CRC Report No. RW-115

E-15 FUEL SURVEY JANUARY AND JULY, 2020

Final Report

October 2021

COORDINATING RESEARCH COUNCIL, INC.
5755 NORTH POINT PARKWAY • SUITE 265 • ALPHARETTA, GA 30022

The Coordinating Research Council, Inc. (CRC) is a non-profit corporation supported by the petroleum and automotive equipment industries. CRC operates through the committees made up of technical experts from industry and government who voluntarily participate. The four main areas of research within CRC are: air pollution (atmospheric and engineering studies); aviation fuels, lubricants, and equipment performance; heavy-duty vehicle fuels, lubricants, and equipment performance (e.g., diesel trucks); and light-duty vehicle fuels, lubricants, and equipment performance (e.g., passenger cars). CRC's function is to provide the mechanism for joint research conducted by the two industries that will help in determining the optimum combination of petroleum products and automotive equipment. CRC's work is limited to research that is mutually beneficial to the two industries involved. The final results of the research conducted by, or under the auspices of, CRC are available to the public.

Acknowledgment

This project was funded by the Coordinating Research Council Emissions Committee in collaboration with the Alliance for Automotive Innovation.

Abbreviations and Acronyms

Deg. C	degrees Celsius
Deg. F	degrees Fahrenheit
ASTM	ASTM International
BTU	British thermal unit
CRC	Coordinating Research Council
DIPE	Diisopropyl ether
DVPE	dry vapor pressure equivalent
EX	nominally X% ethanol by volume and (100-X)% gasoline or other hydrocarbons
ETBE	ethyl tert-butyl ether
EPA	U.S. Environmental Protection Agency
EVAP	evaporated
FTC	U.S. Federal Trade Commission
kg	kilograms
L	liters
LV%	liquid volume percent
lb	pound
mg/100mL	milligrams per 100 milliliters
MON	Motor Octane Number
MTBE	methyl tert-butyl ether
ppm wt.	parts per million by weight
psi	pounds per square inch
RON	Research Octane Number
RVP	Reid Vapor Pressure
Std Dev	Standard Deviation
TAME	tert-amyl methyl ether
V/L=X	vapor/liquid where the ratio is X
VOL %	percent by volume
wt%	percent by weight

Executive Summary

EPA took two separate actions, one in 2010 and one in 2011, to approve the use of E15 fuel for model year 2001 and newer light duty vehicles. EPA, in May 2019, issued a final rule to extend summertime 1 psi RVP waiver (previously provided only to E10) to gasoline ethanol blends up to 15% ethanol. This action facilitated the year-round sale of E15 in conventional gasoline areas.

CRC project RW-115 was initiated in 2019 to develop an initial snapshot of E15 fuel qualities and an understanding of how E15 is marketed and dispensed to the consumer. The results are provided in CRC report 674, titled "E15 Fuel Survey, July 2019." This report continues CRC project RW-115. Specifically, this phase of the CRC project RW-115 documents the fuel properties of E15 fuel samples from a wide array of retail stations sampled in January and July 2020. Each sample was tested for critical operability properties. Basic statistical values are provided, but the small data sample suggests these statistics may be used only for characterization. Of the fuels sampled, ethanol content ranged from 9.2% to 16.8% in January 2020, and from 9.8% to 16.8% in July 2020. Vapor pressure ranged from 11.4 psi to 15.6 psi in January 2020, and from 7.2 psi to 10 psi in July 2020.

Photographs taken at several stations revealed no consistency in the description of E15 on dispensing pumps. The regulatory label developed by EPA to alert consumers to the appropriate and lawful use of E15 was found on most dispensers, but its location on the pumps varied widely from station to station. All stations posted octane ratings, but the E15 fuel and its octane rating were often not easily related. Three samples in January 2020 and no samples in July 2020 were found to have a lower octane rating than their posted octane rating.

Introduction

As explained in CRC Report 674 [1], EPA approved the use of E15 fuel in model year 2001 and newer light duty vehicles with two separate actions in 2010[2] and 2011[3]. In May 2019[4], EPA issued a final rule to extend summertime 1 psi RVP waiver (previously provided only to E10) to gasoline ethanol blends up to 15% ethanol. This action was to facilitate the year-round sale of E15 in conventional gasoline areas. Federal programs offered funding designed to expand the infrastructure for renewable fuels via the installation of blending dispensers. As of July 2021, E15 was available at more than 2,470 refueling stations in 30 states[5]. However, on July 2, 2021, the U.S. Court of Appeals for the District of Columbia Circuit ruled the EPA exceeded its

---

[1] Coordinating Research Council. 2020, "E15 Fuel Survey, July 2019," http://3mpm51mqb7ryj2j12n04r01b-wpengine.netdna-ssl.com/wp-content/uploads/2020/04/CRC-Report-No.-674.pdf

[2] Partial Grant and Partial Denial of Clean Air Act Waiver Application Submitted by Growth Energy to Increase the Allowable Ethanol Content of Gasoline to 15 Percent; Decision of the Administrator. 2010. Federal Register, Vol. 75, No. 213, November 4, 2010, page 68094

[3] Partial Grant of Clean Air Act Waiver; Application Submitted by Growth Energy to Increase the Allowable Ethanol Content of Gasoline to 15 Percent; Decision of the Administrator. 2011. Federal Register Vol. 76, No. 17, January 26, 2011, page 4662

[4] Modifications to Fuel Regulations to Provide Flexibility for E15; Modifications to RFS RIN Market Regulations. 2019. 40 CFR Part 80. Federal Register Vol. 84, No. 111, June 10, 2019. Page 26980

[5] Growth Energy, 2021, "Higher Blends Retail Footprint," accessed July 2021, https://growthenergy.org/growth-energy-ethanol-data-hub/higher-blends-retail-footprint/

authority by lifting summertime vapor pressure restrictions on the sale of E15[6]. As of this writing, the impact of the ruling on the future availability of E15 in the market is uncertain.

EPA requires[7]"Any retailer or wholesale purchaser-consumer who sells, dispenses, or offers for sale or dispensing E15 shall affix the following conspicuous and legible label to the fuel dispenser." See Figure 1.

Figure 1. EPA mandated E15 dispenser label

EPA also specifies the placement of the label on the E15 dispenser, "The label shall be placed on the upper two-thirds of each fuel dispenser where the consumer will see the label when selecting a fuel to purchase. For dispensers with one Handle, the label shall be placed above the button or other control used for selecting E15, or in any other manner which clearly indicates which control is used to select E15. For dispensers with multiple Handles, the label shall be placed in the location that is most likely to be seen by the consumer at the time of selection of E15."

While EPA considers E15 a conventional gasoline, the Federal Trade Commission (FTC) classifies E15 as an alternative fuel[8]. The FTC's rule does not require an octane rating for E15 at the dispenser. Subsequently, retailers are allowed to label E15 by FTC or EPA's requirements. Retailers marketing fuels with ethanol content from 10% to 83% are required to post labels with ethanol percentage disclosures. The FTC requires a range level with the label stating the nearest multiple of 10% ethanol for ranges of >10%-50%.

