

LEGEND for 2004–2015Q1 NRC Reports & OWOC observations of surface oil sheen at GoM MC20,
 excerpted and organized by On Wings Of Care, Inc. 2015 ("OWOC") © OnWingsOfCare.org

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OWOC Flight Observations of MC20 are published at OnWingsOfCare.org.
 See those articles for photos, videos, GPS flight tracks, and flight logs for these and other of OWOC aerial observations of the Gulf of Mexico, since late April 2010.

No.	Subject	Comment
1	General	All NRC reports refer to this as a "Platform incident" (MC20A), N28°56'10", W88°58'08". Column headings and entries are abbreviated herein, and repetitious info (such as Responsible Party and Location, which are always Taylor Energy Co and Mississippi Canyon 20) is omitted; all information is substantively identical to that in the original NRC reports, which can be viewed online here: http://www.nrc.uscg.mil/ . OWOC gratefully acknowledges the assistance of Ms. Trisha James of Navarre, FL in extracting data from the NRC reports for these analyses.
2	Sea Conditions	Wave Condition: 0: Calm; 1: Smooth (< 1 ft); 2: Slight (1—3 ft); 3: Moderate (3—5 ft); 4: Rough (5—8 ft); 5: Very Rough (8—12 ft) Current speed is omitted here. It has been entered by an observer only once in 2015Q1 (5 its on 20150115) and fewer than 10 times total since 2005. Wind speed is given in the NRC Reports variably in units of KTS or MPH on the few reports where it is noted at all. Units of knots (kts, 1 nautical mile per hour, or about 1.15 mph) are used here.
3	Sheen Appearance	Sheen Color & Additional Info are verbatim from the NRC reports but are consolidated in these spreadsheets, whereas in the NRC reports this information appears randomly in either the Incident Commons spreadsheet or various columns of the Incident Details spreadsheet, if it appears at all.
4	Sheen Length & Width	Length and width of the sheen are cited in the NRC reports with variable units of "miles" or "feet", and occasionally (as in OWOC observations) meters. The Taylor reports do not state explicitly whether "miles" means statute miles (sm) or nautical miles (nm or NM), although we might assume that where they state wind in mph (kts), they cite sheen dimensions in units of sm (nm). Here we assume that "miles" means nm, and we use the conversions: 1 nm = 6,076 ft = 1.85 km ~ 1.15 sm. It is obvious by the entry value whether NM or FT are intended, so we omit explicit mention of the units here.
5	Sheen Area	For sheen area (product of Sheen Length and Width), we use units of acres, where 1 acre = 43,560 sq ft (~ 1 nm x 7.2 ft.) (Metric units would be easier all around, since 1 cu m = 1 micron X 1 sq km, but...)
6	Amount of Material	The unit for "Amount of material" is US gallons. We write "0" where the NRC Report lists "0" or "0-U" or "Unknown Amount." Only the Taylor-provided NRC Reports provide estimated Amounts of Material. But the Taylor reports give no information about what assumptions are used to arrive at those estimated amounts. Amount of Material is not a quantity that can be observed directly; it must be estimated by multiplying sheen area with sheen thickness. In aerial observations, sheen thickness can only be estimated approximately, based on appearance of the sheen, and the accuracy depends critically on the thickness itself. See below. The estimated Amount of Material, or Volume (in US gallons), is the product of sheen area and estimated sheen thickness, by the relation: Amt (gal) = 1.069 X Area (acres) X Thickness (microns).



