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Environmental Pollution in Nigeria: A Comparative Study of Oil Spills Pollution among Oil Companies in the Niger Delta

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Abstract: This study examines the variation in oil spills pollution among the oil companies in the Niger Delta from 2016 – 2020. The study seeks to achieve two specific objectives and is been guided by two research questions and two null hypothesis were formulated. The study adopted *ex-post facto* research design. The study uses judgemental sampling technique comprising seventeen (17) oil companies from the oil industry in Nigeria. Analysis of Variance (ANOVA) was used to analyse the data. The study revealed that there is a similarity in variation of oil spills between 2016-2020. The study further revealed that there is a strong and significant variation in oil spills among the oil companies during the period. The study therefore concludes that there is an increase in oil spills variation among oil companies in the Niger Delta. The study recommends that oil companies in the Niger Delta should routinely check their pipelines and change old ones to avoid ruptured pipes which results in oil spill. Also the study further recommends that the oil companies should maintain a healthy and cordial relationship with their host communities so as to avert sabotage (deliberate breaking of pipelines) which is a major cause of oil spill in the Niger Delta.

Key words: Environmental Pollution, Oil Spills, Oil Companies

1.0 Introduction

The environment is thought of as the natural world or ecosystem. It is describe as the physical surrounding in which people, animals and plants live. The environment as a system interacts with its elements/components which results in each influencing the other. Okafor (2018) assert that man as part of the biotic components of the environment in turn affects the environment and the environment in turn affect man. The environment has plays a key role in the sustainability of mankind by providing food, water and air and other necessities of live. Ifeoma 2015, supporting this assertion opine that the environment around us has constitute a ‘’life support system’’.

The environment is the whole surrounding of man consisting of everything around us both biotic and abiotic. The natural environment of man comprise of the ecosystem consisting of all living things including micro-organisms. The natural environment entails everything thing that is not made by man.

There is also the human environment. This is man-made environment that has been modified by man to suit his needs. Man-made environment are built by man and include cities, parks buildings, gardens, bridges etc. This man-made environment is seen today as the major cause of pollution, although pollution also comes from the natural environment such as forest fires, volcanoes, earthquakes, etc. These events occur seldomly compared to that from the man-made environment such as oil spills, blow- out, gas flaring etc.

Pollution is the introduction of harmful substances into the environment to alter the course of nature. The harmful substances are referred to as pollutants.

The environment is very central to our human existence. This is predicated on the fact that our life sustainability depends on the environmental quality, including environmental goods and services as well as other derivatives from the environment.

The environment is endowed with abundant natural resources and man in his quest to exploit the natural endowment has resulted in environmental pollution the world over and Nigeria in particular.

Nigeria is blessed with abundant natural resources among which is crude oil popularly referred to as ‘’black gold’’. Since its discovery over five decades ago, Nigeria has been operating a mono-economy with all its dependence on oil. This has led to increase in oil activities both onshore and offshore. Oil which is now the primary base of Nigeria‘s economy has become a major source of environmental pollution to their host communities.

1.2 Statement of Problem

Over the years, oil exploration, production and refinement in Nigeria has culminated in various environmental and ecological problems such as oil spills, gas flaring, habitat destruction, air and water pollution

and degradation etc. The oil spills often affects the productive capacity of the land, pollute water bodies thereby causing irreparable damage to the arable land and aquatic lives.

Oil spill is a significant environmental problem in Nigeria. Nigeria emits approximately 80millions metric tonnes of carbon dioxide annually (USEIA 2016) this adversely affects the socio-economic activities of the host communities whose means of livelihood are based on the fishing and farming. Following more than 50 years of oil and gas exploration and production Nigeria has suffered extensive environmental degradation occasioned by oil spills and gas flaring. Despite the nation's commitment to climate change action, the country still dependence on fossil fuels – a major source of green house gases. Though Nigeria ranked among top gas flaring nations, yet, her end to gas flaring seems illusive, this is due to her continual shifting of date to end gas flaring e.g from 2005 to 2008 to 2010 to 2020 and most recently to 2030.

1.3 Objectives of the Study

The main objective of this study is to examine the variation in oil spill pollution among the oil companies operating in the Niger Delta region of Nigeria. Other specific objectives are to;

1. Ascertain the variation in oil spill pollution between 2016-2020
2. Determine the variation in oil spill pollution among the oil companies in the Niger Delta.

1.4 Research Questions

In line with the study objectives, the study will be guided by the following research questions.

1. What is the variation in oil spill pollution between 2016 - 2020?
2. What is the variation in oil spill pollution among the oil companies in the Niger Delta?

1.5 Research hypothesis

The following hypothesis will guide the study

1. There is no significant variation in oil spill pollution between 2016-2020.
2. There is no significant variation in oil spill pollution among the oil companies in the Niger Delta.

2.0 Review of Related Literature

2.1 Review of oil companies in Nigeria

Oil exploration in Nigeria dates back to 1908 with the pioneer prospecting activities of the Nigerian Bitumen Company (NBC). This however did not last following the outbreak of the World War 1 in 1914 (Ite and Ibok 2013). The colonial government later granted the NBC exploration rights in Nigeria due to lack of a competent British Oil company to undertake exploration operations and subsequently this led to the merger between Royal Dutch Shell and William Knox D'Arcy in 1930. The British colonial government subsequently showed support and/or commitment towards the joint venture between Royal Dutch Shell and William Knox D'Arcy (Shell D'Arcy) with the approval of a loan of £25,000 for NBC (Umejesi and Akpan 2013).