E15 fuel properties, quality, and dispenser configuration and labeling are all important factors and are not well understood. This project, CRC project RW-115, was performed to improve the understanding of E15 fuel quality and how E15 is being marketed and dispensed to the

---

[6] American Fuel & Petrochemical Manufacturers v. EPA, United States Court of Appeals for the District of Columbia Circuit, Decided July 2, 2021, No. 19-1124, https://www.cadc.uscourts.gov/internet/opinions.nsf/D33AF132E64A3D1E85258706005062EC/$file/19-1124-1904888.pdf

[7] Regulation of Fuels and Fuel Additives: RFS Pathways II, and Technical Amendments to the RFS Standards and E15 Misfueling Mitigation Requirements, 79 Fed.Reg. 42128-42167 (July 18, 2014),(codified at 40 C.F.R § 80.1501)

[8] Automotive Fuel Ratings, Certification and Posting; Final Rule Adopting Rating, Certification, and Labeling Requirements for Certain Ethanol-Gasoline Blends, 16 CFR Part 306 (2016)

consumer. Specifically, the study analyzed and documented the fuel properties of E15 fuel samples, and E15 labeling, naming, and dispenser style and configurations from a wide array of retail stations. CRC report 674, titled "E15 Fuel Survey, July 2019" provided results from E15 fuel sampled during July 2019. This report provides results from E15 samples collected from January and July 2020.

Methodology

The E15 Fuel Survey data reflect "snapshots" of market fuel properties sampled and measured at three different periods in time. The number of cities and the number of stations in those cities varied from period to period as shown in Table 1. The cities and stations sampled were not selected to meet statistical criteria, or on the basis of market share. The cities were selected based on research which indicated a city had a high probability of stations offering E15. The stations within each of those cities were selected at random by the volunteers (samplers).

Table 1. Number Cites and Stations Included by Sample Period

Sample Period	Cities	Retail Stations
July 2020	10	10
January 2020	14	39
July 2019	14	38

Basic statistical values are provided, but the small data sample suggests these statistics may be used only to characterize these data as there is a high probability it is not indicative of E15 nation-wide or even in the cities sampled.

Sample Collection and Photographs

Volunteer field fuel samplers collected E15 samples from various retail stations as noted in Table 2. Samples were collected in July 2020, January 2020, and, as reported earlier, July 2019. The test samples were packaged and shipped to Saybolt Petroleum Services in Deer Park Texas for analysis. When the samples arrived at the laboratory, they were assigned a unique lab identification number and were held in cold storage until they were tested. Table 3 shows the methods Saybolt used to test the 2020 E15 sample properties.

The samplers were also tasked with taking the following two photographs of the dispensers:

- Photograph of the dispenser encompassing the area of the product selection buttons, the display and any labeling and product identification information.
- A view of the entire dispenser including the hoses

Table 2. List of Cites and Number of E15 Samples Collected

Cities	E15 Samples Collected		
	July 2020	January 2020	July 2019
Atlanta, GA	1	2	1
Chicago, IL	1	3	3
Cleveland, OH	1	3	3
Dallas, TX	1	3	3
Des Moines, IA		3	3
Denver, CO	1	1	1
Lansing/Grand Rapids, MI	1	2	2
Greensboro, NC		3	3
Houston, TX	1	3	3
Milwaukee, WI		2	2
Minn./St. Paul, MN	1	5	5
New Orleans, LA	1	3	3
Omaha, NE		3	3
Pittsburgh, PA	1	3	3
Total	10	39	38

Figure 2. Location of cities where fuel samples were collected for this study.

Table 3. List of Properties and Methods Used to Test the E15 Samples Collected

Property	Test Method	Number of Samples Tested		
		Jan 2020	July 2020	July 2019
Distillation	ASTM D-86	All	All	All
Driveability Index	ASTM D-4814	All	All	All
Distillation Index	Supplied by the Auto Alliance*	All	All	All
Vapor Pressure	ASTM D-5191 (EPA Equation)	All	All	All
Relative Density, 60/60 Deg F	ASTM D-4052	All	All	All
Sulfur	ASTM D-5453	All	All	All
Oxygenates	ASTM D-5599	All	All	All
Hydrogen-Carbon, Oxygen-Carbon Ratio	Derived from Oxys & FIA Data	All	All	All
Octane Numbers		All	All	All
RON	ASTM D-2699	All	All	All
MON	ASTM D-2700	All	All	All
Solvent Washed and Unwashed Gums	ASTM D-381	All	All	All
Water Content	ASTM E-203	All	All	All
Aromatics	ASTM D-6379	All		All
Aromatics	ASTM D-1319		All	
Olefins	ASTM D-6550	All		All
Olefins	ASTM D-1319		All	
Saturates	ASTM D-1319		All	
BTU, Gross	ASTM D-240	20	5	19
BTU, Net	Calculation	20	5	19
Hydrogen Content	ASTM D5291	20	5	19

* Distillation Index = (T10*1.5) + (T50*3) + (T90) + (20 x wt% of oxygen contributed by ethanol)

Results and Discussion

Due to the small number of stations visited in this study compared to the total number of retail gasoline fuel stations in the United States, the samples collected are not meant to be representative of national E15 quality, rather this is a snapshot of E15 fuel quality.

A summary of the 2020 data is provided in Appendix A. Also included for quick reference in Appendix A is the July 2019 summary data. For raw data, refer to the separate spreadsheets in the crcao.org website for project RW-115.

Dispenser Labeling

Photos of the retail stations where the samples were taken are shown for January 2020 and July 2020 in Appendix B and Appendix C, respectively. Every site did not have photos provided, and those with photos may not have two photos. The overall labeling and descriptions for E15 gasoline varied between retail stations, including variation between different franchise stores in the same city.

E15 was marketed to consumers using various descriptions. Descriptions for E15 observed during the survey were: Unleaded 88, E15, Unleaded E15, Unleaded 15, E-15, e15, Plus and Unleaded Plus. The EPA mandated E15 label was present on most dispensers. The location of the EPA mandated label varied widely, from near or on the dispenser actuator button, to near the dispenser handle.

Posted octane rating values of 88 were shown for all dispensers except for two in January 2020 and one in July 2020. In each of the surveys performed in January 2020 and July 2020, one dispenser posted an octane rating of 86. There were three samples, all collected during January 2020, for which measured octane number (R+M)/2 was lower than the posted octane number. A fourth sample is in question for its measured versus posted octane since the EPA E15 label appears to be placed under the incorrect dispenser actuator button.

Conclusion

This project provided a general understanding of E15 fuel quality and how E15 is marketed and dispensed to the consumer over three snapshots in time. It documented the critical operability properties of E15 fuel samples collected from 39 retail stations in January 2020, 10 retail stations in July 2020, and previously reported 38 retail stations in July 2019. The limited sample size for each time period precludes any representation of national E15 fuel quality. Basic statistical values are provided, but the small data sample sizes suggest that these statistics may be used only to characterize these data as there is a high probability that they are not indicative of E15 nation-wide or even in the cities sampled. Of the fuels sampled, ethanol content ranged from 9.2% to 16.8% in January 2020, and from 9.8% to 16.8% in July 2020, Vapor pressure ranged from 11.4 psi to 15.6 psi in January 2020, and from 7.2 psi to 10.0 psi in July 2020. Three samples in January 2020, and none in July 2020 were found to have a lower octane rating than their posted octane rating.

Photographs taken at several stations revealed no consistent labeling or naming convention for E15. The EPA regulatory E15 label was found on most dispensers, but its placement on dispensers varied widely from station to station.

