



Refinery MACT Summary Report: Evaluating Benzene Fenceline Monitoring Data

Established March 2020

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Background

In December 2015, the U.S. Environmental Protection Agency (EPA) issued the Refinery MACT (maximum achievable control technology) Rule to further control toxic air emissions from petroleum refineries and provide important information about refinery emissions to the public and neighboring communities. This rule requires refineries to monitor benzene emissions at key emission sources within their facilities and around their fencelines. The EPA estimated that when fully implemented in 2018, this rule would result in a reduction of 5,200 tons per year of toxic air pollutants, and 50,000 tons per year of volatile organic compounds (VOC).

Identified refineries were required to install passive diffusive tube monitors around the facilities fenceline and near sources to allow for continual monitoring of benzene concentrations around the entire plant. These monitors were chosen due to their low detection limits, allowing them to detect benzene concentrations in the ambient air near a refinery during typical operating conditions. The number of samplers varies, ranging anywhere from 10-50, depending on the size and number of sources in the facility. In January 2018, refineries were instructed to begin monitoring benzene in order to collect 12 months of data for calculation of a rolling annual average. By the spring of 2019, each refinery was required to report the collected monitoring data to the EPA, and reporting was required to continue on a quarterly basis. These data were released to the public through the EPA's Compliance and Emission Data Reporting Interface (CEDRI) website in the summer of 2019 and remains public as it is reported. The Texas Commission on Environmental Quality (TCEQ) also reviews this data as it becomes available.

Air Monitoring for Benzene

Benzene Fenceline Monitoring

The purpose of the EPA fenceline monitoring rule is to identify fugitive emissions sources that may not be well characterized in emissions inventories but that may still contribute significantly to a facility's overall emissions. The EPA predicted that the highest concentrations of these fugitive emissions would likely occur at fenceline near ground level of the facility, and that air monitoring would provide a direct measurement of the total concentrations of air toxics around the facility. Since benzene tends to be a risk driver and primary component of fugitive emissions, the EPA suggests that reducing benzene emissions would reduce emissions of other air toxics as well. Therefore, the new rule required passive benzene samplers be placed around the perimeter of the facility, creating complete coverage of the fenceline. The passive, diffusive benzene samplers are small tubes (about the diameter of a pencil) with carbon sorbent material inside. The tubes are hung around the fenceline of the facility and uncapped to expose them to air for two weeks, and then the tubes are recapped and sent to the lab for analysis. The end result is a series of two-week average benzene concentrations from around each facility.

TCEQ Stationary Ambient Air Monitoring

The TCEQ collects ambient VOC data throughout the state in two ways: discrete canister sampling and near-real-time automated gas chromatograph (autoGC) monitoring. Canister samplers continuously collect ambient air in a stainless-steel canister over a 24-hour period.

The canister is then shipped to the TCEQ Air Laboratory in Austin, and the sample is analyzed for 85 targeted VOCs. Most canister sampling sites collect one sample every six days, or approximately 50 to 60 samples per year. AutoGC samplers collect 40-minute ambient air samples every hour, and the sample is immediately analyzed onsite by the autoGC during the next 20 minutes. The autoGC analyzes the sample for 46 targeted VOCs and collects 40-minute samples every hour for 22 hours each day. Although both samplers are designed to look at long-term data trends, the autoGC sampler also provides short-term data and can be useful in identifying sources of pollutants. The year is considered complete if 75% of the scheduled sampling days have valid data.

Evaluation of Ambient Air Monitoring Data

EPA Delta C Calculations and Requirements

The EPA uses the site-wide fenceline monitoring data to calculate an annual average for each refinery, which they refer to as a delta C (or ΔC). This calculation is designed to consider background or other nearby sources of benzene that may be influencing the monitored concentrations. For each two-week period, the highest and lowest benzene concentrations are identified from all of the sites around the facility, and the delta C is the difference between those two concentrations. The annual average is then calculated by taking the average of 26 consecutive delta C concentrations. This calculation can become even more complicated for refineries that submit plans for corrected benzene concentrations. According to the EPA rule, only certain sources fall under this new rule, and therefore refineries can submit modeling plans to deduct the potential emissions from sources that are not included. The EPA set the action level of $9 \mu\text{g}/\text{m}^3$ (2.8 ppb) for annual average benzene delta C concentrations. Refineries that exceed this action level are required to submit an action plan to the TCEQ. TCEQ staff in the Office of Compliance and Enforcement (OCE) and the respective regional offices are reviewing the fenceline monitoring data for delta C compliance.