In 1939, British Petroleum (a consortium of Royal Dutch Shell and William Knox) was granted a sole concessionary right to explore petroleum hydrocarbons over the whole country and prospecting later began in 1938 (Ite et al 2013). Although the world war II (1939-1945) did disrupt the initial oil exploration activities of shell D'Arcy later (British Petroleum), exploration operations in the Niger delta region resumed in 1946 and crude oil reserves were discovered in commercial quantities in 1956 near Oloibiri community in Ogbia local government Area in Beyelsa state (Pearson 1970), Haack, Sundaraman, Diejomahar, Xian, Gant, May and Kelsh 2000). In February 1958, shell D'Arcy (now Shell British Petroleum) with an average of 6000 barrels of crude oil per day (bopd) began exporting crude oil produced from Oloibiri and Afam oil fields in Port Harcourt (Haack et al 2000 and Ite et al 2013). Due to the contributions of crude oil towards economic developments, the sole concession rights over the whole country earlier granted to Shell-British Petroleum was reviewed in 1959 and exclusive rights were extended to other multinational oil companies which encouraged accelerated exploration (Adelemo and Baba 1993, Baumberg, 2000). Prior to Nigeria's independence on October 1 1960, non-British oil companies such as Mobil Exploration Nigeria (later incorporated as Mobil Producing Nigeria on 6th June 1969 was granted oil exploration license in 1955, Tenneco in 1960, Golf Oil and later Chevron in 1961, Agip in 1962 and Elf in 1962.

The increased dominance of the Nigerian economy by oil sector following independence prompted the Federal Government to review the sole concession policy and exclusive exploration rights was issued to several other multinational oil companies (Ite et al 2013). Despite the adverse impact of the Nigerian civil War (1967-1970) petroleum resources export were the main driver for infrastructural development in the country that subsequently led to the establishment of Department of Petroleum Resources (DPR) Inspectorate in 1970. In other for the country to secure an efficient, economic and regular supply of petroleum resources to consumers, Nigeria joined the Organisation of Petroleum Exporting Countries (OPEC) in 1971.

Over the years, technological advances in oil exploration activities have resulted in the discovery of more oil and gas reserves in the Niger Delta region and increased production rate put Nigeria on the front burner among the major oil producing country around the world. Over the past six decades most of these multinational oil companies have recorded considerable successes in petroleum exploration, production and development in about 159 oil fields and over 1481 oil wells located within the Nigeria's Niger Delta region (Oku, 2014).

2.2 Oil Spill Pollution in Nigeria

Nigeria petro businesses, a review of Nigeria's energy and petrochemical industry reveals that between 1976 to 1990, a total of 2,796 oil spills incidences were reported involving an estimated 2,105,393 barrels of oil seeping through floating on or devastating the country's terrestrial coastal and offshore, human and marine environments. This has increased tremendously from the late `90's through 2016 with a major spill occurring in 2008 at Bodo City in Ogoniland.

Prospecting for oil affects the environment at every stage of the process, from finding oil reserves to waste disposal. Pollution is the addition of any substance or form of energy (e.g. heat, harmful substance, solid waste etc) to the environment at a rate faster than the environment can accommodate it by dispersion, breakdown, recycling or storage in some harmful form. Sources of oil spill pollution include;

- Massive single spillage resulting from a spill of overflowing storage tank, overturned transport vehicles and fractured pipeline.
- Smaller, but perhaps repetitive, losses, which often arises from careless, handling at small factories and similar installations or the surreptitious dumping of their waste oils.

Oil pollution of water bodies usually arise from spillage, pipeline breakage, leakage at drilling rigs, disposal of used oil or lubricant, gas flaring and usage of chemicals. Any of these situations may lead to the destruction of extinction of wildlife habitat, plant, birds and marine life contamination of drinking waters destruction of property and means of livelihood of the inhabitant, health risk to mankind, fire outbreak and depletion of the ozone layer and forest (Olusoga, 2007).

3.0 Methodology

In carrying out this study, *expost-facto* research design was adopted. The study makes use of secondary data sourced from the National Oil Spills Detection and Regulatory Agency (NOSDRA) yearly bulletin for (2016-2020). The population of the study covers twenty (28) Oil companies. The sample for the study comprise of seventeen (17) oil companies out of the population. The sampled companies were selected based on the volume of spills in order to enhance easy comparability and variation of the required data.

4.0 Data presentation and Analysis

Research Question 1

Table 4.1 Variation in Oil Spills pollution between 2016- 2020

Years	*No. of Companies*	*Sum*	*Average*
2016	17	40947	2408.647
2017	17	28574	1680.824
2018	17	26102	1535.412
2019	17	38801	2282.412
2020	17	16824	989.6471

Result from Table4.1 shows that in 2016, there was a sum total of oil spill amounting to 40, 947 barrels with an average spill of 2,408.65 barrels.

In 2017, as seen from the table above the total sum of 28,574 barrels of oil were spilled with an average of 1,680.83 barrels. In 2018, as observed in table 4.1 above, the sum of 26,102 barrels of oil spill occurred with an average of 1,535.41 barrels. 2019 witnessed a total sum of 28,801 barrels of oil spill resulting in an average sum of 2,282.41 barrels.