Appendix A: RW-115 Summary Data
January 2020

TEST DESCRIPTION		Units	Method	Maximum	Minimum	Average	Std Dev	Kurtosis	Skew
RELATIVE DENSITY 60/60 Deg. F		kg/L	ASTM D-4052	0.7358	0.7179	0.7259	0.0040	0.2347	0.4735
VAPOR PRESSURE		psi	ASTM D-5191 (EPA)	15.60	11.40	14.37	1.00	2.12	-1.42
DISTILLATION									
	IBP	Deg. F	ASTM D-86	86	75	79	2.9	-0.59	0.27
	5% EVAP	Deg. F	ASTM D-86	102	83	92	4.0	1.09	0.43
	10% EVAP	Deg. F	ASTM D-86	112	96	103	3.7	0.91	1.08
	20% EVAP	Deg. F	ASTM D-86	126	112	118	3.3	0.50	0.88
	30% EVAP	Deg. F	ASTM D-86	138	127	132	2.6	0.16	0.31
	40% EVAP	Deg. F	ASTM D-86	148	141	145	1.8	-0.13	-0.42
	50% EVAP	Deg. F	ASTM D-86	156	151	154	1.3	-0.26	-0.51
	60% EVAP	Deg. F	ASTM D-86	200	158	163	9.1	12.18	3.56
	70% EVAP	Deg. F	ASTM D-86	238	194	223	11.7	0.33	-0.99
	80% EVAP	Deg. F	ASTM D-86	275	252	263	5.5	-0.52	0.16
	90% EVAP	Deg. F	ASTM D-86	325	294	310	7.5	-0.31	-0.12
	95% EVAP	Deg. F	ASTM D-86	368	321	344	10.3	-0.06	0.12
	FBP	Deg. F	ASTM D-86	419	370	398	12.1	-0.51	-0.24
	RECOVERED	Vol %	ASTM D-86	97.3	95.3	96.4	0.48	-0.155	-0.168
	RESIDUE	Vol %	ASTM D-86	1.2	0.7	1.1	0.10	4.102	-1.797
	LOSS	Vol %	ASTM D-86	3.6	1.6	2.6	0.45	-0.228	0.295
	E158	Vol %	ASTM D-86	59.6	53.1	56.0	1.60	-0.210	0.420
	E200	Vol %	ASTM D-86	70.3	60.0	66.6	2.58	0.145	-0.701
	E212	Vol %	ASTM D-86	71.1	62.7	67.8	2.21	-0.414	-0.490
	E266	Vol %	ASTM D-86	83.9	77.6	80.9	1.52	-0.463	-0.017
	E300	Vol %	ASTM D-86	91.0	86.1	88.1	1.36	-0.649	0.461
	E330	Vol %	ASTM D-86	96.3	90.8	93.3	1.21	0.124	0.027
	E338	Vol %	ASTM D-86	97.0	92.0	94.4	1.06	0.062	0.025
DRIVEABILITY INDEX			ASTM D-4814	1164	941	1054	51.3	0.158	-0.101
DISTILLATION INDEX			Supplied by Alliance	1073	988	1035	18.1	0.553	-0.206
VAPOR/LIQUID RATIO									
	TEMP V/L=4	Deg. F	ASTM D-4814	110	93	98	4.0	2.652	1.545
	TEMP V/L=10	Deg. F	ASTM D-4814	113	96	101	3.8	2.569	1.543
	TEMP V/L=20	Deg. F	ASTM D-4814	113	99	104	3.4	1.954	1.451
	TEMP V/L=45	Deg. F	ASTM D-4814	113	101	106	2.7	1.424	1.116
OXYGENATES									
	METHANOL	Vol %	ASTM D-5599	0.0000	0.0000				
	ETHANOL	Vol %	ASTM D-5599	17.5	10.0	14.4	1.76	0.470	-0.617
	MTBE	Vol %	ASTM D-5599	0.0000	0.0000				
	ETBE	Vol %	ASTM D-5599	0.0000	0.0000				
	TAME	Vol %	ASTM D-5599	0.0000	0.0000				
	DIPE	Vol %	ASTM D-5599	0.0000	0.0000				
AROMATICS		LV%	ASTM D-6379	29.5	16.9	22.8	2.99	0.329	0.483
OLEFINS		LV%	ASTM D-6550	14.8	1.2	7.0	2.71	1.264	0.444
SULFUR CONTENT		ppm wt.	ASTM D-5453	16	3	8	3.6	-0.497	0.531
WATER CONTENT		ppm wt.	ASTM E-203	2452	1340	1863	263.2	-0.201	0.162
RESEARCH OCTANE NUMBER			ASTM D-2699	94.7	90.6	93.1	0.87	0.924	-0.815
MOTOR OCTANE NUMBER			ASTM D-2700	86.2	83.2	84.7	0.70	-0.508	-0.041
ANTI-KNOCK INDEX AS FOUND			(R+M)/2	90.0	87.1	88.9	0.73	0.074	-0.641
POSTED AKI			Observed	88.0	86.0	87.9	0.4		
UNWASHED GUM		mg/100mL	ASTM D-381	12.5	3.0	6.1	2.29	1.043	1.366
SOLVENT WASHED GUM		mg/100mL	ASTM D-381	0.5	0.5	0.5	0.00		
HYDROGEN-CARBON RATIO			Derived From Oxy & Aromatics	3.03	2.55	2.84	0.116	0.346	-0.529
OXYGEN-CARBON RATIO			Derived From Oxy & Aromatics	0.067	0.037	0.054	0.0072	0.294	-0.541
STOICHIOMETRIC AIR/FUEL RATIO			Derived From Oxy & Aromatics	14.90	14.67	14.79	0.043	1.443	-0.131
BTU, Gross		BTU/lb	ASTM D-240	19242.00	18295.00	18724.40	236.096	-0.170	0.310
BTU, Net		BTU/lb	CALCULATED	17923	17030	17445	235.5	-0.508	0.179
HYDROGEN CONTENT		Wt%	ASTM D-5291	15	14	14	0.3	-0.212	0.364

