9768	0.6365	1.1224	1.5224	1.8816	2.3256	3.1545
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	1.9768	0.6365	1.1224	1.5224	1.8816	2.3256	3.1545
Cond. Prospect Potential	1.9768	0.6365	1.1224	1.5224	1.8816	2.3256	3.1545
Cond. (B) Play Potential	1.9768	0.6365	1.1224	1.5224	1.8816	2.3256	3.1545
Cond. (A) Play Potential	1.9768	0.6365	1.1224	1.5224	1.8816	2.3256	3.1545
Uncond. Play Potential	1.9768	0.6365	1.1224	1.5224	1.8816	2.3256	3.1545
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0003	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 44

FASP:TG 87.2 PC Mar. 19, 1987 10:29 ROLLSRAL.DAT Run # 1

TIGHT GAS SANDS

RollinsTrout Cr. (Ro>1.1) Advanced Low INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	6.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	64.000	112.00	224.00	320.00	416.00	544.00	768.00
Thickness (feet)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Porosity (percent)	5.0000	5.6000	6.4000	7.0000	7.6000	8.4000	9.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	7.3000	7.4000	7.6000	7.8000	8.0000	8.2000	8.3000
HC Saturation (percent)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Number of Prospects	1	1	1	1	1	1	1

RollinsTrout Cr. (Ro>1.1) Advanced Low GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	326.800	142.363
Thickness	40.000	5.073
Porosity	7.000	0.879
Trap Fill	100.000	0.000
Depth	7.800	0.254
HC Saturation	40.000	5.073
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.4300000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9600000						

Depth Floor (feet) = 50000.00

Table 45. Calculation of low estimate of recoverable gas in the Rollins or Trout Creek basin center gas play using future advanced technology.

RollinsTrout Cr. (Ro>1.1) Advanced Low — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.1810	0.0965	0.0701	0.1140	0.1597	0.2238	0.3637
Cond. Prospect Potential	0.1810	0.0965	0.0701	0.1140	0.1597	0.2238	0.3637
Cond. (B) Play Potential	0.1810	0.0965	0.0701	0.1140	0.1597	0.2238	0.3637
Cond. (A) Play Potential	0.1810	0.0965	0.0701	0.1140	0.1597	0.2238	0.3637
Uncond. Play Potential	0.1810	0.0965	0.0701	0.1140	0.1597	0.2238	0.3637
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.1810	0.0965	0.0701	0.1140	0.1597	0.2238	0.3637
Cond. Prospect Potential	0.1810	0.0965	0.0701	0.1140	0.1597	0.2238	0.3637
Cond. (B) Play Potential	0.1810	0.0965	0.0701	0.1140	0.1597	0.2238	0.3637
Cond. (A) Play Potential	0.1810	0.0965	0.0701	0.1140	0.1597	0.2238	0.3637
Uncond. Play Potential	0.1810	0.0965	0.0701	0.1140	0.1597	0.2238	0.3637
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0002	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 45

FASP:TG 87.2 PC Mar. 19, 1987 10:37 ROLLSTAL.DAT Run # 1

TIGHT GAS SANDS

Rollins/Trout Cr. Trans. Advanced Low INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	8.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	40.000	45.000	60.000	75.000	95.000	135.00	155.00
Thickness (feet)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Porosity (percent)	5.0000	5.6000	6.4000	7.0000	7.6000	8.4000	9.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	4.2000	4.4000	4.7000	5.0000	5.3000	5.6000	5.8000
HC Saturation (percent)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Number of Prospects	1	1	1	1	1	1	1

Rollins/Trout Cr. Trans. Advanced Low GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	81.000	27.701
Thickness	40.000	5.073
Porosity	7.000	0.879
Trap Fill	100.000	0.000
Depth	5.000	0.385
HC Saturation	40.000	5.073
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.3900000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9600000						

Depth Floor (feet) = 50000.00

Table 46. Calculation of low estimate of recoverable gas in the Rollins or Trout Creek transition zone gas play using future advanced technology.

Rollins/Trout Cr. Trans. Advanced Low — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.0381	0.0174	0.0169	0.0258	0.0346	0.0465	0.0710
Cond. Prospect Potential	0.0381	0.0174	0.0169	0.0258	0.0346	0.0465	0.0710
Cond. (B) Play Potential	0.0381	0.0174	0.0169	0.0258	0.0346	0.0465	0.0710
Cond. (A) Play Potential	0.0381	0.0174	0.0169	0.0258	0.0346	0.0465	0.0710
Uncond. Play Potential	0.0381	0.0174	0.0169	0.0258	0.0346	0.0465	0.0710
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.0381	0.0174	0.0169	0.0258	0.0346	0.0465	0.0710
Cond. Prospect Potential	0.0381	0.0174	0.0169	0.0258	0.0346	0.0465	0.0710
Cond. (B) Play Potential	0.0381	0.0174	0.0169	0.0258	0.0346	0.0465	0.0710
Cond. (A) Play Potential	0.0381	0.0174	0.0169	0.0258	0.0346	0.0465	0.0710
Uncond. Play Potential	0.0381	0.0174	0.0169	0.0258	0.0346	0.0465	0.0710
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0001	0.0000	0.0001	0.0001	0.0001	0.0002	0.0002
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 46