TCEQ Long-Term AMCV Comparison

Air Monitoring Comparison Values, or AMCVs, are chemical-specific short- and long-term air concentrations used in the evaluation of air monitoring data to protect human health and welfare. AMCVs are developed by the TCEQ Toxicology Division and are set well below levels where effects have been shown to occur. Short-term AMCVs are based on data concerning acute health effects, odor potential, and acute vegetation effects, while long-term AMCVs are based on data concerning chronic health or vegetation effects. Although exceedances of the AMCVs do not necessarily lead to health effects, the TCEQ works to keep ambient air concentrations below their respective AMCVs. Short-term (1- or 24-hour) samples are compared to applicable short-term AMCVs, while annual averages are calculated from the short-term monitoring samples and compared to long-term AMCVs. It is important to note that it is not appropriate to compare short-term samples to the long-term AMCV, because the long-term AMCV is based on a lifetime of exposure. It is only appropriate to compare short-term samples to the appropriate short-term AMCV (1-hour or 24-hour) and long-term sampling data (at least one year, but most appropriately the lifetime average) to the long-term AMCV.

Benzene has two short-term AMCVs, a 1-hour AMCV of 580 $\mu\text{g}/\text{m}^3$ (180 ppb) and a 24-hour AMCV of 320 $\mu\text{g}/\text{m}^3$ (100 ppb), and a long-term AMCV of 4.5 $\mu\text{g}/\text{m}^3$ (1.4 ppb).

The TCEQ evaluates measurements of air toxics in ambient air collected from air monitoring sites that are located throughout the state of Texas. Data from monitoring air toxics can be used for finding pollution sources, evaluating air-permit applications, and identifying potential health concerns. The TCEQ toxicology staff uses ambient air monitoring to assess the potential for measured concentrations of air toxics to impair health and cause odors. In a similar manner, the toxicology staff reviews the benzene fence-line monitoring data on an individual sampler basis, comparing the annual average from each sampler to the long-term AMCV of 4.5 $\mu\text{g}/\text{m}^3$ (1.4 ppb). Although the EPA allows for the deduction of background concentrations or emissions from sources that do not fall under the refinery guidance, the TCEQ evaluates the total benzene concentration at the specific site monitored. So while the EPA Refinery MACT Rule is focused on reducing emissions related to specific processes, the TCEQ is focused on reducing human exposure.

Identifying Potential Samplers of Interest

Since the TCEQ is evaluating each sampler on an individual basis, it is important to note that not all of the samplers and/or refineries are of equal concern. While some facilities are near communities or other areas where private citizens may be exposed, other facilities are in the center of highly industrialized areas, surrounded completely by other facilities or tank farms. The same is true for benzene samplers, depending on which side of the facility they are located and the predominate wind direction. As each facility has its own specific monitoring plan and surrounding area land use, site-specific evaluations are needed to evaluate ambient air monitoring data for the potential for health effects. Therefore, the TCEQ reviewed each facility and identified samplers of interest (SOIs) that would be the more representative of community exposure. While all of the sampling data continue to be evaluated on a quarterly basis, a focus is put on these identified SOIs to specifically evaluate exposure.