July 2020

TEST DESCRIPTION		Units	Method	Maximum	Minimum	Average	Std Dev	Kurtosis	Skew
RELATIVE DENSITY 60/60 Deg. F		kg/L	ASTM D-4052	0.7455	0.7351	0.7415	0.0035	-0.6484	-0.7137
VAPOR PRESSURE		psi	ASTM D-5191 (EPA)	10.00	7.20	9.00	1.16	-1.14	-0.94
DISTILLATION									
	IBP	Deg. F	ASTM D-86	107	89	97	6.2	-0.94	0.70
	5% EVAP	Deg. F	ASTM D-86	128	111	117	7.1	-1.15	0.88
	10% EVAP	Deg. F	ASTM D-86	135	120	125	6.2	-1.14	0.90
	20% EVAP	Deg. F	ASTM D-86	143	129	134	5.3	-1.04	0.85
	30% EVAP	Deg. F	ASTM D-86	150	138	143	4.1	-0.99	0.72
	40% EVAP	Deg. F	ASTM D-86	156	146	151	2.9	-0.30	0.43
	50% EVAP	Deg. F	ASTM D-86	199	154	161	12.8	10.16	3.14
	60% EVAP	Deg. F	ASTM D-86	231	161	194	28.2	-1.98	-0.22
	70% EVAP	Deg. F	ASTM D-86	253	179	237	20.5	8.15	-2.73
	80% EVAP	Deg. F	ASTM D-86	284	257	274	9.2	-0.62	-0.77
	90% EVAP	Deg. F	ASTM D-86	332	306	323	8.6	-0.19	-0.98
	95% EVAP	Deg. F	ASTM D-86	368	337	356	10.8	-0.35	-0.99
	FBP	Deg. F	ASTM D-86	423	381	406	12.9	0.03	-0.96
	RECOVERED	Vol %	ASTM D-86	98.3	97.0	97.4	0.39	2.805	1.622
	RESIDUE	Vol %	ASTM D-86	1.2	0.7	1.0	0.14	1.710	-1.353
	LOSS	Vol %	ASTM D-86	2.1	0.8	1.6	0.35	2.147	-1.179
	E158	Vol %	ASTM D-86	56.3	42.9	50.8	3.73	0.857	-0.661
	E200	Vol %	ASTM D-86	71.0	50.2	60.2	5.83	-0.031	0.197
	E212	Vol %	ASTM D-86	71.7	52.7	61.9	5.29	0.050	0.200
	E266	Vol %	ASTM D-86	81.9	75.2	77.6	2.31	-0.799	0.731
	E300	Vol %	ASTM D-86	89.0	83.7	85.5	1.86	-0.665	0.829
	E330	Vol %	ASTM D-86	94.0	89.7	91.4	1.61	-0.892	0.797
	E338	Vol %	ASTM D-86	95.1	91.1	92.6	1.45	-0.734	0.882
DRIVEABILITY INDEX			ASTM D-4814	1179	1008	1087	55.3	-0.780	0.449
DISTILLATION INDEX			Supplied by Alliance	1214	1054	1091	44.9	6.454	2.345
VAPOR/LIQUID RATIO									
	TEMP V/L=4	Deg. F	ASTM D-4814	135	116	123	8.1	-1.063	0.957
	TEMP V/L=10	Deg. F	ASTM D-4814	139	119	126	8.1	-1.006	0.970
	TEMP V/L=20	Deg. F	ASTM D-4814	145	121	128	8.4	-0.173	1.167
	TEMP V/L=45	Deg. F	ASTM D-4814	155	123	130	9.9	3.809	1.912
OXYGENATES									
	METHANOL	Vol %	ASTM D-5599	0.0000	0.0000				
	ETHANOL	Vol %	ASTM D-5599	16.8	9.8	13.1	1.91	0.688	0.366
	MTBE	Vol %	ASTM D-5599	0.0000	0.0000				
	ETBE	Vol %	ASTM D-5599	0.0000	0.0000				
	TAME	Vol %	ASTM D-5599	0.0000	0.0000				
	DIPE	Vol %	ASTM D-5599	0.0000	0.0000				
CORRECTED AROMATICS		VOL%	ASTM D-1319	22.0	14.8	19.0	2.20	-0.295	-0.502
CORRECTED OLEFINS		VOL%	ASTM D-1319	9.4	1.9	5.6	2.59	-1.075	0.341
CORRECTED OLEFINS		VOL%	ASTM D-1319	66.40	59.50	62.26	2.215	-0.342	0.574
UNCORRECTED AROMATICS		VOL%	ASTM D-1319	26	18	22	2.5	-0.711	-0.046
UNCORRECTED OLEFINS		VOL%	ASTM D-1319	11	2	6	3.0	-1.167	0.377
UNCORRECTED SATURATES		VOL%	ASTM D-1319	75.60	68.70	71.62	2.041	0.132	0.298
SULFUR CONTENT		ppm wt.	ASTM D-5453	11	5	8	1.8	-0.576	-0.041
WATER CONTENT		ppm wt.	ASTM E-203	2420	1611	1937	253.6	-0.286	0.600
RESEARCH OCTANE NUMBER			ASTM D-2699	94.8	92.1	93.6	0.81	-0.424	-0.187
MOTOR OCTANE NUMBER			ASTM D-2700	85.6	83.7	84.5	0.63	-1.175	0.397
ANTI-KNOCK INDEX AS FOUND			(R+M)/2	90.0	88.0	89.0	0.63	-0.915	-0.105
POSTED AKI			Observed	88.0	86.0	87.8	0.6		
UNWASHED GUM		mg/100mL	ASTM D-381	11.5	5.0	7.2	2.07	0.041	0.747
SOLVENT WASHED GUM		mg/100mL	ASTM D-381	1.0	0.5	0.8	0.29		-1.732
HYDROGEN-CARBON RATIO			Derived From Oxy & Aromatics	2.09	2.03	2.05	0.022	-1.096	0.493
OXYGEN-CARBON RATIO			Derived From Oxy & Aromatics	0.059	0.034	0.045	0.0068	0.839	0.573
STOICHIOMETRIC AIR/FUEL RATIO			Derived From Oxy & Aromatics	14.14	13.71	13.93	0.130	-0.193	-0.174
BTU, Gross		BTU/lb	ASTM D-240	19027	18623	18821	145.3	1.364	0.116
BTU, Net		BTU/lb	CALCULATED	17746	17361	17546	139.1	1.267	0.266
HYDROGEN CONTENT		Wt%	ASTM D-5291	14	14	14	0.1	3.213	-1.786