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7	Sheen thickness and Bonn (BAOAC) guidelines	<p>For dull, metallic, or dark sheen — typically thicker than a few microns, visible observation cannot distinguish thicknesses more than a few microns, so only a minimum thickness can be estimated. For colored or "rainbow" sheen, the thickness is in the range of visible light wavelengths (0.3—5.0 micron), since the colored appearance is caused by thin-film interference (e.g., light reflected from the bottom of the sheen interfering coherently with light reflected from the upper surface). (Now you see why metric units for the sheen dimensions would have simplified the arithmetic of calculating sheen volumes!) For sheen that appears very light gray or "barely discernible", the thickness must usually be in the range of 0.04—0.1 micron, and as it becomes more silvery it is typically 0.2—0.3 micron.</p> <p>An international standard, adopted formally by NOAA and the U.S. Coast Guard in 2006, is the "Bonn" or "BAOAC" (Bonn Agreement Oil Appearance Code) standard, which uses the following ranges and nominal values for correlating sheen appearance in aerial observations with estimated sheen thickness. These guidelines are stipulated in the Coast Guard's handbook "Open Water Oil Identification Job Aid for aerial observation" (OWJA 2012, revised from 2007), which is used for Coast Guard training. (Mysteriously, these guidelines appear never to have been used for the Taylor estimates of Amount of Material in the NRC reports.)</p> <table border="0" data-bbox="323 564 1306 710"> <tr> <td>Silver/Gray:</td> <td>0.04—0.3 micron</td> <td>(NOMINAL Barely Discernible or Gray = 0.1; Silvery = 0.2.)</td> </tr> <tr> <td>Rainbow:</td> <td>0.3—5.0 micron</td> <td>(NOMINAL: Faint Colors = 0.5; Rainbow or Brightly Colored = 1.0)</td> </tr> <tr> <td>Metallic:</td> <td>5.0 — 50 micron</td> <td>(NOMINAL: Dull = 3.0; Dark = 10.0)</td> </tr> <tr> <td>Transitional Dark:</td> <td>50—200 micron</td> <td>(NOMINAL: 100 microns.)</td> </tr> <tr> <td>Dark (True color):</td> <td>> 200 micron</td> <td>(NOMINAL: Very Dark = 200 microns)</td> </tr> <tr> <td>Emulsion (water in oil):</td> <td>>1 mm</td> <td>(brown/orange) (NOMINAL: Emulsion = 500 micron)</td> </tr> </table>	Silver/Gray:	0.04—0.3 micron	(NOMINAL Barely Discernible or Gray = 0.1; Silvery = 0.2.)	Rainbow:	0.3—5.0 micron	(NOMINAL: Faint Colors = 0.5; Rainbow or Brightly Colored = 1.0)	Metallic:	5.0 — 50 micron	(NOMINAL: Dull = 3.0; Dark = 10.0)	Transitional Dark:	50—200 micron	(NOMINAL: 100 microns.)	Dark (True color):	> 200 micron	(NOMINAL: Very Dark = 200 microns)	Emulsion (water in oil):	>1 mm	(brown/orange) (NOMINAL: Emulsion = 500 micron)
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8	Bonn-estimated Amounts of Material	<p>Where we cite "B-Amt" we mean the Amount of Material estimated using the Bonn or BAOAC guidelines noted above. All NRC reports submitted by NOAA, OWOC, or other entities not representing Taylor Energy show "zero" or "zero-unknown" for their Amounts. In these spreadsheets, we provide estimated Amounts of material for all NRC reports and for the 40 OWOC flight observations that were published at OnWingsOfCare.org, all based on the Bonn guidelines. We also provide a "corrected estimate" for the Amounts of material given in the Taylor Energy NRC reports, which we abbreviate by "B-Tay" or "B-NRC" and "Tay" or "NRC", respectively, when referring to Amounts of Material.</p>																		
9	Equivalent Average Thickness (EAT)	<p>The Taylor Energy NRC reports give no information about what thicknesses were assumed or other assumptions that went into their estimates of Amount of Material. It is straightforward and instructive to infer from their estimates an equivalent average thickness ("NEAT" for NRC Equivalent Average Thickness) by dividing the estimated Amount of Material by the observed sheen area, using the arithmetic conversion: NEAT (micron) = Amt of Material (gal) / Area of Sheen (acres) / 1.069.</p> <p>==> We find that the NEAT values that follow from the Taylor NRC reports are, for a majority of the reports, smaller than 0.04 micron — the very minimum thickness for "barely discernible" sheen according to the Bonn guidelines. 0.04 micron is 40 nanometers, or the diameter of a few tens of petroleum molecules; a typical human hair has a diameter of 10—100 microns. Considering that close to 100% of the observations by OWOC's 40 documented flyovers found considerable amounts of rainbow and darker sheen, the assumptions used by Taylor Energy to estimate their Amounts of Material are quite suspect.</p> <p>NRC reports submitted by the NOAA/NESDIS satellite information service (highlighted in gray in these spreadsheets) give detailed information about observed sheen area, but they are not able to determine accurately whether the sheen observed is light gray, silvery, rainbow, or darker. In estimating Amounts of Material associated with the NOAA satellite observation reports, we decided to be very conservative -- i.e., to give what can be considered a <i>minimum</i> estimate of the Amount of Material, by using a NEAT of 0.1 micron, equivalent to sheen that is light gray or barely discernible. Still, the large areas noted by the NOAA satellite observations tend to give higher estimates for Amount of Material even than the Bonn-estimated amounts from the Taylor, OWOC, and other observations. That is unnerving, and it should be, for it could well mean that we have all under-estimate the amount of pollution and how far it has spread.</p>																		