The year 2020, experience a total sum of 16,824 barrels of oil spill amounting to an average of 989.65 barrels.

The average of the oil spills from 2016 to 2020 the period cover by this study is presented in a pie chart below;

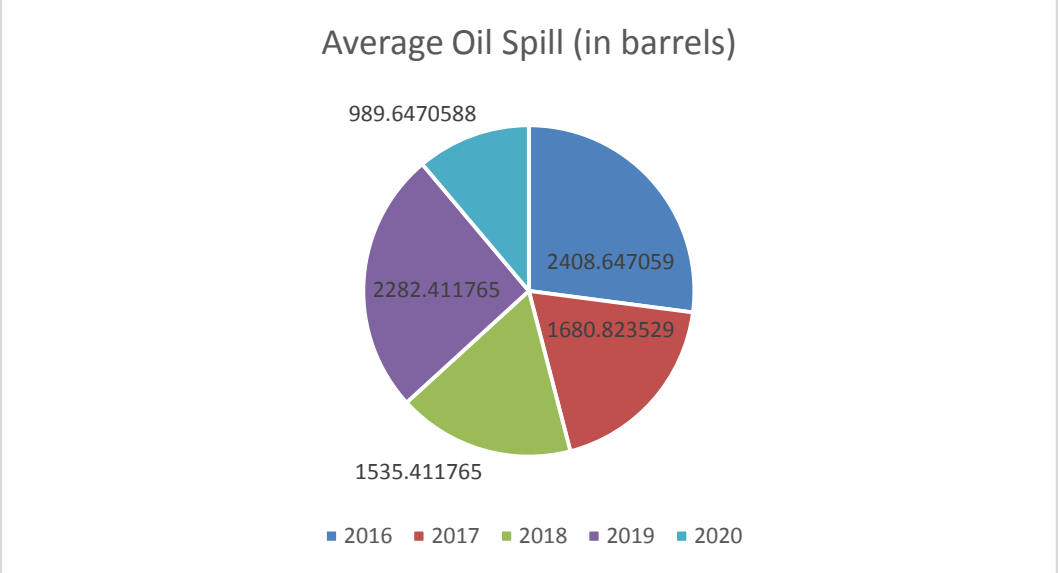

Table 4.2 ANOVA for variation in oil spill pollution between 2016- 2020

Source of Variation	*SS*	*df*	*MS*	*F-cal*	*P-value*	*F-crit*
Between Groups	22812809.72	4	5703202	0.401595	0.806959	2.485885
Within Groups	1136110006.47	80	14201375			
Total	1158922816.19	84				

Table 2 shows that F (4, 80) = 0.402, p >0.05. Based on this result the null hypothesis was accepted. This indicates that there is no significant variation in oil spill pollution between 2016 and 2020. This implies that there was similarity in the oil spill pollution within the period.

Research Question 2

Table 4.3 variation in oil spill pollution among the oil companies in the Niger Delta

Groups/Companies	*No. of Years*	*Sum*	*Average*	*Variance*
SPDC	5	57754	11550.8	3326559.2
NAOC	5	17332	3466.4	2893700.8
EROTON EP	5	9828	1965.6	5263127.3
SEPLAT	5	161	32.2	1294.7
HERITAGE	5	10804	2160.8	6192111.2
FIRST	5	492	98.4	33890.3
NDWEST	5	4834	966.8	734418.7
CHEVRON	5	563	112.6	43045.3
ERL	5	145	29	1716.5
AITEO E&P	5	17598	3519.6	7109742.3
PPMC	5	975	195	13666
TOTAL	5	2075	415	674211.5
PLATFORM	5	52	10.4	146.8
NPDC	5	28338	5667.6	81158180.3
ESSO	5	72	14.4	1036.8
ADDAX	5	219	43.8	3264.2