Facilities with SOIs Above the Long-Term AMCV for Benzene

Region 12 – Houston

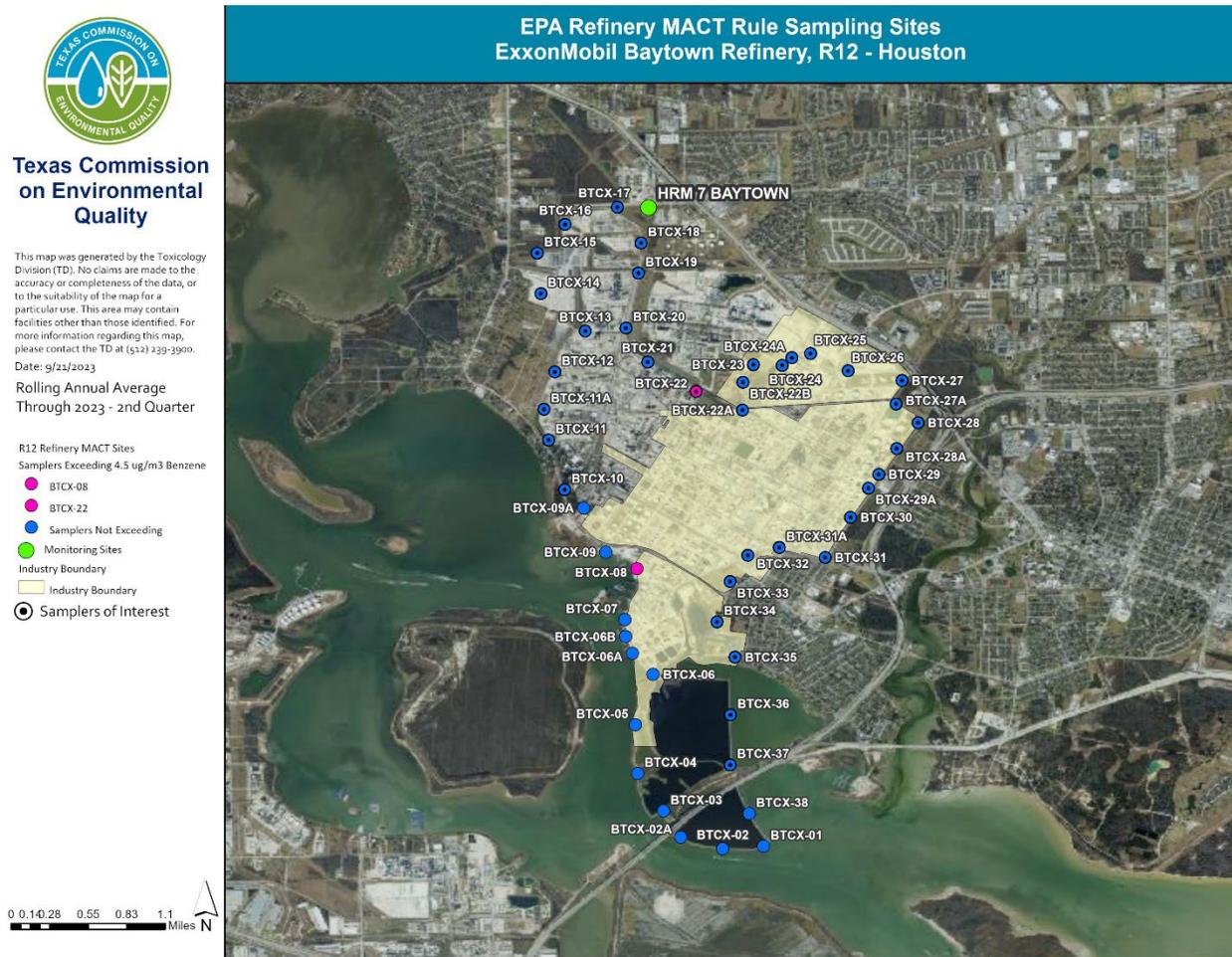
ExxonMobil Baytown Refinery – RN102579307

The ExxonMobil Baytown Refinery is located on approximately 3,400 acres along the Houston Ship Channel, about 25 miles east of Houston, and has the capability to process up to 584,000 barrels of crude oil per day. The refinery is located on the Upper San Jacinto Bay, which runs along the southern fence-line of the facility (Figure 1). The remainder of the surrounding area is highly residential, with the city of Baytown engulfing the refinery and covering nearly every fence-line other than those directly on the ship channel. There is currently one stationary autoGC monitor in the vicinity of the ExxonMobil Baytown Refinery, [HRM 7 Baytown](#), located on the north side of the facility, and it is not currently above the long-term AMCV for benzene.