FASPHE:AG 87.1 PC Mar. 19, 1987 15:08 Run No. 1

This file is TGAL.AGL

INPUT SUMMARY

Degree of dependency 0.7500	OIL Mean	OIL S.D.	OIL EN/MP	NON-ASSOC GAS Mean	NON-ASSOC GAS S.D.	NON-ASSOC GAS EN/MP	DISSOLVED GAS Mean	DISSOLVED GAS S.D.	DISSOLVED GAS EN/MP	GAS Mean	GAS S.D.	GAS EN/MP
Williams Fork (Ro > 1.1) Advanced Low	1.00	1.00	1.000	8030.27	1902.62	1.000	1.00	1.00	1.000	8030.27	1902.62	1.000
	1.00	1.00	1.000	8030.27	1902.62	1.000	1.00	1.00	1.000	8030.27	1902.62	1.000
Williams Fork Transition Advanced Low	1.00	1.00	1.000	4795.36	1507.35	1.000	1.00	1.00	1.000	4795.36	1507.35	1.000
	1.00	1.00	1.000	4795.36	1507.35	1.000	1.00	1.00	1.000	4795.36	1507.35	1.000
Iles (Ro > 1.1) Advanced Low	1.00	1.00	1.000	2828.21	798.42	1.000	1.00	1.00	1.000	2828.21	798.42	1.000
	1.00	1.00	1.000	2828.21	798.42	1.000	1.00	1.00	1.000	2828.21	798.42	1.000
Iles Transition Advanced Low	1.00	1.00	1.000	1976.77	636.53	1.000	1.00	1.00	1.000	1976.77	636.53	1.000
	1.00	1.00	1.000	1976.77	636.53	1.000	1.00	1.00	1.000	1976.77	636.53	1.000
RollinsTrout Cr. (Ro >1.1) Advanced Low	1.00	1.00	1.000	181.00	96.52	1.000	1.00	1.00	1.000	181.00	96.52	1.000
	1.00	1.00	1.000	181.00	96.52	1.000	1.00	1.00	1.000	181.00	96.52	1.000
Rollins/Trout Cr. Trans. Advanced Low	1.00	1.00	1.000	38.06	17.44	1.000	1.00	1.00	1.000	38.06	17.44	1.000
	1.00	1.00	1.000	38.06	17.44	1.000	1.00	1.00	1.000	38.06	17.44	1.000
TIGHT GAS SANDS - Advanced Low	1.00	1.00	6.000	2974.95	2979.48	6.000	1.00	1.00	6.000	2974.95	2979.48	6.000
	6.00	5.11	1.000	17849.68	4377.96	1.000	6.00	5.11	1.000	17849.68	4377.96	1.000

Table 47. Calculation of aggregated recoverable gas using the future advanced technology low recovery factor and a .75 degree of dependency.

TIGHT GAS SANDS - Advanced Low ESTIMATED RESOURCES IN PLACE

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Accumulation Size	0.001000	0.001000	0.0002	0.0004	0.0007	0.0012	0.0028
Cond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
Uncond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
NON-ASSOCIATED GAS (Trillions of CuFt)							
Accumulation Size	2.974946	2.979481	0.5336	1.1981	2.1020	3.6879	8.2809
Cond Aggregate Potential	17.84968	4.377962	11.649	14.728	17.336	20.405	25.800
Uncond Aggregate Potential	17.84968	4.377962	11.649	14.728	17.336	20.405	25.800
DISSOLVED GAS (Trillions of CuFt)							
Accumulation Size	0.001000	0.001000	0.0002	0.0004	0.0007	0.0012	0.0028
Cond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
Uncond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
GAS (Trillions of CuFt)							
Accumulation Size	2.974946	2.979481	0.5336	1.1981	2.1020	3.6879	8.2809
Cond Aggregate Potential	17.84968	4.377962	11.649	14.728	17.336	20.405	25.800
Uncond Aggregate Potential	17.84968	4.377962	11.649	14.728	17.336	20.405	25.800

Table 47

FASP:TG 87.2 PC Mar. 19, 1987 10:17 WFORKRAM.DAT Run # 1

TIGHT GAS SANDS

Williams Fork (Ro > 1.1) Advanced M.L. INPUT SUMMARY

Play Attribute Probabilities					Prospect Attribute Probabilities	
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	15.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1000.0	1050.0	1125.0	1190.0	1250.0	1325.0	1360.0
Thickness (feet)	475.00	520.00	590.00	650.00	720.00	800.00	975.00
Porosity (percent)	4.5000	5.2500	6.0000	6.5000	6.9000	7.2500	7.5000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	7.7000	7.9000	8.2000	8.4000	8.6000	8.9000	9.2000
HC Saturation (percent)	40.000	43.000	47.000	50.000	52.000	54.000	55.000
Number of Prospects	1	1	1	1	1	1	1

Williams Fork (Ro > 1.1) Advanced M.L. GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	187.750	85.887
Thickness	658.500	95.753
Porosity	6.390	0.652
Trap Fill	100.000	0.000
Depth	8.402	0.314
HC Saturation	49.275	3.515
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.4100000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9700000						

Depth Floor (feet) = 50000.00

Table 48. Calculation of most likely estimate of recoverable gas in the Williams Fork basin center gas play using future advanced technology.

Williams Fork (Ro > 1.1) Advanced M.L. ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	30.114	7.1348	19.950	25.029	29.302	34.305	43.039
Cond. Prospect Potential	30.114	7.1348	19.950	25.029	29.302	34.305	43.039
Cond. (B) Play Potential	30.114	7.1348	19.950	25.029	29.302	34.305	43.039
Cond. (A) Play Potential	30.114	7.1348	19.950	25.029	29.302	34.305	43.039
Uncond. Play Potential	30.114	7.1348	19.950	25.029	29.302	34.305	43.039
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	30.114	7.1348	19.950	25.029	29.302	34.305	43.039
Cond. Prospect Potential	30.114	7.1348	19.950	25.029	29.302	34.305	43.039
Cond. (B) Play Potential	30.114	7.1348	19.950	25.029	29.302	34.305	43.039
Cond. (A) Play Potential	30.114	7.1348	19.950	25.029	29.302	34.305	43.039
Uncond. Play Potential	30.114	7.1348	19.950	25.029	29.302	34.305	43.039
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0003	0.0000	0.0002	0.0002	0.0003	0.0003	0.0003
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 48

FASP:TG 87.2 PC Mar.19, 1987 10:23 WFORKTAM.DAT Run # 1

TIGHT GAS SANDS

Williams Fork Transition Advanced M.L. - INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	18.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1664.0	1792.0	1888.0	1952.0	2016.0	2112.0	2240.0
Thickness (feet)	135.00	185.00	235.00	275.00	325.00	405.00	470.00
Porosity (percent)	5.0000	5.7500	6.5000	7.0000	7.4000	7.7500	8.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	5.4000	5.5000	5.7000	5.9000	6.1000	6.3000	6.4000
HC Saturation (percent)	40.000	43.000	47.000	50.000	53.000	57.000	60.000
Number of Prospects	1	1	1	1	1	1	1

Williams Fork Transition Advanced M.L. GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1952.000	105.648
Thickness	283.625	69.930
Porosity	6.890	0.652
Trap Fill	100.000	0.000
Depth	5.900	0.254
HC Saturation	50.000	4.397
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.3900000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/88L)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9100000						

Depth Floor (feet) = 50000.00

Table 49. Calculation of most likely estimate of recoverable gas in the Williams Fork transition zone gas play using future advanced technology.