FORTE OIL PLC	5	6	1.2	7.2

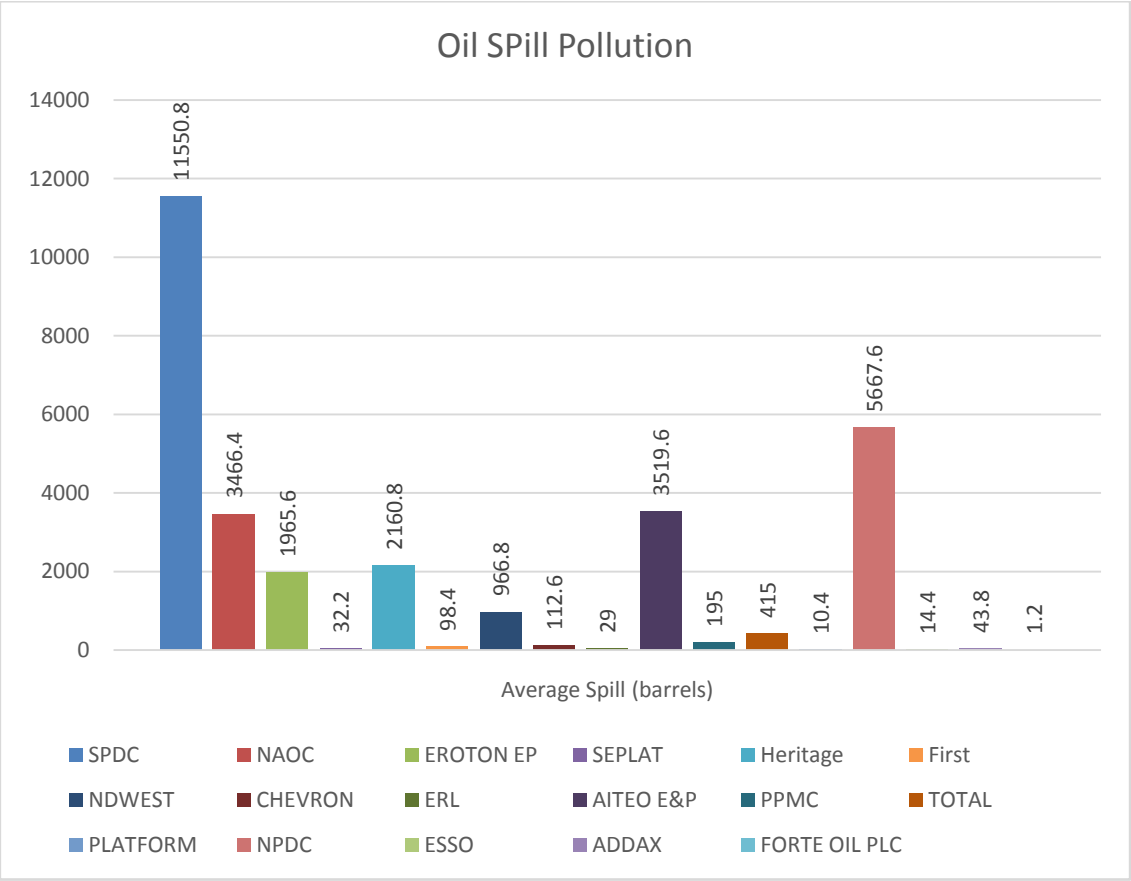

Table 4.4 ANOVA for variation in oil spills pollution among oil companies in the Niger Delta.

Source of Variation	*SS*	*df*	*MS*	*F-cal*	*P-value*	*F-crit*
Between Groups	729122340	16	45570146.24	7.21	0.00	1.79
Within Groups	429800476	68	6320595.24			
Total	1158922816	84				

The result from Table 4 shows a significant variation in oil spill pollution among the companies. Consequently, there is need to conduct a post hoc test to ascertain where the difference occurred, which is shown in Table 5 (see Appendix).

As shown in Table 5, there was a significant difference in oil spill pollution between SPDC and EROTON (p = 0.01 <0.05). There was also significant difference in oil spill pollution between SPDC and SEPLAT (p=0.00 □ 0.05).

Again, as revealed in Table 5, there was a significant difference in oil spill pollution between SPDC and HERITAGE (0.014 □ 0.05). Also, there exist significant difference in oil spill variation between SPDC and FIRST Oil (0.00□ 0.05). Table 5 further reveal that there is a significant difference in oil spill pollution between SPDC and NDWEST (0.00□ 0.05). SPDC and CHEVRON also has significant variation in oil spill pollution (0.00□ 0.05).

There also exist significant difference in oil spill pollution between SPDC and ERL (0.00 □ 0.05). In the same vein SPDC and PPMC has a significant difference in oil spill pollution (0.00□ 0.05). SPDC and TOTAL has a significant difference in oil spill pollution (0.01 □ 0.05).

Table 5; again reveal that there is significant difference in oil spill variation between SPDC and PLATFORM Oil (0.00 □ 0.05). Also, there is a significant difference in oil variation between SPDC and ESSO Oil (0.00 □ 0.05). There also exists a significant difference between SPDC and ADDAX as well as FORTE (0.00 □ 0.005)

Hypothesis Testing

Hypothesis 1: There is no significant variation in oil spill between 2016-2020

The ANOVA result showed an F- calculated value of 0.401595 and P- value of 0.806959. The P- value from the result is greater than 0.05 level of significance. The ANOVA result indicates that there is no significant variation in oil spill between 2016-2020 in the Niger Delta. Based on the analysed result, the study accepts the null hypothesis and therefore concludes that there is no variation in oil spill between 2016-2020 in the Niger Delta.

Hypothesis 2: There is no significant variation in oil spill among oil companies in the Niger Delta.

The analysed result on significant variation in oil spill among oil companies in the Niger Delta showed an F-calculated value of 7.21 and P- value of 0.00. The P- value from the result is less than 0.05 level of significance. The ANOVA result indicates that there is significance variation in oil spill among the oil companies in the Niger Delta. Based on the analysed result, the study rejects the null hypothesis and accepts the alternative hypothesis and therefore concludes that there is significant variation in oil spill among oil companies in the Niger Delta.

5.0 Conclusion and Recommendation

This study was carried out to investigate variation in oil spill pollution among oil companies in the Niger Delta. The analysed result of the study revealed that there is no variation in oil spill pollution between 2016-2020. The study rather showed that there is a similarity in oil spill pollution during the period. The study further revealed that there is significant difference in variation of oil spill pollution among the oil companies particularly between SPDC and others oil companies. The study therefore recommends that oil companies in the Niger Delta should routinely check their pipelines and change old ones to avoid ruptured pipes which results in oil spill. Also the study further recommends that the oil companies should maintain a healthy and cordial relationship with their host communities so as to avert sabotage (deliberate breaking of pipelines) which is a major cause of oil spill in the Niger Delta.