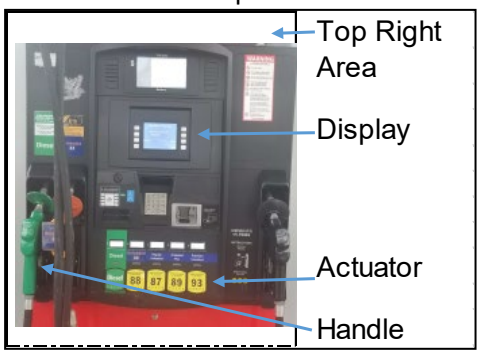
July 2019

TEST DESCRIPTION		Units	Method	Maximum	Minimum	Average	Std Dev	Kurtosis	Skew
RELATIVE DENSITY 60/60 Deg. F		kg/L	ASTM D-4052	0.7476	0.7354	0.7413	0.0032	-0.7872	0.0274
VAPOR PRESSURE		psi	ASTM D-5191 (EPA)	10.10	7.00	8.98	1.18	-1.24	-0.79
DISTILLATION									
	IBP	Deg. F	ASTM D-86	108	90	97	6.3	-1.12	0.76
	5% EVAP	Deg. F	ASTM D-86	131	109	117	7.6	-1.22	0.76
	10% EVAP	Deg. F	ASTM D-86	138	119	125	6.9	-1.19	0.75
	20% EVAP	Deg. F	ASTM D-86	145	127	135	5.7	-1.12	0.66
	30% EVAP	Deg. F	ASTM D-86	152	137	143	4.7	-1.09	0.57
	40% EVAP	Deg. F	ASTM D-86	156	146	151	3.3	-1.18	0.53
	50% EVAP	Deg. F	ASTM D-86	182	154	159	5.5	7.79	2.46
	60% EVAP	Deg. F	ASTM D-86	227	160	190	26.5	-1.83	0.20
	70% EVAP	Deg. F	ASTM D-86	258	232	242	6.4	-0.58	0.26
	80% EVAP	Deg. F	ASTM D-86	293	262	275	7.5	-0.62	0.33
	90% EVAP	Deg. F	ASTM D-86	334	306	321	8.2	-1.01	-0.23
	95% EVAP	Deg. F	ASTM D-86	371	334	355	9.9	-0.89	-0.19
	FBP	Deg. F	ASTM D-86	426	388	406	9.2	-0.67	-0.10
	RECOVERED	Vol %	ASTM D-86	98.1	96.6	97.2	0.32	1.088	0.764
	RESIDUE	Vol %	ASTM D-86	1.3	1.0	1.1	0.07	1.211	0.582
	LOSS	Vol %	ASTM D-86	2.3	0.9	1.7	0.31	0.742	-0.556
	E158	Vol %	ASTM D-86	56.5	43.1	50.6	3.98	-1.143	-0.518
	E200	Vol %	ASTM D-86	66.5	53.0	60.1	4.08	-1.432	-0.327
	E212	Vol %	ASTM D-86	67.4	55.5	61.8	3.65	-1.407	-0.353
	E266	Vol %	ASTM D-86	80.8	72.5	77.6	1.98	-0.362	-0.283
	E300	Vol %	ASTM D-86	88.8	82.0	85.8	1.75	-0.844	-0.013
	E330	Vol %	ASTM D-86	94.5	89.2	91.7	1.55	-1.181	0.173
	E338	Vol %	ASTM D-86	95.3	90.9	92.9	1.32	-1.145	0.119
DRIVEABILITY INDEX			ASTM D-4814	1189	1003	1076	38.4	0.827	0.546
DISTILLATION INDEX			Supplied by Alliance	1133	1045	1082	27.3	-1.186	0.559
VAPOR/LIQUID RATIO									
	TEMP V/L=4	Deg. F	ASTM D-4814	137	116	123	8.0	-1.171	0.837
	TEMP V/L=10	Deg. F	ASTM D-4814	140	119	126	8.0	-1.195	0.816
	TEMP V/L=20	Deg. F	ASTM D-4814	141	120	128	7.8	-1.258	0.774
	TEMP V/L=45	Deg. F	ASTM D-4814	147	120	129	8.3	-0.900	0.801
OXYGENATES									
	METHANOL	Vol %	ASTM D-5599	0.0	0.0				
	ETHANOL	Vol %	ASTM D-5599	16.8	9.2	13.0	1.43	2.109	-0.440
	MTBE	Vol %	ASTM D-5599	0.0	0.0				
	ETBE	Vol %	ASTM D-5599	0.0	0.0				
	TAME	Vol %	ASTM D-5599	0.0	0.0				
	DIPE	Vol %	ASTM D-5599	0.0	0.0				
AROMATICS		LV%	ASTM D-6379	22.5	14.8	18.4	1.94	-0.553	0.158
OLEFINS		LV%	ASTM D-6550	12.5	1.8	8.3	2.42	0.158	-0.244
SODIUM CONTENT		ppm wt.	ASTM D-5863	0.50	0.03	0.21	0.174	-1.400	0.506
SULFUR CONTENT		ppm wt.	ASTM D-5453	22	2	14	4.6	-0.213	-0.386
WATER CONTENT		ppm wt.	ASTM E-203	2788	1246	1900	245.6	4.763	0.880
RESEARCH OCTANE NUMBER			ASTM D-2699	95.4	91.6	93.5	0.77	1.384	-0.109
MOTOR OCTANE NUMBER			ASTM D-2700	84.8	82.2	83.5	0.63	-0.570	-0.021
ANTI-KNOCK INDEX AS FOUND			(R+M)/2	89.8	87.0	88.5	0.60	1.006	-0.435
POSTED AKI			Observed	88.0	88.0	88.0	0.0		
UNWASHED GUM		mg/100mL	ASTM D-381	12.2	3.8	6.8	2.07	0.327	0.909
SOLVENT WASHED GUM		mg/100mL	ASTM D-381	1.0	0.2	0.4	0.22	1.557	1.261
HYDROGEN-CARBON RATIO			Derived From Oxy & Aromatics	2.13	1.99	2.06	0.037	-0.807	-0.093
OXYGEN-CARBON RATIO			Derived From Oxy & Aromatics	0.058	0.031	0.045	0.0053	1.546	-0.375
STOICHIOMETRIC AIR/FUEL RATIO			Derived From Oxy & Aromatics	14.27	13.68	13.94	0.119	1.082	0.566
BTU, Gross		BTU/lb	ASTM D-240	18824	18263	18576	158.0	-0.180	-0.478
BTU, Net		BTU/lb	CALCULATED	17558	16971	17297	154.0	0.317	-0.561
HYDROGEN CONTENT		Wt%	ASTM D-5291	14.27	13.37	13.74	0.223	0.333	0.458

Appendix B: Station Photographs Summary – January 2020

CITY	GRADE	BRAND	Photos (Quantity)	E15 EPA Label Dispenser Location*	E15 Marketing	Octane Rating		
						(R+M)/2	Posted	Measured ≥ Posted?
Atlanta, GA	E15	Racetrac Atlanta	2	Above Handle	Unleaded 88	89.5	88.0	TRUE
Atlanta, GA	E15	Racetrac Smyrna				88.9	88.0	TRUE
Chicago, IL	E15	Thorntons #19	1	Not found	Unleaded 15	89.7	88.0	TRUE
Chicago, IL	E15	Thorntons #320	2	Above Display	Unleaded 15	89.9	88.0	TRUE
Chicago, IL	E15	Thorntons #9	2	Above Display	Unleaded 15	89.2	88.0	TRUE
Cleveland, OH	E15	Sheetz 465	2	Above Handle	Unleaded 88	89.0	88.0	TRUE
Cleveland, OH	E15	Sheetz 533	2	Not found	Unleaded 88	88.8	88.0	TRUE
Cleveland, OH	E15	Sheetz 552	2	Above Handle	Unleaded 88	89.0	88.0	TRUE
Dallas, TX	E15	Murphy	1	Above Handle	e15	88.2	88.0	TRUE
Dallas, TX	E15	Quik Trip 922	2	Below Handle	Unleaded E15	89.2	88.0	TRUE
Dallas, TX	E15	Quik Trip 975	2	Below Handle	Unleaded E15	88.9	88.0	TRUE
Denver, CO	E15	Kum N Go	2	Above Handle	E-15	87.1	86.0	TRUE
Des Moines, IA	E15	HyVee	2	Not found	E-15	90.0	88.0	TRUE
Des Moines, IA	E15	Kum N Go				89.8	88.0	TRUE
Des Moines, IA	E15	Kwik Star	1	Above Handle	Unleaded 88	89.2	88.0	TRUE
Detroit, MI	E15	NuVu Ionia	3	Top, Right	Unleaded 88	89.2	88.0	TRUE
Detroit, MI	E15	NuVu Rockford	2	Not found	Unleaded 88	89.1	88.0	TRUE
Greensboro, NC	E15	Sheetz 484	1	Not found	Unleaded 88	89.2	88.0	TRUE
Greensboro, NC	E15	Sheetz 489				88.8	88.0	TRUE
Greensboro, NC	E15	Sheetz 509				88.8	88.0	TRUE
Houston, TX	E15	Buckys	1	Not found	E-15	87.6	88.0	FALSE
Houston, TX	E15	Murphy 7575	1	Above Handle	e15	87.4	88.0	FALSE
Houston, TX	E15	Murphy 7576				88.0	88.0	TRUE
Milwaukee, WI	E15	Jetz	3	Above Handle	Unleaded 88	88.7	88.0	TRUE
Milwaukee, WI	E15	Kwik Trip	3	Above Handle	Unleaded 88	89.8	88.0	TRUE
Minneapolis/St. Paul, MN	E15	Holiday				89.7	88.0	TRUE
Minneapolis/St. Paul, MN	E15	Minnoco	1	Below Actuator	Unleaded 88	88.8	88.0	TRUE
Minneapolis/St. Paul, MN	E15	Stop N Shop	1	Below Actuator	Unleaded Plus	87.6	87 or 88	?
Minneapolis/St. Paul, MN	E15	Tesoro				88.7	88.0	TRUE
Minneapolis/St. Paul, MN	E15	Winner	1	Below Actuator	Plus	88.6	88.0	TRUE
New Orleans, LA	E15	Racetrac 2430	2	Above Handle	Unleaded 88	87.9	88.0	FALSE
New Orleans, LA	E15	Racetrac 2469	2	Above Handle	Unleaded 88	89.0	88.0	TRUE
New Orleans, LA	E15	Racetrac 2493	2	Above Handle	Unleaded 88	88.8	88.0	TRUE
Omaha, NE	E15	Kum N Go	2	Above Handle	E-15	90.0	88.0	TRUE
Omaha, NE	E15	Pump & Pantry	2	Not found	Unleaded 88	89.2	88.0	TRUE
Omaha, NE	E15	Sapp Bros.	2	Not found	E-15	88.8	88.0	TRUE
Pittsburgh, PA	E15	Sheetz 189	2	Above Handle	Unleaded 88	88.9	88.0	TRUE
Pittsburgh, PA	E15	Sheetz 360	2	Above Handle	Unleaded 88	88.0	88.0	TRUE
Pittsburgh, PA	E15	Sheetz 500	2	Above Handle	Unleaded 15	89.6	88.0	TRUE
		Total:	58				False =	3