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	21.579	6.7831	12.424	16.736	20.586	25.322	34.109
Cond. Prospect Potential	21.579	6.7831	12.424	16.736	20.586	25.322	34.109
Cond. (B) Play Potential	21.579	6.7831	12.424	16.736	20.586	25.322	34.109
Cond. (A) Play Potential	21.579	6.7831	12.424	16.736	20.586	25.322	34.109
Uncond. Play Potential	21.579	6.7831	12.424	16.736	20.586	25.322	34.109
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	21.579	6.7831	12.424	16.736	20.586	25.322	34.109
Cond. Prospect Potential	21.579	6.7831	12.424	16.736	20.586	25.322	34.109
Cond. (B) Play Potential	21.579	6.7831	12.424	16.736	20.586	25.322	34.109
Cond. (A) Play Potential	21.579	6.7831	12.424	16.736	20.586	25.322	34.109
Uncond. Play Potential	21.579	6.7831	12.424	16.736	20.586	25.322	34.109
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0002	0.0000	0.0002	0.0002	0.0002	0.0002	0.0003
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 49

FASP:TG 87.2 PC Mar. 19, 1987 10:04 ILESRAM.DAT Run # 1

TIGHT GAS SANDS

Iles (Ro > 1.1) Advanced Most Likely — INPUT SUMMARY

Play Attribute Probabilities

Hydrocarbon Source	Timing	Migration	Potential Res. Facies
1.000	1.000	1.000	1.000

Prospect Attribute Probabilities

Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	15.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1400.0	1450.0	1550.0	1625.0	1700.0	1800.0	1850.0
Thickness (feet)	100.00	110.00	130.00	150.00	175.00	215.00	235.00
Porosity (percent)	4.5000	5.2000	6.0000	6.5000	6.9000	7.3000	7.5000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	8.6000	8.8000	9.1000	9.3000	9.5000	9.8000	10.000
HC Saturation (percent)	40.000	43.000	47.000	50.000	52.000	54.000	55.000
Number of Prospects	1	1	1	1	1	1	1

Iles (Ro > 1.1) Advanced Most Likely — GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1625.000	107.432
Thickness	155.125	32.589
Porosity	6.390	0.670
Trap Fill	100.000	0.000
Depth	9.300	0.308
HC Saturation	49.275	3.515
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

Cond. Prob. Prospect has
Cond. Play Prob.
Uncond. Play Prob.

RESOURCE	Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.4500000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	1.0500000						

Depth Floor (feet) = 50000.00

Table 50. Calculation of most likely estimate of recoverable gas in the Iles basin center gas play using future advanced technology.

Iles (Ro > 1.1) Advanced Most Likely — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	10.606	2.9941	6.4723	8.4679	10.207	12.303	16.096
Cond. Prospect Potential	10.606	2.9941	6.4723	8.4679	10.207	12.303	16.096
Cond. (B) Play Potential	10.606	2.9941	6.4723	8.4679	10.207	12.303	16.096
Cond. (A) Play Potential	10.606	2.9941	6.4723	8.4679	10.207	12.303	16.096
Uncond. Play Potential	10.606	2.9941	6.4723	8.4679	10.207	12.303	16.096
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	10.606	2.9941	6.4723	8.4679	10.207	12.303	16.096
Cond. Prospect Potential	10.606	2.9941	6.4723	8.4679	10.207	12.303	16.096
Cond. (B) Play Potential	10.606	2.9941	6.4723	8.4679	10.207	12.303	16.096
Cond. (A) Play Potential	10.606	2.9941	6.4723	8.4679	10.207	12.303	16.096
Uncond. Play Potential	10.606	2.9941	6.4723	8.4679	10.207	12.303	16.096
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0003	0.0000	0.0002	0.0002	0.0003	0.0003	0.0004
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 50

FASP:TG 87.2 PC Mar. 19, 1987 10:11 ILESTAM.DAT Run # 1

TIGHT GAS SANDS

Iles Transition Advanced Most Likely INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	20.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1000.0	1025.0	1075.0	1125.0	1175.0	1225.0	1250.0
Thickness (feet)	35.000	50.000	65.000	75.000	85.000	100.00	110.00
Porosity (percent)	5.0000	5.6000	6.4000	7.0000	7.6000	8.4000	9.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	7.6000	7.8000	8.0000	8.2000	8.4000	8.6000	8.8000
HC Saturation (percent)	40.000	43.000	47.000	50.000	54.000	60.000	65.000
Number of Prospects	1	1	1	1	1	1	1

Iles Transition Advanced Most Likely GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1125.000	63.410
Thickness	74.875	15.679
Porosity	7.000	0.879
Trap Fill	100.000	0.000
Depth	8.200	0.263
HC Saturation	50.725	5.366
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob: Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.3900000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/88L)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9000000						

Depth Floor (feet) = 50000.00

Table 51. Calculation of most likely estimate of recoverable gas in the Iles trasition zone gas play using future advanced technology.

Iles Transition Advanced Most Likely — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	4.9419	1.5913	2.8059	3.8060	4.7041	5.8141	7.8862
Cond. Prospect Potential	4.9419	1.5913	2.8059	3.8060	4.7041	5.8141	7.8862
Cond. (B) Play Potential	4.9419	1.5913	2.8059	3.8060	4.7041	5.8141	7.8862
Cond. (A) Play Potential	4.9419	1.5913	2.8059	3.8060	4.7041	5.8141	7.8862
Uncond. Play Potential	4.9419	1.5913	2.8059	3.8060	4.7041	5.8141	7.8862
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	4.9419	1.5913	2.8059	3.8060	4.7041	5.8141	7.8862
Cond. Prospect Potential	4.9419	1.5913	2.8059	3.8060	4.7041	5.8141	7.8862
Cond. (B) Play Potential	4.9419	1.5913	2.8059	3.8060	4.7041	5.8141	7.8862
Cond. (A) Play Potential	4.9419	1.5913	2.8059	3.8060	4.7041	5.8141	7.8862
Uncond. Play Potential	4.9419	1.5913	2.8059	3.8060	4.7041	5.8141	7.8862
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0003	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 51

FASP:TG 87.2 PC Mar. 19, 1987 10:31 ROLLSRAM.DAT Run # 1

TIGHT GAS SANDS

Rollins/Trout Cr. (Ro>1.1) Advanced M.L. INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	20.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	64.000	112.00	224.00	320.00	416.00	544.00	768.00
Thickness (feet)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Porosity (percent)	5.0000	5.6000	6.4000	7.0000	7.6000	8.4000	9.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	7.3000	7.4000	7.6000	7.8000	8.0000	8.2000	8.3000
HC Saturation (percent)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Number of Prospects	1	1	1	1	1	1	1

Rollins/Trout Cr. (Ro>1.1) Advanced M.L. GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	326.800	142.363
Thickness	40.000	5.073
Porosity	7.000	0.879
Trap Fill	100.000	0.000
Depth	7.800	0.254
HC Saturation	40.000	5.073
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.4300000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9600000						

Depth Floor (feet) = 50000.00

Table 52. Calculation of most likely estimate of recoverable gas in the Rollins or Trout Creek basin center gas play using future advanced technology.