The ExxonMobil Baytown Refinery is located in the center of Baytown, with residential areas on nearly every side of the facility, and therefore the TCEQ identified all of the samplers not along the ship channel fenceline as SOIs. Currently, the identified **SOIs include Samplers BTCX-10 – BTCX-37**. As of 2023Q2, the SOIs that are over the long-term AMCV for benzene are detailed below:

- **Sampler BTCX-22** ended quarter 2 of 2023 with an annual average of 6.07 $\mu\text{g}/\text{m}^3$, 1.57 $\mu\text{g}/\text{m}^3$ over the long-term AMCV for benzene. The annual average at this sampler has fluctuated over the last couple of years and decreases in benzene concentrations are encouraged.

Figure 1. Sampler position around the ExxonMobil Baytown Refinery – 2023Q2



Shell Oil Deer Park – RN100211879

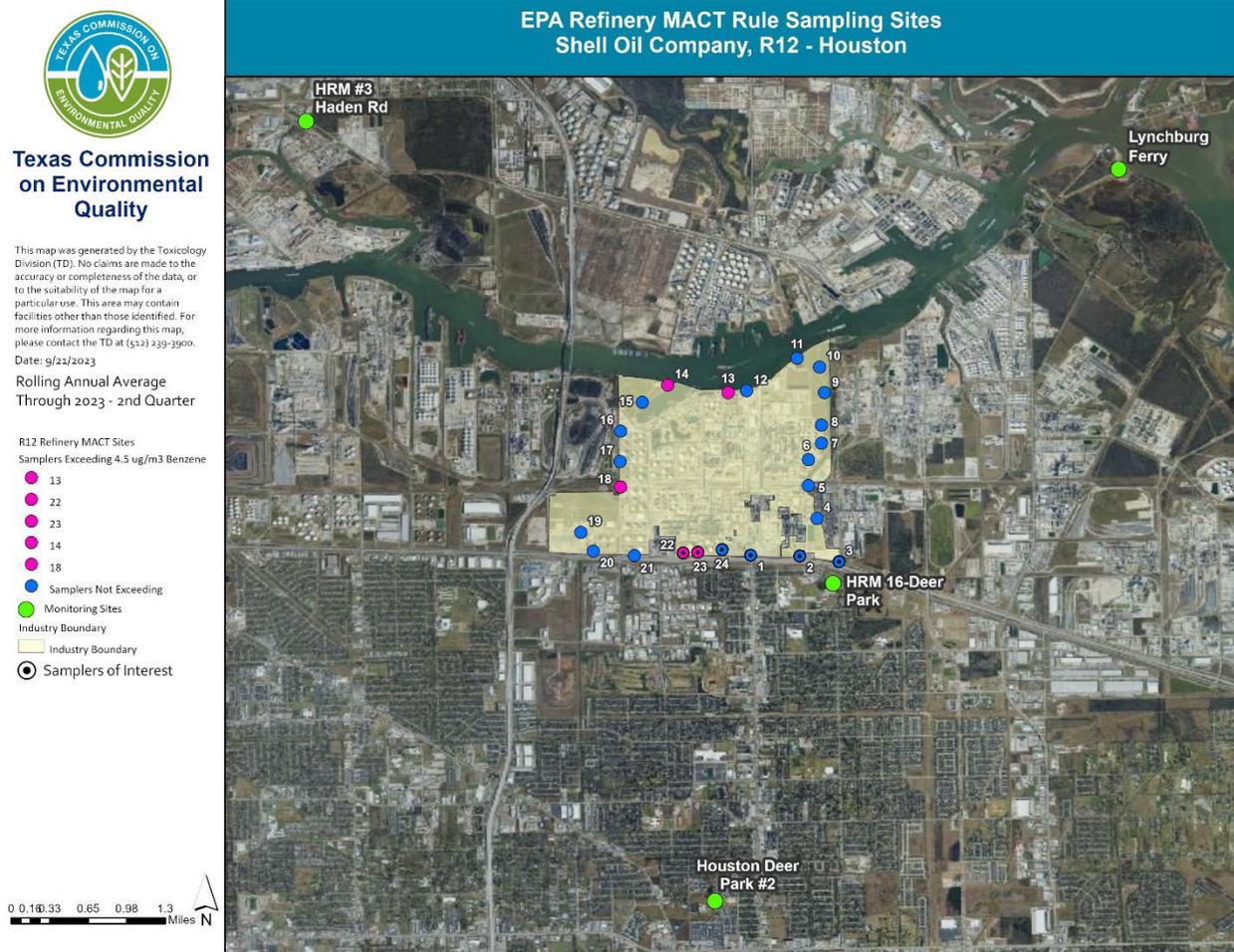
Shell Oil Deer Park is a 1500-acre complex located in Deer Park, Texas, approximately 20 miles east of downtown Houston along the Houston Ship Channel. This facility is surrounded by industrial complexes to the east and west, and to the north opposite the Houston Ship Channel (Figure 2). To the south, directly across from State Highway 225, is the city of Deer Park, home to over 33,000 people. There are currently three stationary monitoring sites in the area that