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Appendix

Table 5: Result of Post Hoc Test

(I) Companies	(J) Companies	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
SPDC	NAOC	8084.400	1590.043	.088	-435.76	16604.56
	EROTON	9585.200*	1590.043	.010	1065.04	18105.36
	SEPLAT	11518.600*	1590.043	.000	2998.44	20038.76
	HERITAGE	9390.000*	1590.043	.014	869.84	17910.16
	FIRST	11452.400*	1590.043	.000	2932.24	19972.56
	NDWEST	10584.000*	1590.043	.002	2063.84	19104.16
	CHEVRON	11438.200*	1590.043	.000	2918.04	19958.36
	ERL	11521.800*	1590.043	.000	3001.64	20041.96
	AITEO	8031.200	1590.043	.094	-488.96	16551.36
	PPMC	11355.800*	1590.043	.000	2835.64	19875.96
	TOTAL	11135.800*	1590.043	.001	2615.64	19655.96
	PLATFORM	11540.400*	1590.043	.000	3020.24	20060.56
	NPDC	5883.200	1590.043	.620	-2636.96	14403.36
	ESSO	11536.400*	1590.043	.000	3016.24	20056.56
	ADDAX	11507.000*	1590.043	.000	2986.84	20027.16
	FORTE	11549.600*	1590.043	.000	3029.44	20069.76
NAOC	SPDC	-8084.400	1590.043	.088	-16604.56	435.76
	EROTON	1500.800	1590.043	1.000	-7019.36	10020.96
	SEPLAT	3434.200	1590.043	.996	-5085.96	11954.36
	HERITAGE	1305.600	1590.043	1.000	-7214.56	9825.76
	FIRST	3368.000	1590.043	.997	-5152.16	11888.16
	NDWEST	2499.600	1590.043	1.000	-6020.56	11019.76
	CHEVRON	3353.800	1590.043	.997	-5166.36	11873.96
	ERL	3437.400	1590.043	.996	-5082.76	11957.56
	AITEO	-53.200	1590.043	1.000	-8573.36	8466.96
	PPMC	3271.400	1590.043	.998	-5248.76	11791.56
	TOTAL	3051.400	1590.043	.999	-5468.76	11571.56
	PLATFORM	3456.000	1590.043	.996	-5064.16	11976.16
	NPDC	-2201.200	1590.043	1.000	-10721.36	6318.96
	ESSO	3452.000	1590.043	.996	-5068.16	11972.16
	ADDAX	3422.600	1590.043	.996	-5097.56	11942.76
	FORTE	3465.200	1590.043	.995	-5054.96	11985.36
EROTON	SPDC	-9585.200*	1590.043	.010	-18105.36	-1065.04
	NAOC	-1500.800	1590.043	1.000	-10020.96	7019.36
	SEPLAT	1933.400	1590.043	1.000	-6586.76	10453.56
	HERITAGE	-195.200	1590.043	1.000	-8715.36	8324.96
	FIRST	1867.200	1590.043	1.000	-6652.96	10387.36
	NDWEST	998.800	1590.043	1.000	-7521.36	9518.96
	CHEVRON	1853.000	1590.043	1.000	-6667.16	10373.16
	ERL	1936.600	1590.043	1.000	-6583.56	10456.76
	AITEO	-1554.000	1590.043	1.000	-10074.16	6966.16
	PPMC	1770.600	1590.043	1.000	-6749.56	10290.76
	TOTAL	1550.600	1590.043	1.000	-6969.56	10070.76
	PLATFORM	1955.200	1590.043	1.000	-6564.96	10475.36
	NPDC	-3702.000	1590.043	.991	-12222.16	4818.16
	ESSO	1951.200	1590.043	1.000	-6568.96	10471.36
	ADDAX	1921.800	1590.043	1.000	-6598.36	10441.96