Rollins/Trout Cr. (Ro>1.1) Advanced M.L. — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.6033	0.3217	0.2338	0.3799	0.5324	0.7460	1.2123
Cond. Prospect Potential	0.6033	0.3217	0.2338	0.3799	0.5324	0.7460	1.2123
Cond. (B) Play Potential	0.6033	0.3217	0.2338	0.3799	0.5324	0.7460	1.2123
Cond. (A) Play Potential	0.6033	0.3217	0.2338	0.3799	0.5324	0.7460	1.2123
Uncond. Play Potential	0.6033	0.3217	0.2338	0.3799	0.5324	0.7460	1.2123
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.6033	0.3217	0.2338	0.3799	0.5324	0.7460	1.2123
Cond. Prospect Potential	0.6033	0.3217	0.2338	0.3799	0.5324	0.7460	1.2123
Cond. (B) Play Potential	0.6033	0.3217	0.2338	0.3799	0.5324	0.7460	1.2123
Cond. (A) Play Potential	0.6033	0.3217	0.2338	0.3799	0.5324	0.7460	1.2123
Uncond. Play Potential	0.6033	0.3217	0.2338	0.3799	0.5324	0.7460	1.2123
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0002	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 52

FASP:TG 87.2 PC Mar. 19, 1987 10:38 ROLLSTAM.DAT Run # 1

TIGHT GAS SANDS

Rollins/Trout Cr. Trans. Advanced M.L. INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	22.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	40.000	45.000	60.000	75.000	95.000	135.00	155.00
Thickness (feet)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Porosity (percent)	5.0000	5.6000	6.4000	7.0000	7.6000	8.4000	9.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	4.2000	4.4000	4.7000	5.0000	5.3000	5.6000	5.8000
HC Saturation (percent)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Number of Prospects	1	1	1	1	1	1	1

Rollins/Trout Cr. Trans. Advanced M.L. GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	81.000	27.701
Thickness	40.000	5.073
Porosity	7.000	0.879
Trap Fill	100.000	0.000
Depth	5.000	0.385
HC Saturation	40.000	5.073
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.3900000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9600000						

Depth Floor (feet) = 50000.00

Table 53. Calculation of most likely estimate of recoverable gas in the Rollins or Trout Creek transition zone play.

Rollins/Trout Cr. Trans. Advanced M.L. ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.1047	0.0480	0.0464	0.0709	0.0952	0.1277	0.1951
Cond. Prospect Potential	0.1047	0.0480	0.0464	0.0709	0.0952	0.1277	0.1951
Cond. (B) Play Potential	0.1047	0.0480	0.0464	0.0709	0.0952	0.1277	0.1951
Cond. (A) Play Potential	0.1047	0.0480	0.0464	0.0709	0.0952	0.1277	0.1951
Uncond. Play Potential	0.1047	0.0480	0.0464	0.0709	0.0952	0.1277	0.1951
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.1047	0.0480	0.0464	0.0709	0.0952	0.1277	0.1951
Cond. Prospect Potential	0.1047	0.0480	0.0464	0.0709	0.0952	0.1277	0.1951
Cond. (B) Play Potential	0.1047	0.0480	0.0464	0.0709	0.0952	0.1277	0.1951
Cond. (A) Play Potential	0.1047	0.0480	0.0464	0.0709	0.0952	0.1277	0.1951
Uncond. Play Potential	0.1047	0.0480	0.0464	0.0709	0.0952	0.1277	0.1951
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0001	0.0000	0.0001	0.0001	0.0001	0.0002	0.0002
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 53

FASPHE:AG 87.1 PC Mar. 19, 1987 13:12 Run No. 1

This file is TGAM.AGL

INPUT SUMMARY

Degree of dependency 0.7500	OIL Mean	OIL S.D.	OIL EN/MP	NON-ASSOC GAS Mean	NON-ASSOC GAS S.D.	NON-ASSOC GAS EN/MP	DISSOLVED GAS Mean	DISSOLVED GAS S.D.	DISSOLVED GAS EN/MP	GAS Mean	GAS S.D.	GAS EN/MP
Williams Fork (Ro > 1.1) Advanced M.L.	1.00	1.00	1.000	30113.50	7134.82	1.000	1.00	1.00	1.000	30113.50	7134.82	1.000
	1.00	1.00	1.000	30113.50	7134.82	1.000	1.00	1.00	1.000	30113.50	7134.82	1.000
Williams Fork Transition Advanced M.L.	1.00	1.00	1.000	21579.10	6783.09	1.000	1.00	1.00	1.000	21579.10	6783.09	1.000
	1.00	1.00	1.000	21579.10	6783.09	1.000	1.00	1.00	1.000	21579.10	6783.09	1.000
Iles (Ro > 1.1) Advanced Most Likely	1.00	1.00	1.000	10605.80	2994.09	1.000	1.00	1.00	1.000	10605.80	2994.09	1.000
	1.00	1.00	1.000	10605.80	2994.09	1.000	1.00	1.00	1.000	10605.80	2994.09	1.000
Iles Transition Advanced Most Likely	1.00	1.00	1.000	4941.91	1591.32	1.000	1.00	1.00	1.000	4941.91	1591.32	1.000
	1.00	1.00	1.000	4941.91	1591.32	1.000	1.00	1.00	1.000	4941.91	1591.32	1.000
Rollins/Trout Cr. (Ro>1.1) Advanced M.L.	1.00	1.00	1.000	603.34	321.73	1.000	1.00	1.00	1.000	603.34	321.73	1.000
	1.00	1.00	1.000	603.34	321.73	1.000	1.00	1.00	1.000	603.34	321.73	1.000
Rollins/Trout Cr. Trans. Advanced M.L.	1.00	1.00	1.000	104.67	47.96	1.000	1.00	1.00	1.000	104.67	47.96	1.000
	1.00	1.00	1.000	104.67	47.96	1.000	1.00	1.00	1.000	104.67	47.96	1.000
TIGHT GAS SANDS - Advanced Most Likely	1.00	1.00	6.000	11324.72	11893.86	6.000	1.00	1.00	6.000	11324.72	11893.86	6.000
	6.00	5.11	1.000	67948.32	16759.06	1.000	6.00	5.11	1.000	67948.32	16759.06	1.000

Table 54. Calculation of aggragated recoverable gas using the most likely future advanced technology recovery factor and a .75 degree of dependency.