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10	Our conclusions about Total Amounts of Material	<p>In order to make consistent estimates of material, based on all NRC report data and other documented observations (including revision of the Taylor estimates based on the Taylor-provided data in the NRC reports), we use the Bonn guidelines to assign sheen thickness to the areas and percent coverages for the different sheen appearances provided. Those assumptions are given in the column labeled "Assumptions." We use the nominal values noted above from the Bonn ranges, and for all of the NRC reports and other observations, there were only a few instances where we assigned a thickness greater than 1.0 (rainbow), and those for small areas specifically noted by Taylor to be dark brown. Thus, we consider our estimates of Amounts of material to be conservatively low.</p> <p>Our Bonn-estimated Amounts of Material are on average (analyzed for all reports from 2004 through first quarter of 2015) <u>15 times larger</u> than the estimates provided in the Taylor NRC reports. This means that, if the sheen areas in the Taylor reports are not under-estimated, the total amount of pollution in MC20 since late 2004 is 15 times more than Taylor has purported it to be. Unfortunately, reports from non-Taylor entities, which began increasing in number since 2011 when OWOC began making regular observations and in 2012 when NOAA began making satellite reports, suggest a tendency toward <u>larger sheen areas</u> than those reported by Taylor. From all data, and even de-emphasizing the large sheen areas suggested by the NOAA satellite data, OWOC estimates that the <u>total oil represented by sheen in MC20 since late 2004 exceeds that reported by Taylor by a factor of 27.</u> (The NOAA data alone, even assuming a sheen thickness no greater than 0.1 micron, would imply that this factor is 77, three times larger still than OWOC's estimate!)</p>
11	Anomalies in the Taylor Energy NRC Reports	<p>Anomalies in the Taylor Energy NRC reports are numerous, adding to questions about their accuracy, and for which we had to make some adjustments. For example:</p> <ul style="list-style-type: none"> — Some Taylor reports provide no sheen appearance description at all, or no sheen dimensions, or both (!), and yet the reports provide non-zero estimates for Amounts of Material for that day's observation. To provide Bonn-corrections for those Taylor estimates, we use the sheen appearance descriptions or sizes from other observations made on the same day by OWOC or from Taylor observations on the days immediately before or after, or if those would produce an anomalously <u>large</u> correction, then we just multiply the Taylor estimate by a factor of 15. (We are choosing to err on the side of a minimal correction to the Taylor estimates, which may turn out to cause under-estimation, but we prefer to stay close to the average correction factors deduced from well documented observations by OWOC and other independent entities on the same days as the Taylor reports) — The Amounts of Material estimates from Taylor are cited to two and sometimes FOUR decimal places — i.e., they represent a precision of 0.0001 —0.01 gal, or between 8-hundredths of a teaspoon and 2.5 Tablespoons. This level of precision is indefensible and nonsensical both mathematically and practically, for observations made at 500-1000' above the sheen from aircraft moving at 100-150 kts. <p>For example: On 2010 December 31, Taylor reported a sheen covering 2,178 sq ft and estimated an Amount of material of 0.0001 gal -- less than one-tenth of a TEASPOON. On 2011 February 10, Taylor reported a sheen covering 7,500 sq ft which they said involved 0.0003 gal of material — less than one-quarter of a teaspoon. And yet, on 17 of the days where OWOC published photos and videos of extensive rainbow sheen, Taylor reported small amounts and the sheen as "barely discernible." Etc.</p> <p>==> We conclude that the Amounts of Material in the Taylor NRC reports are unreasonably small, primarily because of incorrect estimation procedures based on observed data and secondarily because some observations were inaccurate with regard to sheen size and appearance.</p>