* E15 EPA Label Dispenser Locations Nomenclature



January 2020

Location: Atlanta, GA **Store: Racetrac**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
2	Above Handle	Unleaded 88	89.5	88.0	TRUE

January 2020

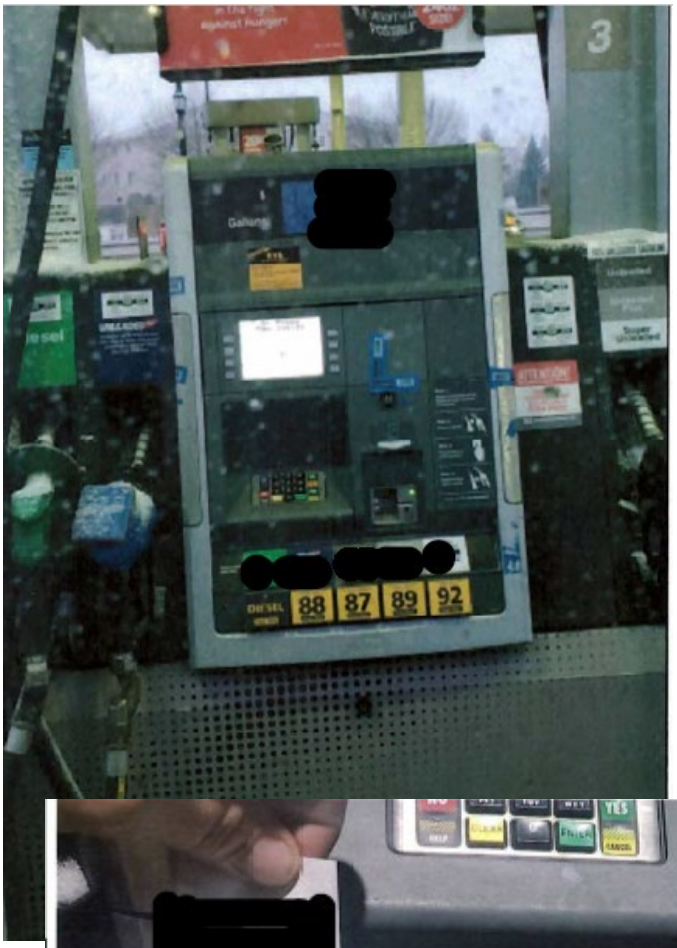
Location: Chicago, IL **Store: Thorntons #19**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
1	Not found	Unleaded 15	89.7	88.0	TRUE

January 2020

Location: Chicago, IL **Store: Thorntons #320**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
2	Above Display	Unleaded 15	89.9	88.0	TRUE



January 2020

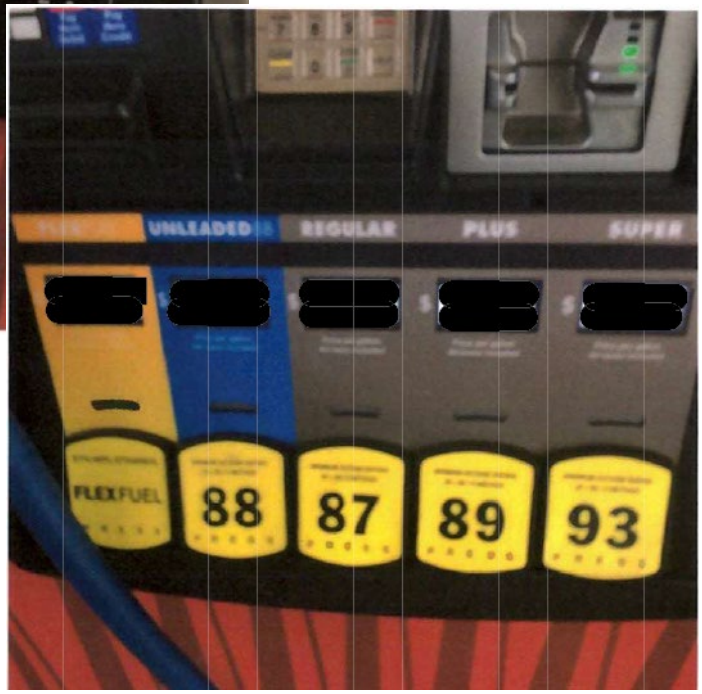
Location: Chicago, IL **Store: Thorntons #9**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
2	Above Display	Unleaded 15	89.2	88.0	TRUE

January 2020

Location: Cleveland, OH **Store: Sheetz 465**

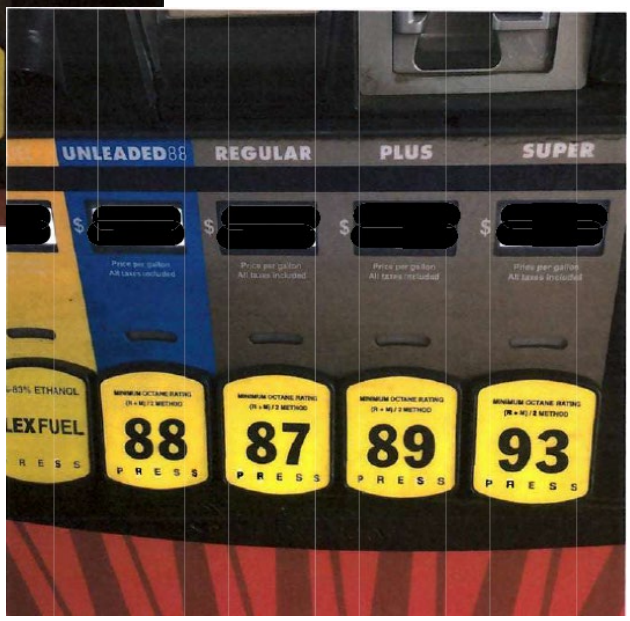
Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
2	Above Handle	Unleaded 88	89.0	88.0	TRUE