TIGHT GAS SANDS - Advanced Most Likely ESTIMATED RESOURCES IN PLACE

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Accumulation Size	0.001000	0.001000	0.0002	0.0004	0.0007	0.0012	0.0028
Cond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
Uncond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
NON-ASSOCIATED GAS (Trillions of CuFt)							
Accumulation Size	11.32472	11.89386	1.8908	4.3656	7.8092	13.969	32.253
Cond Aggregate Potential	67.94832	16.75906	44.233	55.998	65.971	77.721	98.393
Uncond Aggregate Potential	67.94832	16.75906	44.233	55.998	65.971	77.721	98.393
DISSOLVED GAS (Trillions of CuFt)							
Accumulation Size	0.001000	0.001000	0.0002	0.0004	0.0007	0.0012	0.0028
Cond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
Uncond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
GAS (Trillions of CuFt)							
Accumulation Size	11.32472	11.89386	1.8908	4.3656	7.8092	13.969	32.253
Cond Aggregate Potential	67.94832	16.75906	44.233	55.998	65.971	77.721	98.393
Uncond Aggregate Potential	67.94832	16.75906	44.233	55.998	65.971	77.721	98.393

Table 54

FASP:TG 87.2 PC Mar. 19, 1987 10:18 WFORKRAH.DAT Run # 1

TIGHT GAS SANDS

Williams Fork (Ro > 1.1) Advanced High INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	45.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1000.0	1050.0	1125.0	1190.0	1250.0	1325.0	1360.0
Thickness (feet)	475.00	520.00	590.00	650.00	720.00	800.00	975.00
Porosity (percent)	4.5000	5.2500	6.0000	6.5000	6.9000	7.2500	7.5000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	7.7000	7.9000	8.2000	8.4000	8.6000	8.9000	9.2000
HC Saturation (percent)	40.000	43.000	47.000	50.000	52.000	54.000	55.000
Number of Prospects	1	1	1	1	1	1	1

Williams Fork (Ro > 1.1) Advanced High GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	187.750	85.887
Thickness	658.500	95.753
Porosity	6.390	0.652
Trap Fill	100.000	0.000
Depth	8.402	0.314
HC Saturation	49.275	3.515
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.4100000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9700000						

Depth Floor (feet) = 50000.00

Table 55. Calculation of high estimate of recoverable gas in the Williams Fork basin center gas play using future advanced technology.

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	90.341	21.404	59.850	75.087	87.907	102.92	129.12
Cond. Prospect Potential	90.341	21.404	59.850	75.087	87.907	102.92	129.12
Cond. (B) Play Potential	90.341	21.404	59.850	75.087	87.907	102.92	129.12
Cond. (A) Play Potential	90.341	21.404	59.850	75.087	87.907	102.92	129.12
Uncond. Play Potential	90.341	21.404	59.850	75.087	87.907	102.92	129.12
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	90.341	21.404	59.850	75.087	87.907	102.92	129.12
Cond. Prospect Potential	90.341	21.404	59.850	75.087	87.907	102.92	129.12
Cond. (B) Play Potential	90.341	21.404	59.850	75.087	87.907	102.92	129.12
Cond. (A) Play Potential	90.341	21.404	59.850	75.087	87.907	102.92	129.12
Uncond. Play Potential	90.341	21.404	59.850	75.087	87.907	102.92	129.12
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0003	0.0000	0.0002	0.0002	0.0003	0.0003	0.0003
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 55

FASP:TG 87.2 PC Mar.19, 1987 10:24 WFORKTAH.DAT Run # 1

TIGHT GAS SANDS

Williams Fork Transition Advanced High — INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	50.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1664.0	1792.0	1888.0	1952.0	2016.0	2112.0	2240.0
Thickness (feet)	135.00	185.00	235.00	275.00	325.00	405.00	470.00
Porosity (percent)	5.0000	5.7500	6.5000	7.0000	7.4000	7.7500	8.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	5.4000	5.5000	5.7000	5.9000	6.1000	6.3000	6.4000
HC Saturation (percent)	40.000	43.000	47.000	50.000	53.000	57.000	60.000
Number of Prospects	1	1	1	1	1	1	1

Williams Fork Transition Advanced High — GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1952.000	105.648
Thickness	283.625	69.930
Porosity	6.890	0.652
Trap Fill	100.000	0.000
Depth	5.900	0.254
HC Saturation	50.000	4.397
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.3900000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/88L)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9100000						

Depth Floor (feet) = 50000.00

Table 56. Calculation of high estimate of recoverable gas in the Williams Fork transition zone gas play using future advanced technology.

Williams Fork Transition Advanced High — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	59.942	18.842	34.512	46.489	57.183	70.338	94.748
Cond. Prospect Potential	59.942	18.842	34.512	46.489	57.183	70.338	94.748
Cond. (B) Play Potential	59.942	18.842	34.512	46.489	57.183	70.338	94.748
Cond. (A) Play Potential	59.942	18.842	34.512	46.489	57.183	70.338	94.748
Uncond. Play Potential	59.942	18.842	34.512	46.489	57.183	70.338	94.748
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	59.942	18.842	34.512	46.489	57.183	70.338	94.748
Cond. Prospect Potential	59.942	18.842	34.512	46.489	57.183	70.338	94.748
Cond. (B) Play Potential	59.942	18.842	34.512	46.489	57.183	70.338	94.748
Cond. (A) Play Potential	59.942	18.842	34.512	46.489	57.183	70.338	94.748
Uncond. Play Potential	59.942	18.842	34.512	46.489	57.183	70.338	94.748
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0002	0.0000	0.0002	0.0002	0.0002	0.0002	0.0003
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 56