monitor for benzene, a canister and autoGC at Houston Deer Park, HRM#3, and Lynchburg Ferry, and an autoGC at HRM16; none of these monitors are currently above the long-term AMCV for benzene.

The Shell Oil Deer Park facility is just north of the city of Deer Park, and therefore the TCEQ identified the samplers along the southern fenceline of the facility as SOIs. Currently, the identified **SOIs include Samplers 1-3, and 22-24**. As of 2023Q2, the SOIs that are over the long-term AMCV for benzene are detailed below:

- **Sampler 22** has been above the long-term average for benzene since the annual average began calculating in January of 2019. The sampler ended quarter 2 of 2023 with an annual average of 10.17 $\mu\text{g}/\text{m}^3$, 5.67 $\mu\text{g}/\text{m}^3$ over the long-term AMCV for benzene. The annual average at this sampler has fluctuated over the last year and decreases in benzene concentrations are encouraged.
- **Sampler 23** was below the long-term average for benzene in quarter 4 of 2021 but prior to that had been above since the annual average began calculating in January of 2019. The sampler ended quarter 2 of 2023 with an annual average of 13.41 $\mu\text{g}/\text{m}^3$, 8.91 $\mu\text{g}/\text{m}^3$ over the long-term AMCV for benzene. The annual average at this sampler has fluctuated over the last year and decreases in benzene concentrations are encouraged.

Figure 2. Sampler position around the Shell Oil Deer Park Facility – 2023Q2



Region 14 – Corpus Christi

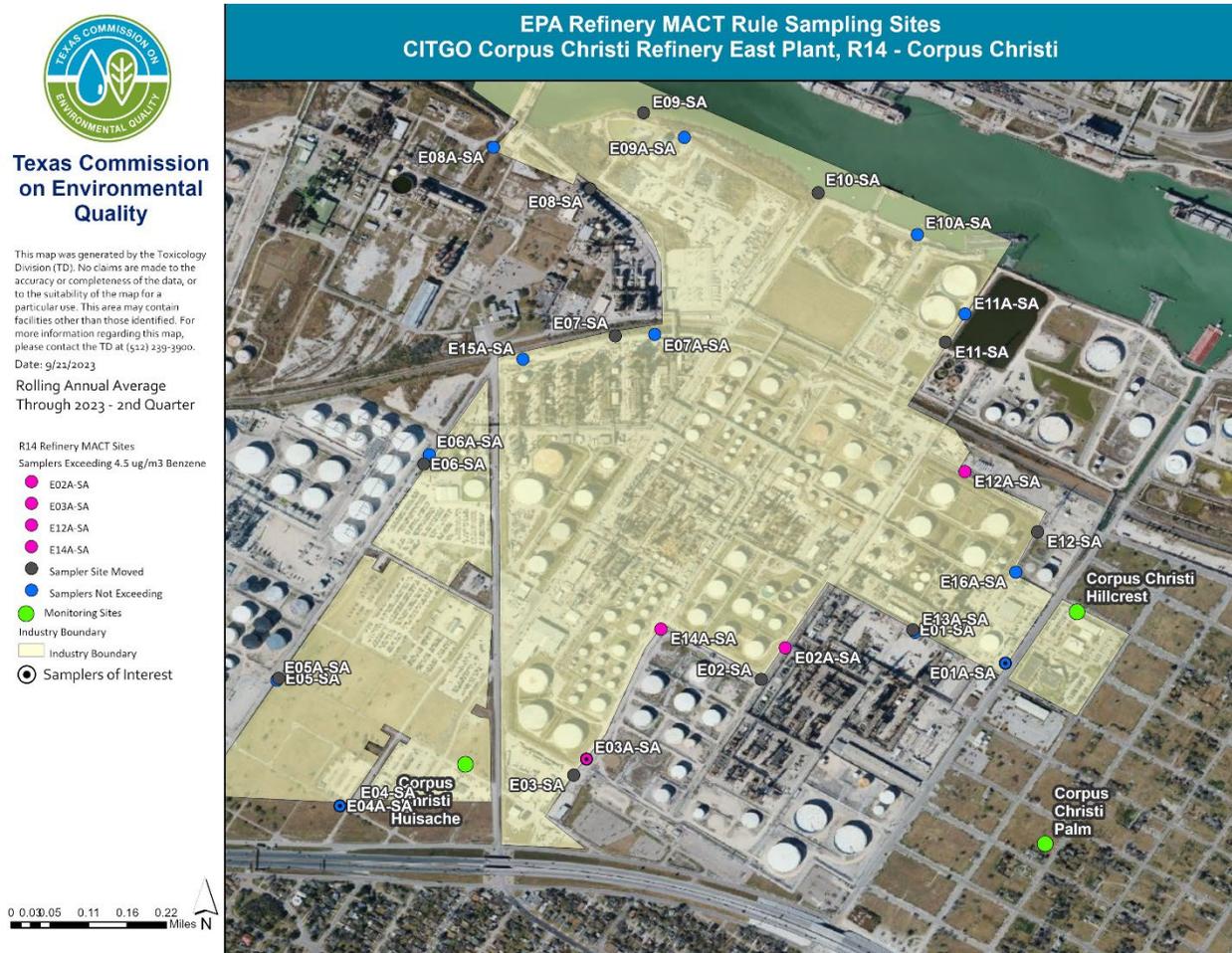
CITGO Corpus Christi Refinery East Plant – RN102555166