January 2020

Location: Cleveland, OH **Store: Sheetz 533**

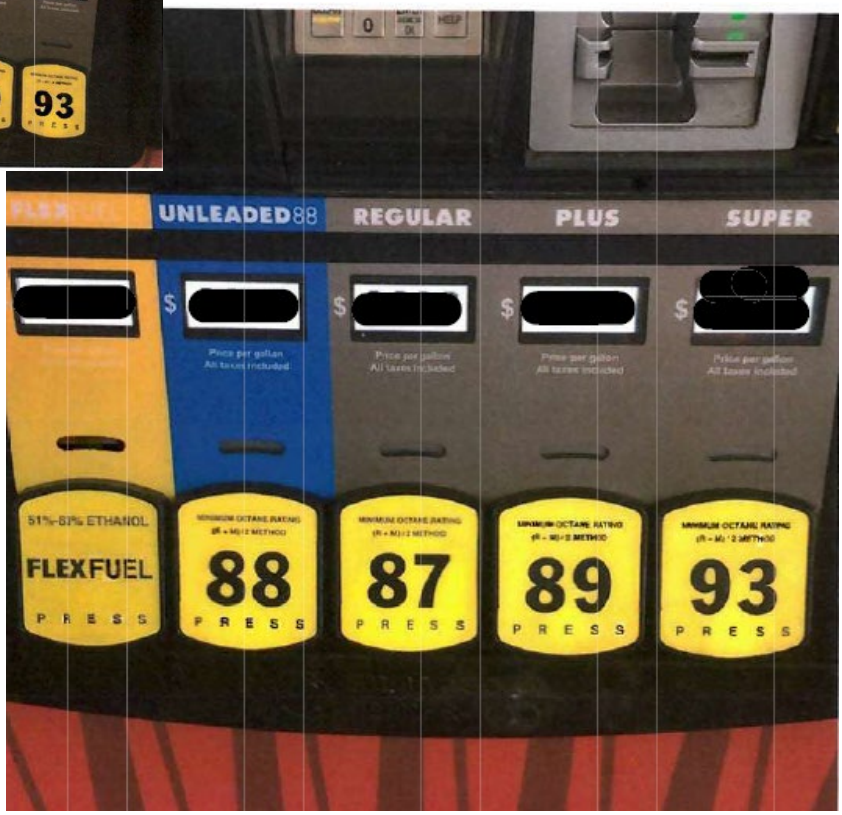
Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
2	Not found	Unleaded 88	88.8	88.0	TRUE



January 2020

Location: Cleveland, OH **Store: Sheetz 552**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
2	Above Handle	Unleaded 88	89.0	88.0	TRUE



January 2020

Location: Dallas, TX **Store: Murphy**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
1	Above Handle	e15	88.2	88.0	TRUE

January 2020

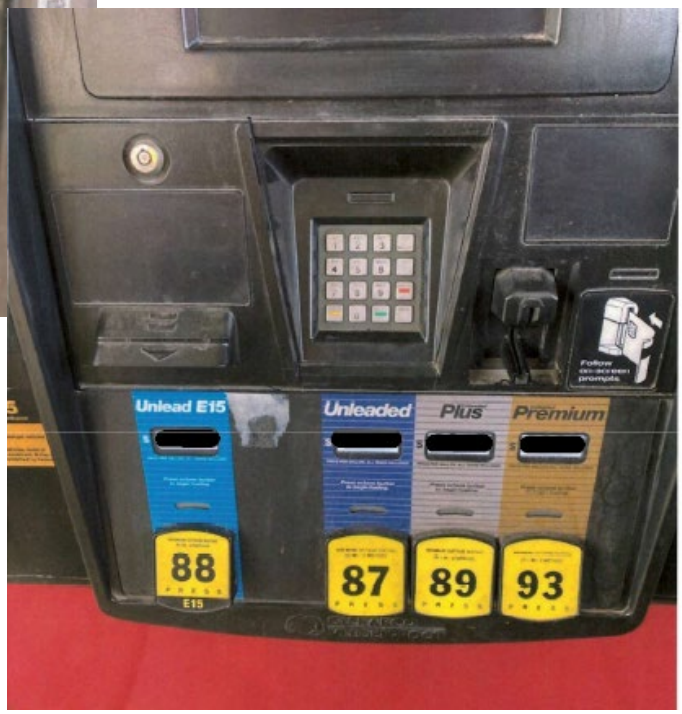
Location: Dallas, TX **Store: Quik Trip 922**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
2	Below Handle	Unleaded E15	89.2	88.0	TRUE

January 2020

Location: Dallas, TX **Store: Quik Trip 975**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
2	Below Handle	Unleaded E15	88.9	88.0	TRUE



January 2020

Location: Denver, CO **Store: Kum N Go**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
2	Above Handle	E-15	87.1	86.0	TRUE

January 2020

Location: Des Moines, IA **Store: HyVee**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured ≥ Posted?
2	Not found	E-15	90.0	88.0	TRUE

January 2020

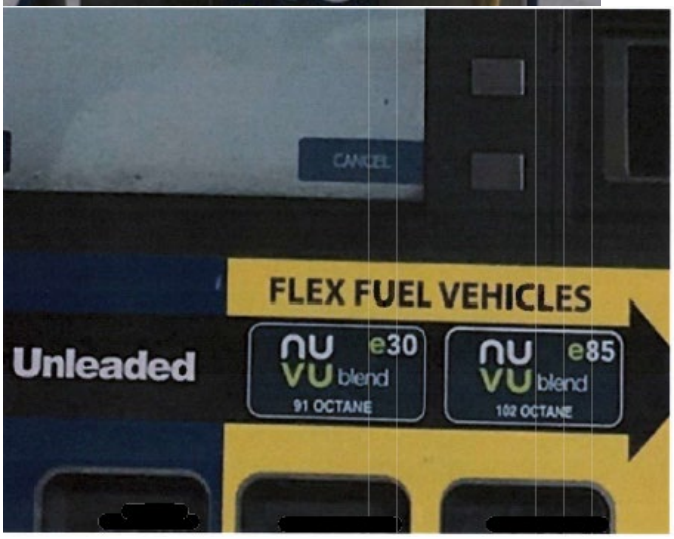
Location: Des Moines, IA **Store: Kwik Star**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
1	Above Handle	Unleaded 88	89.2	88.0	TRUE

January 2020

Location: Detroit, MI **Store: NuVu Ionia**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
3	Top, Right	Unleaded 88	89.2	88.0	TRUE



January 2020

Location: Detroit, MI **Store: NuVu Rockford**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
2	Not found	Unleaded 88	89.1	88.0	TRUE

January 2020

Location: Greensboro, NC **Store: Sheetz**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
1	Not found	Unleaded 88	88.8	88.0	TRUE

January 2020

Location: Houston, TX **Store: Buckys**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
1	Not found	E-15	87.6	88.0	FALSE

January 2020

Location: Houston, TX **Store: Murphy**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
1	Above Handle	e15	87.4	88.0	FALSE

January 2020

Location: Milwaukee, WI **Store: Jetz**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
3	Above Handle	Unleaded 88	88.7	88.0	TRUE

January 2020

Location: Milwaukee, WI **Store: Kuik Trip**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
3	Above Handle	Unleaded 88	89.8	88.0	TRUE

January 2020

Location: Minneapolis/St. Paul, MN **Store: Minnoco**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured ≥ Posted?
1	Below Actuator	Unleaded 88	88.8	88.0	TRUE

January 2020

Location: Minneapolis/St. Paul, MN **Store: Stop N Shop**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
1	Below Actuator	Unleaded Plus	87.6	87 or 88	unknown

January 2020

Location: Minneapolis/St. Paul, MN **Store: Winner**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
1	Below Actuator	Plus	88.6	88.0	TRUE

January 2020

Location: New Orleans, LA **Store: Racetrac 2430**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
2	Above Handle	Unleaded 88	87.9	88.0	FALSE