FASP:TG 87.2 PC Mar. 19, 1987 10:05 ILESRAH.DAT Run # 1

TIGHT GAS SANDS

Iles (Ro > 1.1) Advanced High INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	45.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1400.0	1450.0	1550.0	1625.0	1700.0	1800.0	1850.0
Thickness (feet)	100.00	110.00	130.00	150.00	175.00	215.00	235.00
Porosity (percent)	4.5000	5.2000	6.0000	6.5000	6.9000	7.3000	7.5000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	8.6000	8.8000	9.1000	9.3000	9.5000	9.8000	10.000
HC Saturation (percent)	40.000	43.000	47.000	50.000	52.000	54.000	55.000
Number of Prospects	1	1	1	1	1	1	1

Iles (Ro > 1.1) Advanced High GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1625.000	107.432
Thickness	155.125	32.589
Porosity	6.390	0.670
Trap Fill	100.000	0.000
Depth	9.300	0.308
HC Saturation	49.275	3.515
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.4500000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	1.0500000						

Depth Floor (feet) = 50000.00

Table 57. Calculation of high estimate of recoverable gas in the Iles basin center gas play using future advanced technology.

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	31.817	8.9823	19.417	25.404	30.621	36.909	48.288
Cond. Prospect Potential	31.817	8.9823	19.417	25.404	30.621	36.909	48.288
Cond. (B) Play Potential	31.817	8.9823	19.417	25.404	30.621	36.909	48.288
Cond. (A) Play Potential	31.817	8.9823	19.417	25.404	30.621	36.909	48.288
Uncond. Play Potential	31.817	8.9823	19.417	25.404	30.621	36.909	48.288
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	31.817	8.9823	19.417	25.404	30.621	36.909	48.288
Cond. Prospect Potential	31.817	8.9823	19.417	25.404	30.621	36.909	48.288
Cond. (B) Play Potential	31.817	8.9823	19.417	25.404	30.621	36.909	48.288
Cond. (A) Play Potential	31.817	8.9823	19.417	25.404	30.621	36.909	48.288
Uncond. Play Potential	31.817	8.9823	19.417	25.404	30.621	36.909	48.288
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0003	0.0000	0.0002	0.0002	0.0003	0.0003	0.0004
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 57

FASP:TG 87.2 PC Mar.19, 1987 10:12 ILESTAH.DAT Run # 1

TIGHT GAS SANDS

Iles Transition Advanced High — INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	50.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	1000.0	1025.0	1075.0	1125.0	1175.0	1225.0	1250.0
Thickness (feet)	35.000	50.000	65.000	75.000	85.000	100.00	110.00
Porosity (percent)	5.0000	5.6000	6.4000	7.0000	7.6000	8.4000	9.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	7.6000	7.8000	8.0000	8.2000	8.4000	8.6000	8.8000
HC Saturation (percent)	40.000	43.000	47.000	50.000	54.000	60.000	65.000
Number of Prospects	1	1	1	1	1	1	1

Iles Transition Advanced High — GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	1125.000	63.410
Thickness	74.875	15.679
Porosity	7.000	0.879
Trap Fill	100.000	0.000
Depth	8.200	0.263
HC Saturation	50.725	5.366
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.3900000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9000000						

Depth Floor (feet) = 50000.00

Table 58. Calculation of high estimate of recoverable gas in the Iles transition zone gas play using future advanced technology.

Iles Transition Advanced High — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	12.355	3.9783	7.0148	9.5149	11.760	14.535	19.715
Cond. Prospect Potential	12.355	3.9783	7.0148	9.5149	11.760	14.535	19.715
Cond. (B) Play Potential	12.355	3.9783	7.0148	9.5149	11.760	14.535	19.715
Cond. (A) Play Potential	12.355	3.9783	7.0148	9.5149	11.760	14.535	19.715
Uncond. Play Potential	12.355	3.9783	7.0148	9.5149	11.760	14.535	19.715
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	12.355	3.9783	7.0148	9.5149	11.760	14.535	19.715
Cond. Prospect Potential	12.355	3.9783	7.0148	9.5149	11.760	14.535	19.715
Cond. (B) Play Potential	12.355	3.9783	7.0148	9.5149	11.760	14.535	19.715
Cond. (A) Play Potential	12.355	3.9783	7.0148	9.5149	11.760	14.535	19.715
Uncond. Play Potential	12.355	3.9783	7.0148	9.5149	11.760	14.535	19.715
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0003	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 58

FASP:TG 87.2 PC Mar. 19, 1987 10:32 ROLLSRAH.DAT Run # 1

TIGHT GAS SANDS

Rollins/Trout Cr. (Ro>1.1) Advanced High INPUT SUMMARY

Play Attribute Probabilities				Prospect Attribute Probabilities		
Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	50 00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	64.000	112.00	224.00	320.00	416.00	544.00	768.00
Thickness (feet)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Porosity (percent)	5.0000	5.6000	6.4000	7.0000	7.6000	8.4000	9.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	7.3000	7.4000	7.6000	7.8000	8.0000	8.2000	8.3000
HC Saturation (percent)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Number of Prospects	1	1	1	1	1	1	1

Rollins/Trout Cr. (Ro>1.1) Advanced High GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	326.800	142.363
Thickness	40.000	5.073
Porosity	7.000	0.879
Trap Fill	100.000	0.000
Depth	7.800	0.254
HC Saturation	40.000	5.073
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.4300000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9600000						

Depth Floor (feet) = 50000.00

Table 59. Calculation of high estimate of recoverable gas in the Rollins or Trout Creek basin center gas play using future advanced technology.