The CITGO Refinery East Plant sits on 335 acres near the entrance of the Corpus Christi Ship Channel, and together with the West Plant, has a crude refining capacity of approximately 167,000 barrels/day. The refinery is situated in a mostly industrialized area, with Flint Hills East Plant to the southeast and Magellan Processing to the southwest. The city of Corpus Christi is located southeast of the refinery, with residential areas lining the south side of I-37 and to the east nearly all the way to the ship channel (Figure 3). There are currently three stationary monitoring sites in the area that monitor for benzene, an autoGC at Corpus Christi Palm, and a canister at Corpus Christi Hillcrest and Corpus Christi Huisache, and none of the monitors are currently above the long-term AMCV for benzene.

The CITGO Refinery East Plant has residential areas to the south and east of the facility, and therefore the TCEQ identified the samplers along these fencelines as SOIs. Currently, the identified **SOIs include Samplers E01A-SA, E03A-SA, and E04A-SA**. As of 2023Q2, the SOIs that are over the long-term AMCV for benzene are detailed below:

- **Sampler E03A-SA** ended quarter 2 of 2023 with an annual average of 4.56 $\mu\text{g}/\text{m}^3$, 0.06 $\mu\text{g}/\text{m}^3$ over the long-term AMCV for benzene. A reduction in benzene concentrations are encouraged.

Figure 3. Sampler position around the CITGO Corpus Christi East Plant Refinery – 2023Q2