January 2020

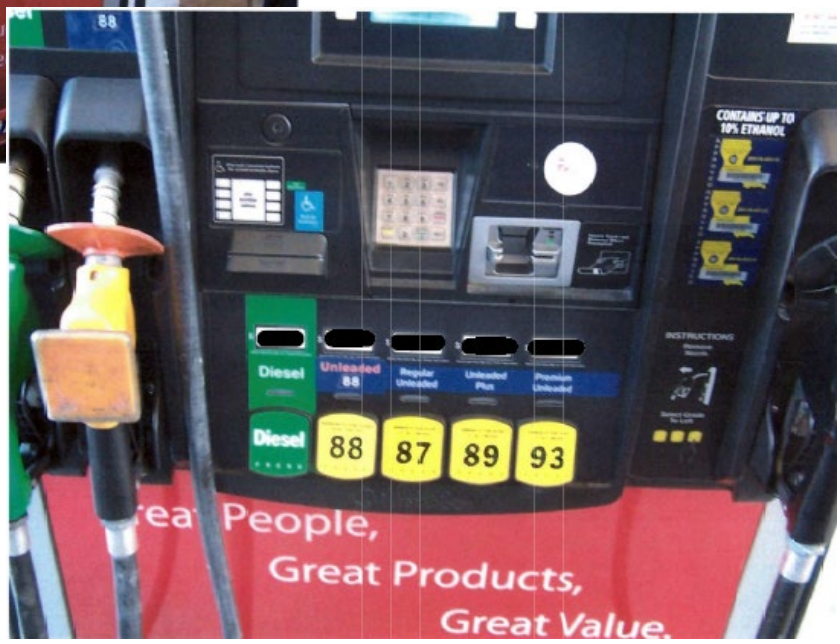
Location: New Orleans, LA **Store: Racetrac 2469**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
2	Above Handle	Unleaded 88	89.0	88.0	TRUE

January 2020

Location: New Orleans, LA **Store: Racetrac 2493**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
2	Above Handle	Unleaded 88	88.8	88.0	TRUE



January 2020

Location: Omaha, NE **Store: Kum N Go**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
2	Above Handle	E-15	90.0	88.0	TRUE

January 2020

Location: Omaha, NE **Store: Pump & Pantry**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
2	Not found	Unleaded 88	89.2	88.0	TRUE

January 2020

Location: Omaha, NE **Store: Sapp Bros**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
2	Not found	E-15	88.8	88.0	TRUE

January 2020

Location: Pittsburgh, PA **Store: Sheetz189**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
2	Above Handle	Unleaded 88	88.9	88.0	TRUE

January 2020

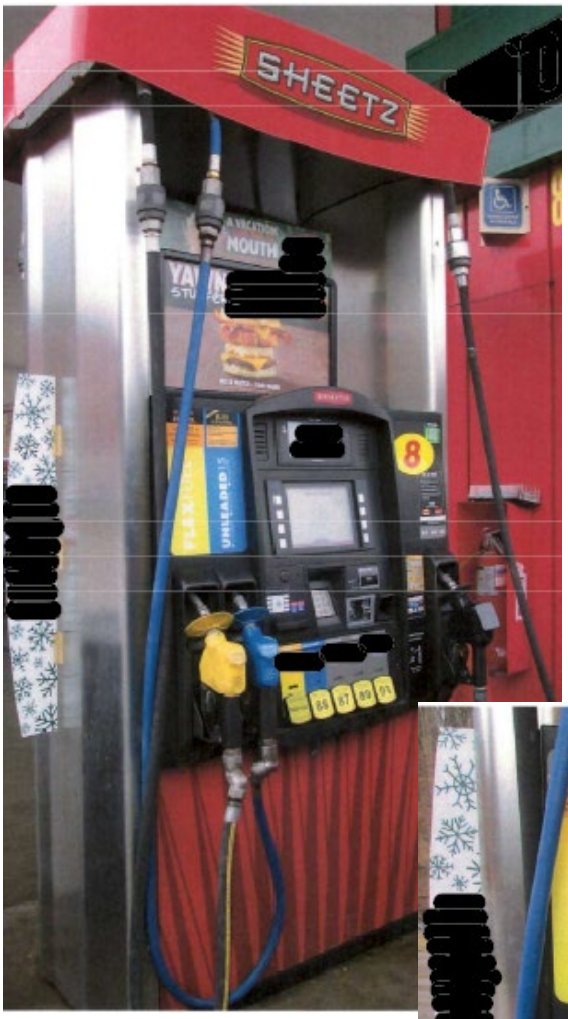
Location: Pittsburgh, PA **Store: Sheetz 360**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
2	Above Handle	Unleaded 88	88.0	88.0	TRUE

January 2020

Location: Pittsburgh, PA **Store: Sheetz500**

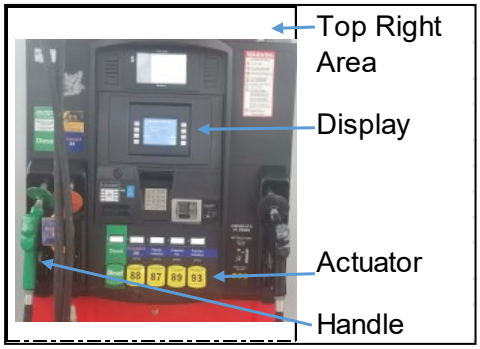
Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
2	Above Handle	Unleaded 15	89.6	88.0	TRUE



Appendix C: Station Photographs Summary – July 2020

CITY	GRADE	BRAND	Photos (Quantity)	E15 EPA Label Dispenser Location*	E15 Marketing	Octane Rating		
						(R+M)/2	Posted	Measured ≥ Posted?
Atlanta, GA	E15	Racetrac	1	Unknown	Unleaded 88	88.9	88.0	TRUE
Chicago, IL	E15	Thorntons	1	Above Display	Unleaded 15	89.8	88.0	TRUE
Cleveland, OH	E15	Sheetz	2	Above Handle	Unleaded 88	89.1	88.0	TRUE
Dallas, TX	E15	Murphy	2	Above Handle	e15	88.3	88.0	TRUE
Denver, CO	E15	Kum N Go	1	Unknown	E-15	89.4	86.0	TRUE
Detroit, MI	E15	NuVu	1	Below Handle	Unleaded 88	89.6	88.0	TRUE
Houston, TX	E15	Murphy				88.6	88.0	TRUE
Minneapolis/St. Paul, MN	E15	Holiday	2	Below Actuator	Plus	90.0	88.0	TRUE
New Orleans, LA	E15	Racetrac	1	Unknown	Unleaded 88	88.0	88.0	TRUE
Pittsburgh, PA	E15	Sheetz 189	2	Above Handle	Unleaded 88	89.2	88.0	TRUE
Pittsburgh, PA	E15	Sheetz 360	2	Above Handle	Unleaded 88	88.6	88.0	TRUE
		Total:	15				False =	0

* E15 EPA Label Dispenser Locations Nomenclature



July 2020

Location: Atlanta, GA **Store: Racetrac**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
1	Unknown	Unleaded 88	88.9	88.0	TRUE

July 2020

Location: Chicago, IL **Store: Thorntons**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
1	Above Display	Unleaded 15	89.8	88.0	TRUE

July 2020

Location: Cleveland, OH **Store: Sheetz**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
2	Above Handle	Unleaded 88	89.1	88.0	TRUE

July 2020

Location: Dallas, TX **Store: Murphy**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured ≥ Posted?
2	Above Handle	e15	88.3	88.0	TRUE

July 2020

Location: Denver, CO **Store: Kum N Go**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
1	Unknown	E-15	89.4	86.0	TRUE

July 2020

Location: Detroit, MI **Store: NuVu**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
1	Below Handle	Unleaded 88	89.6	88.0	TRUE

July 2020

Location: Minneapolis/St. Paul, MN **Store: Holiday**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
2	Below Actuator	Plus	90.0	88.0	TRUE

July 2020

Location: New Orleans, LA **Store: Racetrac 1**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
1	Unknown	Unleaded88	88.0	88.0	TRUE

July 2020

Location: Pittsburgh, PA **Store: Sheetz 189**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
2	Above Handle	Unleaded 88	89.2	88.0	TRUE

July 2020

Location: Pittsburgh, PA **Store: Sheetz 360**

Photos (Quantity)	E15 EPA Label Dispenser Location	E15 Marketing	Octane Rating		
			(R+M)/2	Posted	Measured≥ Posted?
2	Above Handle	Unleaded 88	88.6	88.0	TRUE