GEOLOGIC REPORT

On The

S. O. S. G r o u p

of

SHALE CLAIMS

GARFIELD Co.

Colo.

By

Dean E. Winchester

1924

Report furnished by Dean E. Winchester, Denver, Colo.

DEAN E. WINCHESTER

Consulting Geologist
607 E. & C. Bldg.,
Denver, Colo.

GEOLOGICAL REPORT ON THE S. O. S. GROUP OF OIL SHALE CLAIMS, GARFIELD COUNTY, Colorado.

GEOGRAPHY.

LOCATION AND AREA.

The S.O.S. group of Oil-Shale Claims includes more than 11,000 acres of land, located in the upper reaches of Clear Creek, Garfield County, Colorado. DeBeque the nearest railroad point is approximately 18 miles south of the southern boundary of the property. The claims are arranged so as to command not only all the outcrop of the rich oil-shale zone for a distance of approximately eight miles along both sides of Clear Creek, but cover all of the valley land, and much of the land back of this outcrop. Of the 11220 acres included within the group, approximately 7650 acres are actually underlain by shale of the richer or Mahogany oil-shale zone, and practically every foot of the area is underlain by shale which will some day be mined and treated for its oil value.

TOPOGRAPHY

Along Clear Creek, the richer oil-shale beds weather into impassible cliffs, which rise as nearly vertical walls 300 to 500 feet high. Within the area covered by this report, only two trails, passable to animals, cross from the valley below to the grass covered hills back of the cliff. One of these trails has been used by cattle men since the early days, while the other has only recently been built by the owners of the oil-shale claims. Between the base of the cliff and the valley, 800 to 900 feet below, is steep talus slope which is in places covered with pine and spruce trees of good size. Above and back from the cliff the surface is rolling, grass-covered, and for the most part open, altho viewed from the valley below, it appears as a great flat topped mesa. The photographs accompanying this report are included to more clearly depict the topographic features of the area namely, (a) The cliff, - (b) The Steep Slope below, - (c) More or less flat bottom land of the valley, and - (d) The Rolling upland.

DRAINAGE AND WATER SUPPLY.

Drainage of the area is thru Clear Creek, the principal tributary of Roan Creek, which latter stream joins the Colorado River near DeBeque. Excellent water in considerable quantity is to be found in Clear Creek at all seasons of the year, while during the spring when the heavy snows of the upland are melting, the flow of Clear Creek and each of its tributaries is greatly increased. When the oil-shale industry is established in Clear Creek Canyon, dams and reservoirs will be built across the valleys above the cliff in order to take advantage of this excess flood water flow to furnish the needed water for camps and plants.

ACCESSIBILITY

At the present time, the nearest railroad point is DeBeque on the main line of the D. & R. G. W., 18 miles distant, but it will be possible to build a spur on very reasonable grade up Roan and Clear Creeks to the center of the property. A good automobile road extends up Clear Creek as far as Parks Ranch near the southern edge of the S.O.S. Group.

GEOLOGY.

The Colorado oil-shales belong to what is known as the Green River formation (Tertiary). The formation has a total thickness of something over 2000 feet of

which probably 99% is shale, which will yield at least a small amount of oil when distilled.

The most persistently rich zone of shale is found near the foot of the cliff in the Clear Creek district, and is brown color. On the S.O.S. properties, this zone of shale was examined and sampled along the trail in Cottonwood Creek, and found to be 19 feet 7 inches thick, and according to tests made by Paul S. Nice, Chemist of Denver, (one of the most able and best equipped shale chemists in the United States), this thickness will give an average of 40.8 gallons per ton or 39820 bbls. of oil per acre of land.

The Mahogany zone is known to be exceptionally uniform in thickness and oil yielding capacity over vast areas in Garfield County, and it is safe to assume that it is fairly uniform under the entire 7650 acres of the S.O.S. group, which lie back of the cliff line. If mined by methods which will permit the recovery of 75% of the shale in the ground, this bed alone on the S.O.S. property should yield 228 million barrels of shale oil.

The valuable products manufactured from oil-shale will probably include in addition to shale-oil, a fertilizer made by converting the nitrogen of the shale into Ammonium Sulphate. Based upon research done by the writer while connected with the United States Geological Survey, it is estimated that should 60% of the nitrogen in the Mahogany ledge on the S.O.S. Claims be converted into fertilizer, the property would yield nearly four million tons of Ammonium Sulphate in addition to the oil.

Above and below the Mahogany ledge, the Green River formation on the S.O.S. properties, contains beds of shale of workable thickness and richness, but due to snow which covered the outcrops at the time of the writer's examination in March 1924, it was impractical to attempt a complete examination and sampling of the formation. However, the following section was measured and samples taken.

SECTION OF PART OF THE OIL SHALE BEDS
ALONG TRAIL IN COTTONWOOD CANYON.