	FORTE	1964.400	1590.043	1.000	-6555.76	10484.56
	SPDC	-11518.600*	1590.043	.000	-20038.76	-2998.44
	NAOC	-3434.200	1590.043	.996	-11954.36	5085.96
	EROTON	-1933.400	1590.043	1.000	-10453.56	6586.76
	HERITAGE	-2128.600	1590.043	1.000	-10648.76	6391.56
	FIRST	-66.200	1590.043	1.000	-8586.36	8453.96
	NDWEST	-934.600	1590.043	1.000	-9454.76	7585.56
	CHEVRON	-80.400	1590.043	1.000	-8600.56	8439.76
SEPLAT	ERL	3.200	1590.043	1.000	-8516.96	8523.36
	AITEO	-3487.400	1590.043	.995	-12007.56	5032.76
	PPMC	-162.800	1590.043	1.000	-8682.96	8357.36
	TOTAL	-382.800	1590.043	1.000	-8902.96	8137.36
	PLATFORM	21.800	1590.043	1.000	-8498.36	8541.96
	NPDC	-5635.400	1590.043	.697	-14155.56	2884.76
	ESSO	17.800	1590.043	1.000	-8502.36	8537.96
	ADDAX	-11.600	1590.043	1.000	-8531.76	8508.56
	FORTE	31.000	1590.043	1.000	-8489.16	8551.16
	SPDC	-9390.000*	1590.043	.014	-17910.16	-869.84
	NAOC	-1305.600	1590.043	1.000	-9825.76	7214.56
	EROTON	195.200	1590.043	1.000	-8324.96	8715.36
	SEPLAT	2128.600	1590.043	1.000	-6391.56	10648.76
	FIRST	2062.400	1590.043	1.000	-6457.76	10582.56
	NDWEST	1194.000	1590.043	1.000	-7326.16	9714.16
	CHEVRON	2048.200	1590.043	1.000	-6471.96	10568.36
HERITAGE	ERL	2131.800	1590.043	1.000	-6388.36	10651.96
	AITEO	-1358.800	1590.043	1.000	-9878.96	7161.36
	PPMC	1965.800	1590.043	1.000	-6554.36	10485.96
	TOTAL	1745.800	1590.043	1.000	-6774.36	10265.96
	PLATFORM	2150.400	1590.043	1.000	-6369.76	10670.56
	NPDC	-3506.800	1590.043	.995	-12026.96	5013.36
	ESSO	2146.400	1590.043	1.000	-6373.76	10666.56
	ADDAX	2117.000	1590.043	1.000	-6403.16	10637.16
	FORTE	2159.600	1590.043	1.000	-6360.56	10679.76
	SPDC	-11452.400*	1590.043	.000	-19972.56	-2932.24
	NAOC	-3368.000	1590.043	.997	-11888.16	5152.16
	EROTON	-1867.200	1590.043	1.000	-10387.36	6652.96
	SEPLAT	66.200	1590.043	1.000	-8453.96	8586.36
	HERITAGE	-2062.400	1590.043	1.000	-10582.56	6457.76
	NDWEST	-868.400	1590.043	1.000	-9388.56	7651.76
	CHEVRON	-14.200	1590.043	1.000	-8534.36	8505.96
FIRST	ERL	69.400	1590.043	1.000	-8450.76	8589.56
	AITEO	-3421.200	1590.043	.996	-11941.36	5098.96
	PPMC	-96.600	1590.043	1.000	-8616.76	8423.56
	TOTAL	-316.600	1590.043	1.000	-8836.76	8203.56
	PLATFORM	88.000	1590.043	1.000	-8432.16	8608.16
	NPDC	-5569.200	1590.043	.716	-14089.36	2950.96
	ESSO	84.000	1590.043	1.000	-8436.16	8604.16
	ADDAX	54.600	1590.043	1.000	-8465.56	8574.76
	FORTE	97.200	1590.043	1.000	-8422.96	8617.36
	SPDC	-10584.000*	1590.043	.002	-19104.16	-2063.84
	NAOC	-2499.600	1590.043	1.000	-11019.76	6020.56
	EROTON	-998.800	1590.043	1.000	-9518.96	7521.36
	SEPLAT	934.600	1590.043	1.000	-7585.56	9454.76
	HERITAGE	-1194.000	1590.043	1.000	-9714.16	7326.16
	FIRST	868.400	1590.043	1.000	-7651.76	9388.56
	CHEVRON	854.200	1590.043	1.000	-7665.96	9374.36
NDWEST	ERL	937.800	1590.043	1.000	-7582.36	9457.96
	AITEO	-2552.800	1590.043	1.000	-11072.96	5967.36
	PPMC	771.800	1590.043	1.000	-7748.36	9291.96
	TOTAL	551.800	1590.043	1.000	-7968.36	9071.96
	PLATFORM	956.400	1590.043	1.000	-7563.76	9476.56
	NPDC	-4700.800	1590.043	.912	-13220.96	3819.36
	ESSO	952.400	1590.043	1.000	-7567.76	9472.56
	ADDAX	923.000	1590.043	1.000	-7597.16	9443.16
	FORTE	965.600	1590.043	1.000	-7554.56	9485.76