Facilities with SOIs Below the Long-Term AMCV for Benzene

Region 1 – Amarillo

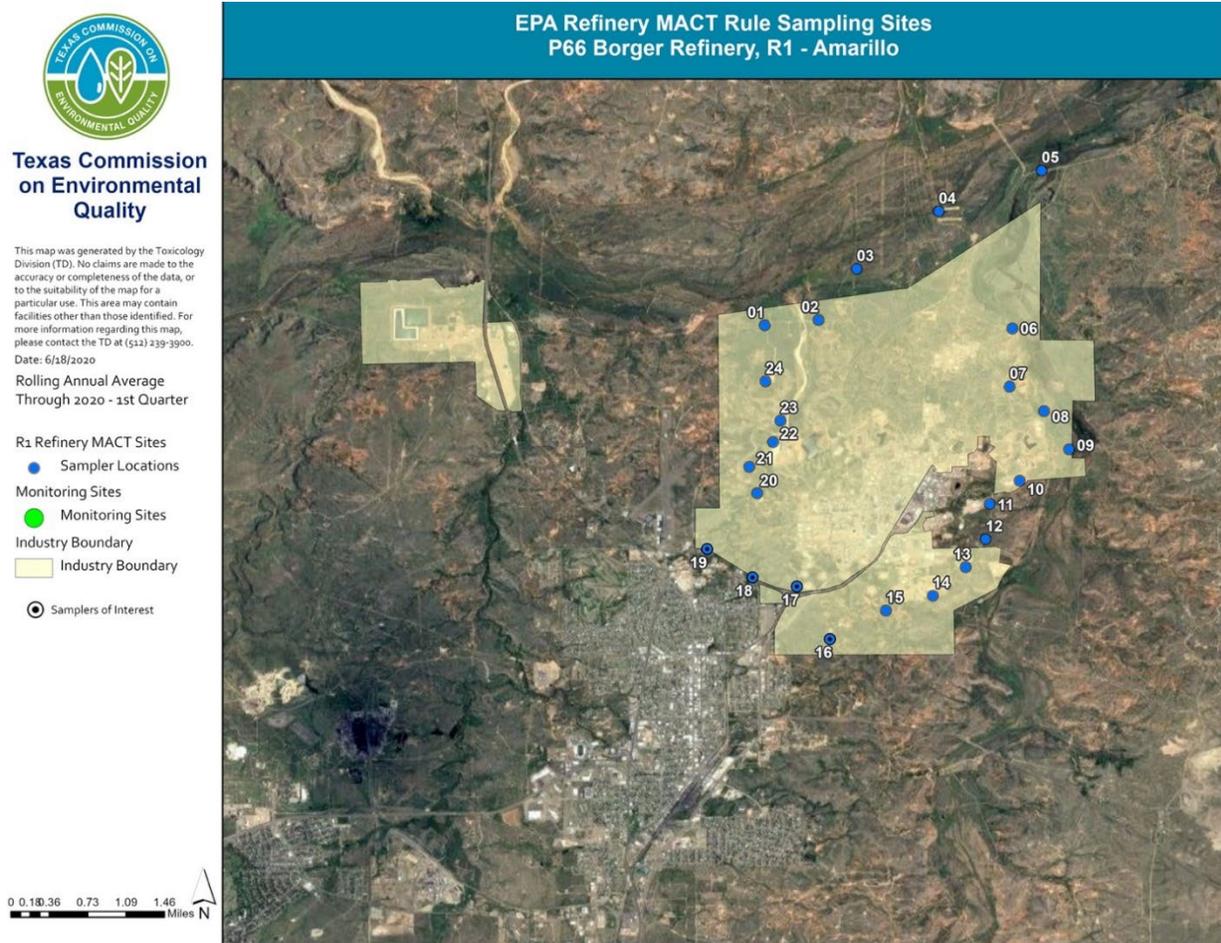
P66 Borger – RN102495884

The Phillips 66 Refinery is a 6,000-acre facility located in the city of Borger, approximately 50 miles north of Amarillo in the Texas panhandle. The refinery is surrounded mostly by vacant property, with the city of Borger being located less than a mile to the southwest (Figure 4). Borger is the largest city in Hutchinson County with over 13,000 residents. There are no stationary air monitors in the area.

The Phillips 66 Refinery is located to the northeast of Borger, and therefore the TCEQ identified the samplers along the southwestern fenceline of the facility as SOIs. Currently, the identified

SOIs include Samplers 16-19. As of 2023Q2, none of the samplers are or ever have been over the long-term AMCV for benzene.

Figure 4. Sampler position around the P66 Borger Refinery – 2023Q2 (no change in map since 2020Q1)