	S.O.S. GROUP	Ft.	Inches
Top	Sandstone marker		9
	Shale lean	3	7
	Shale - Sample #5 yield 40.7 gals. oil per ton.	11	3
	Shale - Sample #6 yield 38.3 Gals. oil per ton	8	4
	Interval - approx.	50	
	Shale sample #4 yield 14.3 gals. oil per ton.	8	0
	Shale sample #3 yield 27.5 gals. oil per ton.	12	6
	Interval	3	0
	Shale sample #2 yield 23.9 gals. oil per ton	5	8
	Shale sample #1 yield 26.3 gals. oil per ton	5	8

Careful sampling of the formation in Parachute Canyon a few miles to the east of the S.O.S. Claims by A.S. Crossfield for the Union Oil Co. of California, has shown that in that area there are at least a dozen beds of shale each of which is sufficiently rich and thick to be attractive. The combined oil yielding capacity of those beds in that area was three times the capacity of the Mahogany ledge alone. Should this ratio hold for the beds underlying the S.O.S. Claims, and there seems no reason to doubt that it does, then the combined oil yielding capacity of the more attractive oil-shale beds on the property may be 700 million bbls., or an amount approximately equal to all of the oil produced by the combined oil fields in the U.S. during the year 1923

The Oil Shale.

By definition, oil-shale is a shale which will yield oil when heated, but which contains practically no free oil.

The oil produced from oil-shale is probably manufactured (in the treatment) from the partly decayed organic material (largely vegetal) contained in the shale and it has recently been proven that it is possible to control the character of the products manufactured by controlling the heat, pressure and time factors used in this process. By the simplest methods of distillation, an oil is produced which may be refined, giving 10-20% gasoline, but it may be practical to increase this percentage if the demand for gasoline warrants.

Oil shale contains nitrogen which may be the source of additional value for the manufacture of Ammonium Sulphate, especially in the richer shales where the nitrogen percentage is correspondingly high.

There are several different types of oil-shale but the more common type is that exhibited by the Mahogany ledge shale. This shale is dark brown to back in color, fine-grained and without grit, laminated and has a specific gravity inversely proportionate to its oil yielding capacity. Oil-shale is more or less rubbery and hard to break. A thin splinter of shale will burn with a smoky flame when ignited with a match.

Oil-shale of the type of the Mahogany shale will contain probably 60% ash or refuse, the disposal of which will add expense, and in some localities a serious problem. Fortunately the S.O.S. Group of Claims includes a larger amount of land appropriate and convenient for dump space.

Because of its rubbery character, the breaking of the shale in mining will doubtless require explosives specially adapted to the shale, but no doubt such a powder will be available when needed. After coming from the mine, the shale may have to be crushed before it is delivered to the retorts. However, experience has taught the Scotch in their oil-shale industry, and experiments have proven with American shale that fine crushing of shale is unnecessary, and of very doubtful advantage. Retorts will be built which will treat the shale practically as it comes from the mine, thus eliminating one of the very great and expensive problems of the industry, for it has been estimated that the crushing of oil-shale to pass even a ½ inch screen will add several cents per ton to the cost of treatment.

ECONOMIC FACTORS.

The relative value of an oil-shale deposit or property depends upon a large number of factors, - (1) The shale, - (2) Location and accessibility, - (3) Topography and water supply, - (4) Timber supply, etc.

A study of these factors as applying to the S.O.S. property results in the following summary:

(1) Of shale there is an abundance, and rich, the estimated oil yielding capacity of the tract should only the Mahogany ledge be mined, being 228 million bbls. Should a single plant producing 5000 bbls. of oil per day be installed, the S.O.S. Group of Claims, contains sufficient shale to keep the plant in operation for 125 years.

(2) The S.O.S. Shale properties are at present reached by good automobile road, and could be connected by easily constructed railroad spur from DeBeque, 18 miles away, where connection will be made with the main standard gauge line of the D. & R.G. Western Ry. On the S.O.S. property, the Mahogany ledge is only about 800 feet above the bottom land in Clear Creek Valley as compared to a difference in elevation of 1500 to 2000 feet in other areas, nearer the railroad. Thus it will be possible to lower the shale from the mines to the retorts in the valley below at comparatively small expense.

(3) On the S.O.S. property, the Mahogany ledge outcrops in continuous cliff exposures for a distance of probably 16 miles affording an abundance of points of entrance for mining.

The oil shale industry will demand lands appropriate and available for the building of towns, plants, and for the disposal of an immense amount of spent or waste shale. Along the valley of Clear Creek within the area covered by the S.O.S. property, there are numerous areas suitable for these purposes. One particularly large flat tract is located near the mouth of Cottonwood Creek, near the middle of the group, and is shown in the photo (plate -1).

Water supply for camp, plant and mine uses is available in Clear Creek, - either as surplus flow from melting snows to be stored in reservoirs to be constructed preferably just above the cliff, or by the purchase of water rights from ranches located along the valley of Clear Creek between the property and the confluence of Clear and Roan Creeks.

(4) Timber supply is available on the property, many of the north slopes being covered with good spruce as is shown in several of the photos.

SUMMARY.

The S.O.S. group of oil-shale claims is most admirably located, contains an abundance of rich oil-shale, and by its location covering all the outcrop of the shale for miles along each side of Clear Creek, practically controls a larger area of shale which lies back of it to the north.

As regards the factors affecting development such as topography, water supply and timber, there are very few tracts of oil-shale land in Colorado which have any advantage over the S.O.S. group.

In view of the advantages of this property and especially the almost certain prospect that in the very near future, shale-oil will be in demand to assist the petroleum industry in supplying the ever increasing demand for petroleum products, I can unhesitatingly recommend the S.O.S. group of shale claims for acquisition and development.

Respectfully submitted,

Dean E, Winchester,

Denver, Colorado
April 19, 1924.