2007—2004 NRC Reports & OWOC observations of surface oil sheen at GoM MC20, excerpted and organized by On Wings Of Care, Inc. 2015 © OnWingsOfCare.org

SEQNOS	INCIDENT DATE TIME	WIND SPEED	WIND DIRECTION	SHEEN COLOR	SHEEN-ODOR DESCRIPTION & SHEEN ADDITIONAL INFO	DIRECTION OF SHEEN TRAVEL	WAVE CONDITION	SHEEN SIZE: LENGTH" (NM or FT)	SHEEN SIZE: WIDTH" (NM or FT)	Reported Sheen Area (acres)	Reported Amt of Material (Gal) "RAM"	BAOAC-Estimated Amt of Material" (Gal) "BRAM"	Assumptions (BAOAC thicknesses for NRC data, etc.)	Ratio of Corrected / Reported Amt of Mtrl "BRAM" / "RAM"	Reported Equiv Avg Thickness (micron) "RET"	BAOAC-Corrected Equiv Avg Thickness (micron) "BRET"	OWOC Sheen Area (acres)	WOC Observed Amt of Material (Gal) "WAM"	OWOC Equiv Thickness (micron) "WET"	OWOC / BAOAC-corrected Amt of Mtrl "WAM/BRAM"	OWOC / Reported Amt of Mtrl "WAM/RAM"	NOAA Sheen Area (acres)	NOAA Observed Amt of Material (Gal) "NAM"	NOAA Equiv Avg Thickness (micron) "NET"	NOAA / BAOAC-corrected Amt of Mtrl "NAM/BRAM"	NOAA / Reported Amt of Mtrl "NAM/RAM"	
2007:																											
839472	2007-06-21 12:15		0 N	BARELY DISCERNIBLE	CALLER STATED THAT DUE TO A VALVE THAT WAS PLUGGED ON A PLATFORM THERE WAS A SPILL OF MATERIALS. CALLER STATED SHE WOULD BE CALLING MORGAN CITY USCG.		2 1	300		42	2		IGNORE (not due to Ivan)		3	0.034	0.100										
847863	2007-09-05 9:39			SILVERY	CALLER STATED THERE IS A SPILL OF MATERIALS FROM A DOWNED PLATFORM DUE TO A FORMER HURRICANE. CALLER DID NOT HAVE INFORMATION ON THE NAME OF THE HURRICANE THAT TOPPLED THIS PLATFORM.		4	200		112	0	23.9	Assume NOT Taylor, Silvery 0.2			0.000	0.200										
857162	2007-12-13 18:50				THE CALLER REPORTED THAT A SUNKEN PLATFORM RELEASED MATERIAL INTO THE ENVIRONMENT. THE PLATFORM HAS BEEN DOWNED BY HURRICANE IVAN.	NE	3 2	1000		279	4.3	298.2	Taylor (because gave an Amt of Material), Assume Rainbow 1.0		69	0.014	1.000										
2007 TOTALS or Ratio of Totals for (1) Taylor NRC Reports											4.3	298.2		69.4													
2007 Daily Averages for (1) Taylor Report*:											279	4.3	298.2			0.014	1.000										
2007 TOTALS for (1) Other NRC Report											112	0	23.9														
2007 Daily Averages for (1) Other NRC Reports:											112	0	23.9			0.000	0.200										
2006:																											
791179	2006-03-17 6:30		5 N	BARELY DISCERNIBLE	///WEB REPORT//THE INCIDENT OCCURRED ON THE DRILLING RIG H&P 105 THAT IS ON LOCATION AT TAYLOR'S MC 218 PLATFORM. WHILE FUELING THE DIESEL MACHINE ON THE DECK APPROXIMATELY 32 OUNCES OF DIESEL FUEL SPILLED ONTO THE DECK. WHILE CLEANING THE DECK, DROPLETS OF DIESEL (MUCH LESS THAN 1 OUNCE OF DIESEL) SPILLED INTO THE GULF WATERS THROUGH THE DECK CREATING A BARELY VISIBLE SHEEN.	S		45	15	0.01	1 TBLSP = 0.004 GAL	0.004	IGNORE (not due to Ivan)			0.424	0.424										