	SPDC	-11438.200*	1590.043	.000	-19958.36	-2918.04
	NAOC	-3353.800	1590.043	.997	-11873.96	5166.36
	EROTON	-1853.000	1590.043	1.000	-10373.16	6667.16
	SEPLAT	80.400	1590.043	1.000	-8439.76	8600.56
	HERITAGE	-2048.200	1590.043	1.000	-10568.36	6471.96
	FIRST	14.200	1590.043	1.000	-8505.96	8534.36
	NDWEST	-854.200	1590.043	1.000	-9374.36	7665.96
CHEVRON	ERL	83.600	1590.043	1.000	-8436.56	8603.76
	AITEO	-3407.000	1590.043	.996	-11927.16	5113.16
	PPMC	-82.400	1590.043	1.000	-8602.56	8437.76
	TOTAL	-302.400	1590.043	1.000	-8822.56	8217.76
	PLATFORM	102.200	1590.043	1.000	-8417.96	8622.36
	NPDC	-5555.000	1590.043	.720	-14075.16	2965.16
	ESSO	98.200	1590.043	1.000	-8421.96	8618.36
	ADDAX	68.800	1590.043	1.000	-8451.36	8588.96
	FORTE	111.400	1590.043	1.000	-8408.76	8631.56
	SPDC	-11521.800*	1590.043	.000	-20041.96	-3001.64
	NAOC	-3437.400	1590.043	.996	-11957.56	5082.76
	EROTON	-1936.600	1590.043	1.000	-10456.76	6583.56
	SEPLAT	-3.200	1590.043	1.000	-8523.36	8516.96
	HERITAGE	-2131.800	1590.043	1.000	-10651.96	6388.36
	FIRST	-69.400	1590.043	1.000	-8589.56	8450.76
	NDWEST	-937.800	1590.043	1.000	-9457.96	7582.36
ERL	CHEVRON	-83.600	1590.043	1.000	-8603.76	8436.56
	AITEO	-3490.600	1590.043	.995	-12010.76	5029.56
	PPMC	-166.000	1590.043	1.000	-8686.16	8354.16
	TOTAL	-386.000	1590.043	1.000	-8906.16	8134.16
	PLATFORM	18.600	1590.043	1.000	-8501.56	8538.76
	NPDC	-5638.600	1590.043	.696	-14158.76	2881.56
	ESSO	14.600	1590.043	1.000	-8505.56	8534.76
	ADDAX	-14.800	1590.043	1.000	-8534.96	8505.36
	FORTE	27.800	1590.043	1.000	-8492.36	8547.96
	SPDC	-8031.200	1590.043	.094	-16551.36	488.96
	NAOC	53.200	1590.043	1.000	-8466.96	8573.36
	EROTON	1554.000	1590.043	1.000	-6966.16	10074.16
	SEPLAT	3487.400	1590.043	.995	-5032.76	12007.56
	HERITAGE	1358.800	1590.043	1.000	-7161.36	9878.96
	FIRST	3421.200	1590.043	.996	-5098.96	11941.36
	NDWEST	2552.800	1590.043	1.000	-5967.36	11072.96
AITEO	CHEVRON	3407.000	1590.043	.996	-5113.16	11927.16
	ERL	3490.600	1590.043	.995	-5029.56	12010.76
	PPMC	3324.600	1590.043	.997	-5195.56	11844.76
	TOTAL	3104.600	1590.043	.999	-5415.56	11624.76
	PLATFORM	3509.200	1590.043	.995	-5010.96	12029.36
	NPDC	-2148.000	1590.043	1.000	-10668.16	6372.16
	ESSO	3505.200	1590.043	.995	-5014.96	12025.36
	ADDAX	3475.800	1590.043	.995	-5044.36	11995.96
	FORTE	3518.400	1590.043	.995	-5001.76	12038.56
	SPDC	-11355.800*	1590.043	.000	-19875.96	-2835.64
	NAOC	-3271.400	1590.043	.998	-11791.56	5248.76
	EROTON	-1770.600	1590.043	1.000	-10290.76	6749.56
	SEPLAT	162.800	1590.043	1.000	-8357.36	8682.96
	HERITAGE	-1965.800	1590.043	1.000	-10485.96	6554.36
	FIRST	96.600	1590.043	1.000	-8423.56	8616.76
	NDWEST	-771.800	1590.043	1.000	-9291.96	7748.36
PPMC	CHEVRON	82.400	1590.043	1.000	-8437.76	8602.56
	ERL	166.000	1590.043	1.000	-8354.16	8686.16
	AITEO	-3324.600	1590.043	.997	-11844.76	5195.56
	TOTAL	-220.000	1590.043	1.000	-8740.16	8300.16
	PLATFORM	184.600	1590.043	1.000	-8335.56	8704.76
	NPDC	-5472.600	1590.043	.744	-13992.76	3047.56
	ESSO	180.600	1590.043	1.000	-8339.56	8700.76
	ADDAX	151.200	1590.043	1.000	-8368.96	8671.36
	FORTE	193.800	1590.043	1.000	-8326.36	8713.96
TOTAL	SPDC	-11135.800*	1590.043	.001	-19655.96	-2615.64