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	1.5083	0.8043	0.5845	0.9498	1.3309	1.8651	3.0307
Cond. Prospect Potential	1.5083	0.8043	0.5845	0.9498	1.3309	1.8651	3.0307
Cond. (B) Play Potential	1.5083	0.8043	0.5845	0.9498	1.3309	1.8651	3.0307
Cond. (A) Play Potential	1.5083	0.8043	0.5845	0.9498	1.3309	1.8651	3.0307
Uncond. Play Potential	1.5083	0.8043	0.5845	0.9498	1.3309	1.8651	3.0307
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	1.5083	0.8043	0.5845	0.9498	1.3309	1.8651	3.0307
Cond. Prospect Potential	1.5083	0.8043	0.5845	0.9498	1.3309	1.8651	3.0307
Cond. (B) Play Potential	1.5083	0.8043	0.5845	0.9498	1.3309	1.8651	3.0307
Cond. (A) Play Potential	1.5083	0.8043	0.5845	0.9498	1.3309	1.8651	3.0307
Uncond. Play Potential	1.5083	0.8043	0.5845	0.9498	1.3309	1.8651	3.0307
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0002	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 59

FASP:TG 87.2 PC Mar. 19, 1987 10:39 ROLLSTAH.DAT Run # 1

TIGHT GAS SANDS

Rollins/Trout Cr. trans. Advanced High INPUT SUMMARY

Play Attribute Probabilities | Prospect Attribute Probabilities

Hydrocarbon Source	Timing	Migration	Potential Res. Facies	Trapping Mechanism	Effective Porosity	Hydrocarbon Accumulation
1.000	1.000	1.000	1.000	1.000	1.000	1.000

Marginal Play Probability	Conditional Deposit Probability	Reservoir Lithology	Hydrocarbon Prob. Gas	Hydrocarbon Prob. Oil	Recovery Factors % Oil	Recovery Factors % Free Gas
1.000	1.000	SAND	1.000	0.000	100.00	55.00

Geologic Variables	F100	F95	F75	F50	F25	F05	F0
Closure (thousand acres)	40.000	45.000	60.000	75.000	95.000	135.00	155.00
Thickness (feet)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Porosity (percent)	5.0000	5.6000	6.4000	7.0000	7.6000	8.4000	9.0000
Trap Fill (percent)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Depth (thousand feet)	4.2000	4.4000	4.7000	5.0000	5.3000	5.6000	5.8000
HC Saturation (percent)	30.000	32.000	36.000	40.000	44.000	48.000	50.000
Number of Prospects	1	1	1	1	1	1	1

Rollins/Trout Cr. trans. Advanced High GEOLOGIC VARIABLES and PROBABILITIES OF OCCURRENCE

	Mean	Std. Dev.
Closure	81.000	27.701
Thickness	40.000	5.073
Porosity	7.000	0.879
Trap Fill	100.000	0.000
Depth	5.000	0.385
HC Saturation	40.000	5.073
Prospects	1.000	0.000
Accumulations	1.000	0.000

"Dry Hole" Risk = 0.0000
Prob. Depth <= 50000 = 1.0000

	RESOURCE Oil	NA Gas	AD Gas	Gas
Cond. Prob. Prospect has	0.0000	1.0000	0.0000	1.0000
Cond. Play Prob.	0.0000	1.0000	0.0000	1.0000
Uncond. Play Prob.	0.0000	1.0000	0.0000	1.0000

Variable	Function	A	B	D(feet)	A	B	D(feet)	A	B
Pe (PSI)	Linear	0.3900000	14.700000						
T (Deg Rankine)	Linear	0.0200000	510.00000						
Rs (Thousand CuFt/BBL)	Linear	1.0000000	1.0000000						
Bo (no units)	Linear	1.0000000	1.0000000						
Z (no units)	Linear	0.0000	0.9600000						

Depth-Floor (feet) = 50000.00

Table 60. Calculation of high estimate of recoverable gas in the Rollins or Trout Creek transition zone gas play using future advanced technology.

Rollins/Trout Cr. trans. Advanced High — ESTIMATED RESOURCES

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.2617	0.1199	0.1160	0.1772	0.2379	0.3194	0.4878
Cond. Prospect Potential	0.2617	0.1199	0.1160	0.1772	0.2379	0.3194	0.4878
Cond. (B) Play Potential	0.2617	0.1199	0.1160	0.1772	0.2379	0.3194	0.4878
Cond. (A) Play Potential	0.2617	0.1199	0.1160	0.1772	0.2379	0.3194	0.4878
Uncond. Play Potential	0.2617	0.1199	0.1160	0.1772	0.2379	0.3194	0.4878
DISSOLVED GAS (Trillions of CuFt)							
Number of Accumulations	0.0	0.0	0	0	0	0	0
Accumulation Size	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. Prospect Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (B) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cond. (A) Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncond Play Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS (Trillions of CuFt)							
Number of Accumulations	1.0000	0.0	1	1	1	1	1
Accumulation Size	0.2617	0.1199	0.1160	0.1772	0.2379	0.3194	0.4878
Cond. Prospect Potential	0.2617	0.1199	0.1160	0.1772	0.2379	0.3194	0.4878
Cond. (B) Play Potential	0.2617	0.1199	0.1160	0.1772	0.2379	0.3194	0.4878
Cond. (A) Play Potential	0.2617	0.1199	0.1160	0.1772	0.2379	0.3194	0.4878
Uncond. Play Potential	0.2617	0.1199	0.1160	0.1772	0.2379	0.3194	0.4878
YIELD FACTORS							
OIL (Thousand BBL / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NON-ASSOCIATED GAS (Million CuFt / Acre-Ft)	0.0001	0.0000	0.0001	0.0001	0.0001	0.0002	0.0002
DISSOLVED GAS (Million CuFt / Acre-Ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 60