2006 TOTALS for (0) Taylor NRC Reports											0	0	0		0												
2006 Daily Averages for (0) Taylor Reports*:											0	0	0			0.000	0.000										
2006 Daily Averages for (0) Other NRC Reports (including OWOC):											0	0	0			0.000	0.000										
2005:																											
748942	2005-02-02 7:50		15 SSE	RAINBOW	TAYLOR ENERGY PLATFORM / NEWLY INSTALLED PLATFORM WITH DRILLING RIG IN PROCESS. AS SOON AS SHEEN WAS NOTICED ALL FUEL TRANSFER ACTIVITIES GOING ON TO DAY TANKS WERE CEASED AND PROBLEM IDENTIFIED AND STOPPED.	SSE	4 25 ft	15 ft		0.01	6 tblsp = 0.023 gal	0.01	IGNORE (got Taylor from Ivan) 0.323 Gal = 6 TBLSP. Rainbow 1.0 Minimum.		0.40	2.499	1.000										
780141	2005-05-27 10:15		5	RAINBOW	THE CALLER IS STATING THAT DURING A CREW CREW CHANGE OUT THIS MORNING THEY DISCOVERED AN UNKNOWN SHEEN. THE LOCATION OF THE SHEEN AT 1015 THIS MORNING WAS 28 51.14N - 088 54.43W.	SW	0	6.5	0.5	2,754	0	2,944	Rainbow 1.0				1.000										
2005 TOTALS for (0) Taylor NRC Reports																											
2005 Daily Averages for (0) Taylor Reports*:																											
2005 Daily Averages for (1) Other NRC Reports (including OWOC):											2,754	0	2,944				1.000										
2004:																											
711824	2004-01-29 6:30			SILVERY	THE CALLER IS REPORTING AN UNKNOWN SHEEN		2	3	6	15,255	0	3,262	IGNORE: pre-Ivan, Silver 0.2 (BUT WHAT HAPPENED?)														
725588	2004-06-20 10:30		8 N	SILVERY	NA UNKNOWN SHEEN WAS DISCOVERED FROM AN UNKNOWN SOURCE.	SSW	2	600		167	17	36	IGNORE: pre-Ivan														
727110	2004-07-03 11:45			SILVERY	DIVERS WERE INSPECTING THE SLUMP. THEY CHIPPED OFF GROWTH THAT WAS INSIDE THE SLUMP CAUSING A RELEASE OF AN UNKNOWN MATERIAL INTO THE WATER.			540	50	0.62	4.6	0.01	IGNORE: pre-Ivan														
(— Above are prior to Hurricane Ivan September 2004)																											
737130	2004-10-31 8:16		2 ESE		BARELY DISCERNIBLE SHEEN COVERAGE 65%, Platform 800m. REPORT OF A SHEEN DISCOVERED IN THE GULF OF MEXICO COMING FROM A PLATFORM.			2.5	1	2,119	41	147				0.018	0.065										
740024	2004-12-27 8:56		5 ESE		SHEEN SIZE WAS RECORDED AT 1/8 MILES LONG BY 25 MILE WIDE, 75% COVERAGE, 100% BRIGHTLY COLORED			1.5	0.25	318	58	255	1.0 - Brightly Colored			0.171	0.750										
2004 TOTALS for (2) Taylor NRC Reports															4												
2004 Daily Averages for (2) Taylor Reports*:											1,218	50	201			0.094	0.408										
2004 Daily Averages for (0) Other NRC Reports (including OWOC):																											
2003:																											
635689	2003-02-01 17:05																										
635689	2003-02-01 17:05																										
639777	2003-03-18 9:39																										

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630982	2003-03-20 8:36																												



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