	NAOC	-3051.400	1590.043	.999	-11571.56	5468.76
	EROTON	-1550.600	1590.043	1.000	-10070.76	6969.56
	SEPLAT	382.800	1590.043	1.000	-8137.36	8902.96
	HERITAGE	-1745.800	1590.043	1.000	-10265.96	6774.36
	FIRST	316.600	1590.043	1.000	-8203.56	8836.76
	NDWEST	-551.800	1590.043	1.000	-9071.96	7968.36
	CHEVRON	302.400	1590.043	1.000	-8217.76	8822.56
	ERL	386.000	1590.043	1.000	-8134.16	8906.16
	AITEO	-3104.600	1590.043	.999	-11624.76	5415.56
	PPMC	220.000	1590.043	1.000	-8300.16	8740.16
	PLATFORM	404.600	1590.043	1.000	-8115.56	8924.76
	NPDC	-5252.600	1590.043	.801	-13772.76	3267.56
	ESSO	400.600	1590.043	1.000	-8119.56	8920.76
	ADDAX	371.200	1590.043	1.000	-8148.96	8891.36
	FORTE	413.800	1590.043	1.000	-8106.36	8933.96
	SPDC	-11540.400*	1590.043	.000	-20060.56	-3020.24
	NAOC	-3456.000	1590.043	.996	-11976.16	5064.16
	EROTON	-1955.200	1590.043	1.000	-10475.36	6564.96
	SEPLAT	-21.800	1590.043	1.000	-8541.96	8498.36
	HERITAGE	-2150.400	1590.043	1.000	-10670.56	6369.76
	FIRST	-88.000	1590.043	1.000	-8608.16	8432.16
	NDWEST	-956.400	1590.043	1.000	-9476.56	7563.76
PLATFORM	CHEVRON	-102.200	1590.043	1.000	-8622.36	8417.96
	ERL	-18.600	1590.043	1.000	-8538.76	8501.56
	AITEO	-3509.200	1590.043	.995	-12029.36	5010.96
	PPMC	-184.600	1590.043	1.000	-8704.76	8335.56
	TOTAL	-404.600	1590.043	1.000	-8924.76	8115.56
	NPDC	-5657.200	1590.043	.690	-14177.36	2862.96
	ESSO	-4.000	1590.043	1.000	-8524.16	8516.16
	ADDAX	-33.400	1590.043	1.000	-8553.56	8486.76
	FORTE	9.200	1590.043	1.000	-8510.96	8529.36
	SPDC	-5883.200	1590.043	.620	-14403.36	2636.96
	NAOC	2201.200	1590.043	1.000	-6318.96	10721.36
	EROTON	3702.000	1590.043	.991	-4818.16	12222.16
	SEPLAT	5635.400	1590.043	.697	-2884.76	14155.56
	HERITAGE	3506.800	1590.043	.995	-5013.36	12026.96
	FIRST	5569.200	1590.043	.716	-2950.96	14089.36
	NDWEST	4700.800	1590.043	.912	-3819.36	13220.96
NPDC	CHEVRON	5555.000	1590.043	.720	-2965.16	14075.16
	ERL	5638.600	1590.043	.696	-2881.56	14158.76
	AITEO	2148.000	1590.043	1.000	-6372.16	10668.16
	PPMC	5472.600	1590.043	.744	-3047.56	13992.76
	TOTAL	5252.600	1590.043	.801	-3267.56	13772.76
	PLATFORM	5657.200	1590.043	.690	-2862.96	14177.36
	ESSO	5653.200	1590.043	.691	-2866.96	14173.36
	ADDAX	5623.800	1590.043	.700	-2896.36	14143.96
	FORTE	5666.400	1590.043	.687	-2853.76	14186.56
	SPDC	-11536.400*	1590.043	.000	-20056.56	-3016.24
	NAOC	-3452.000	1590.043	.996	-11972.16	5068.16
	EROTON	-1951.200	1590.043	1.000	-10471.36	6568.96
	SEPLAT	-17.800	1590.043	1.000	-8537.96	8502.36
	HERITAGE	-2146.400	1590.043	1.000	-10666.56	6373.76
	FIRST	-84.000	1590.043	1.000	-8604.16	8436.16
	NDWEST	-952.400	1590.043	1.000	-9472.56	7567.76
ESSO	CHEVRON	-98.200	1590.043	1.000	-8618.36	8421.96
	ERL	-14.600	1590.043	1.000	-8534.76	8505.56
	AITEO	-3505.200	1590.043	.995	-12025.36	5014.96
	PPMC	-180.600	1590.043	1.000	-8700.76	8339.56
	TOTAL	-400.600	1590.043	1.000	-8920.76	8119.56
	PLATFORM	4.000	1590.043	1.000	-8516.16	8524.16
	NPDC	-5653.200	1590.043	.691	-14173.36	2866.96
	ADDAX	-29.400	1590.043	1.000	-8549.56	8490.76
	FORTE	13.200	1590.043	1.000	-8506.96	8533.36
	SPDC	-11507.000*	1590.043	.000	-20027.16	-2986.84
ADDAX	NAOC	-3422.600	1590.043	.996	-11942.76	5097.56

	EROTON	-1921.800	1590.043	1.000	-10441.96	6598.36
	SEPLAT	11.600	1590.043	1.000	-8508.56	8531.76
	HERITAGE	-2117.000	1590.043	1.000	-10637.16	6403.16
	FIRST	-54.600	1590.043	1.000	-8574.76	8465.56
	NDWEST	-923.000	1590.043	1.000	-9443.16	7597.16
	CHEVRON	-68.800	1590.043	1.000	-8588.96	8451.36
	ERL	14.800	1590.043	1.000	-8505.36	8534.96
	AITEO	-3475.800	1590.043	.995	-11995.96	5044.36
	PPMC	-151.200	1590.043	1.000	-8671.36	8368.96
	TOTAL	-371.200	1590.043	1.000	-8891.36	8148.96
	PLATFORM	33.400	1590.043	1.000	-8486.76	8553.56
	NPDC	-5623.800	1590.043	.700	-14143.96	2896.36
	ESSO	29.400	1590.043	1.000	-8490.76	8549.56
	FORTE	42.600	1590.043	1.000	-8477.56	8562.76
	SPDC	-11549.600*	1590.043	.000	-20069.76	-3029.44
	NAOC	-3465.200	1590.043	.995	-11985.36	5054.96
	EROTON	-1964.400	1590.043	1.000	-10484.56	6555.76
	SEPLAT	-31.000	1590.043	1.000	-8551.16	8489.16
	HERITAGE	-2159.600	1590.043	1.000	-10679.76	6360.56
	FIRST	-97.200	1590.043	1.000	-8617.36	8422.96
	NDWEST	-965.600	1590.043	1.000	-9485.76	7554.56
	CHEVRON	-111.400	1590.043	1.000	-8631.56	8408.76
FORTE	ERL	-27.800	1590.043	1.000	-8547.96	8492.36
	AITEO	-3518.400	1590.043	.995	-12038.56	5001.76
	PPMC	-193.800	1590.043	1.000	-8713.96	8326.36
	TOTAL	-413.800	1590.043	1.000	-8933.96	8106.36
	PLATFORM	-9.200	1590.043	1.000	-8529.36	8510.96
	NPDC	-5666.400	1590.043	.687	-14186.56	2853.76
	ESSO	-13.200	1590.043	1.000	-8533.36	8506.96
	ADDAX	-42.600	1590.043	1.000	-8562.76	8477.56

*. The mean difference is significant at the 0.05 level.