FASPHE:AG 87.1 PC Mar. 19, 1987 15:25

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INPUT SUMMARY

Degree of dependency 0.7500	OIL Mean	OIL S.D.	OIL EN/MP	NON-ASSOC GAS Mean	NON-ASSOC GAS S.D.	NON-ASSOC GAS EN/MP	DISSOLVED GAS Mean	DISSOLVED GAS S.D.	DISSOLVED GAS EN/MP	GAS Mean	GAS S.D.	GAS EN/MP
Williams Fork (Ro > 1.1) Advanced High	1.00	1.00	1.000	90340.50	21404.50	1.000	1.00	1.00	1.000	90340.50	21404.50	1.000
	1.00	1.00	1.000	90340.50	21404.50	1.000	1.00	1.00	1.000	90340.50	21404.50	1.000
Williams Fork Transition Advanced High	1.00	1.00	1.000	59942.00	18841.90	1.000	1.00	1.00	1.000	59942.00	18841.90	1.000
	1.00	1.00	1.000	59942.00	18841.90	1.000	1.00	1.00	1.000	59942.00	18841.90	1.000
Iles (Ro > 1.1) Advanced High	1.00	1.00	1.000	31817.30	8982.27	1.000	1.00	1.00	1.000	31817.30	8982.27	1.000
	1.00	1.00	1.000	31817.30	8982.27	1.000	1.00	1.00	1.000	31817.30	8982.27	1.000
Iles Transition Advanced High	1.00	1.00	1.000	12354.80	3978.30	1.000	1.00	1.00	1.000	12354.80	3978.30	1.000
	1.00	1.00	1.000	12354.80	3978.30	1.000	1.00	1.00	1.000	12354.80	3978.30	1.000
Rollins/Trout Cr. (Ro>1.1) Advanced High	1.00	1.00	1.000	1508.35	804.32	1.000	1.00	1.00	1.000	1508.35	804.32	1.000
	1.00	1.00	1.000	1508.35	804.32	1.000	1.00	1.00	1.000	1508.35	804.32	1.000
Rollins/Trout Cr. trans. Advanced High	1.00	1.00	1.000	261.69	119.90	1.000	1.00	1.00	1.000	261.69	119.90	1.000
	1.00	1.00	1.000	261.69	119.90	1.000	1.00	1.00	1.000	261.69	119.90	1.000
TIGHT GAS SANDS - Advanced High	1.00	1.00	6.000	32704.11	35153.86	6.000	1.00	1.00	6.000	32704.11	35153.86	6.000
	6.00	5.11	1.000	196224.64	48141.34	1.000	6.00	5.11	1.000	196224.64	48141.34	1.000

Table 61. Calculation of aggregated recoverable gas using the high future advanced technology recovery factor and a .75 degree of dependency.

TIGHT GAS SANDS - Advanced High ESTIMATED RESOURCES IN PLACE

	Mean	Std. Dev.	F95	F75	F50	F25	F05
OIL (Billions of BBLs)							
Accumulation Size	0.001000	0.001000	0.0002	0.0004	0.0007	0.0012	0.0028
Cond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
Uncond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
NON-ASSOCIATED GAS (Trillions of CuFt)							
Accumulation Size	32.70411	35.15386	5.2694	12.335	22.276	40.230	94.170
Cond Aggregate Potential	196.2246	48.14134	128.04	161.90	190.57	224.33	283.65
Uncond Aggregate Potential	196.2246	48.14134	128.04	161.90	190.57	224.33	283.65
DISSOLVED GAS (Trillions of CuFt)							
Accumulation Size	0.001000	0.001000	0.0002	0.0004	0.0007	0.0012	0.0028
Cond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
Uncond Aggregate Potential	0.006000	0.005112	0.0014	0.0028	0.0046	0.0075	0.0154
GAS (Trillions of CuFt)							
Accumulation Size	32.70411	35.15386	5.2694	12.335	22.276	40.230	94.170
Cond Aggregate Potential	196.2246	48.14134	128.04	161.90	190.57	224.33	283.65
Uncond Aggregate Potential	196.2246	48.14134	128.04	161.90	190.57	224.33	283.65

Table 61

Total in-place gas	95th	Mean 1st method	Mean program	5th
Williams Fork basin center	133.00	205.568	200.76	287.93
Williams Fork transition	69.025	116.911	119.88	189.50
Iles basin center	43.149	71.950	70.705	107.31
Iles transition	14.030	24.134	24.710	39.431
Rlns.-Trout Cr. basin center	1.1690	3.428	3.0167	6.0614
Rlns.-Trout Cr. transition	0.2109	0.556	0.4758	0.8870
Aggregation at 75% dependency	274.45	422.55	419.55	605.33

Current low	95th	Mean program	5th
Williams Fork basin center	1.3300	2.0076	2.8693
Williams Fork transition	0.6902	1.1988	1.8950
Iles basin center	0.4315	0.7071	1.0731
Iles transition	0.2806	0.4942	0.7886
Rlns.-Trout Cr. basin center	0.0234	0.0603	0.1212
Rlns.-Trout Cr. transition	0.0063	0.0143	0.0266
Aggregation at 75% dependency	2.9217	4.4823	6.4842

Current most likely	95th	Mean program	5th
Williams Fork basin center	3.9900	6.0227	8.6078
Williams Fork transition	2.0707	3.5965	5.6849
Iles basin center	1.2945	2.1212	3.2192
Iles transition	0.8418	1.4826	2.3659
Rlns.-Trout Cr. basin center	0.0584	0.1508	0.3031
Rlns.-Trout Cr. transition	0.0211	0.0476	0.0887
Aggregation at 75% dependency	8.7537	13.4214	19.407

Current high	95th	Mean program	5th
Williams Fork basin center	13.300	20.076	28.693
Williams Fork transition	6.9025	11.988	18.950
Iles basin center	4.3149	7.0705	10.731
Iles transition	2.8059	4.9419	7.8862
Rlns.-Trout Cr. basin center	0.1169	0.3017	0.6061
Rlns.-Trout Cr. transition	0.0316	0.0714	0.1330
Aggregation at 75% dependency	29.039	44.4496	64.196

Table 62. Summary table listing 95%, mean, and 5% estimates of total in-place gas and of recoverable gas in the six plays using the six different recovery factors.

Future Low	95th	Mean program	5th
Williams Fork basin center	5.3200	8.0303	11.477
Williams Fork transition	2.7610	4.7954	7.5798
Iles basin center	1.7260	2.8282	4.2923
ILes transition	1.1224	1.9768	3.1545
Rlns.-Trout Cr. basin center	0.0701	0.1810	0.3637
Rlns.-Trout Cr. transition	0.0169	0.0381	0.0710
Aggregation at 75% dependency	11.649	17.8497	25.800

Future most likely	95th	Mean program	5th
Williams Fork basin center	19.950	30.114	43.039
Williams Fork transition	12.424	21.579	34.109
Iles basin center	6.4723	10.606	16.096
Iles transition	2.8059	4.9419	7.8862
Rlns.-Trout Cr. basin center	0.2338	0.6033	1.2123
Rlns.-Trout Cr. transition	0.0464	0.1047	0.1951
Aggregation at 75% dependency	44.233	67.9483	98.393

Future high	95th	Mean program	5th
Williams Fork basin center	59.850	90.341	129.12
Williams Fork transition	34.512	59.942	94.748
Iles basin center	19.417	31.817	48.288
Iles transition	7.0148	12.355	19.715
Rlns.-Trout Cr. basin center	0.5845	1.5083	3.0307
Rlns.-Trout Cr. transition	0.1160	0.2617	0.4878
Aggregation at 75%	128.04	196.225	283.65

Table 62