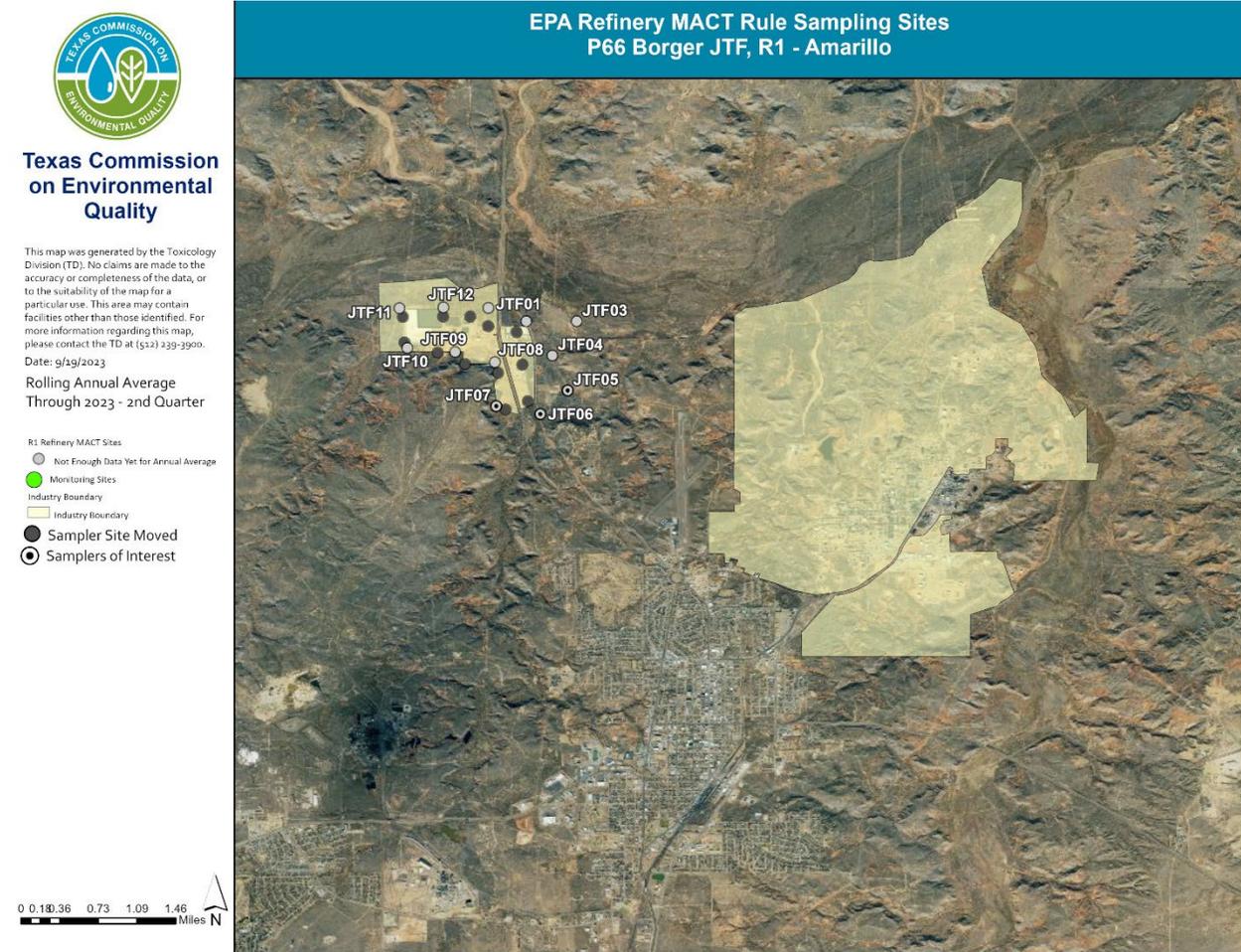
P66 Borger JTF – RN102495884

The Phillips 66 Refinery has an additional tank farm located approximately 2.5 miles away from the main refinery outside of Borger. This tank farm is even further from the city of Borger, about 1.5 miles northwest from the outskirts of the city and is surrounded completely by vacant land (Figure 5). Similar to the main refinery, there are no stationary air monitors in the area.

The Phillips 66 Tank Farm is located to the northwest of Borger with a few residents located close to the southwestern fenceline, and therefore the TCEQ identified the samplers along the southeastern fenceline of the facility as SOIs. Currently, the identified **SOIs include Samplers JTF06-JTF07**. As of 2023Q2, none of the SOIs are over the long-term AMCV for benzene.

Note: all samplers were moved in 2023Q1, a full year’s worth of data will need to be collected at the new sampler sites before an annual average can be calculated.

Figure 5. Sampler position around the P66 Borger JTF – 2023Q2



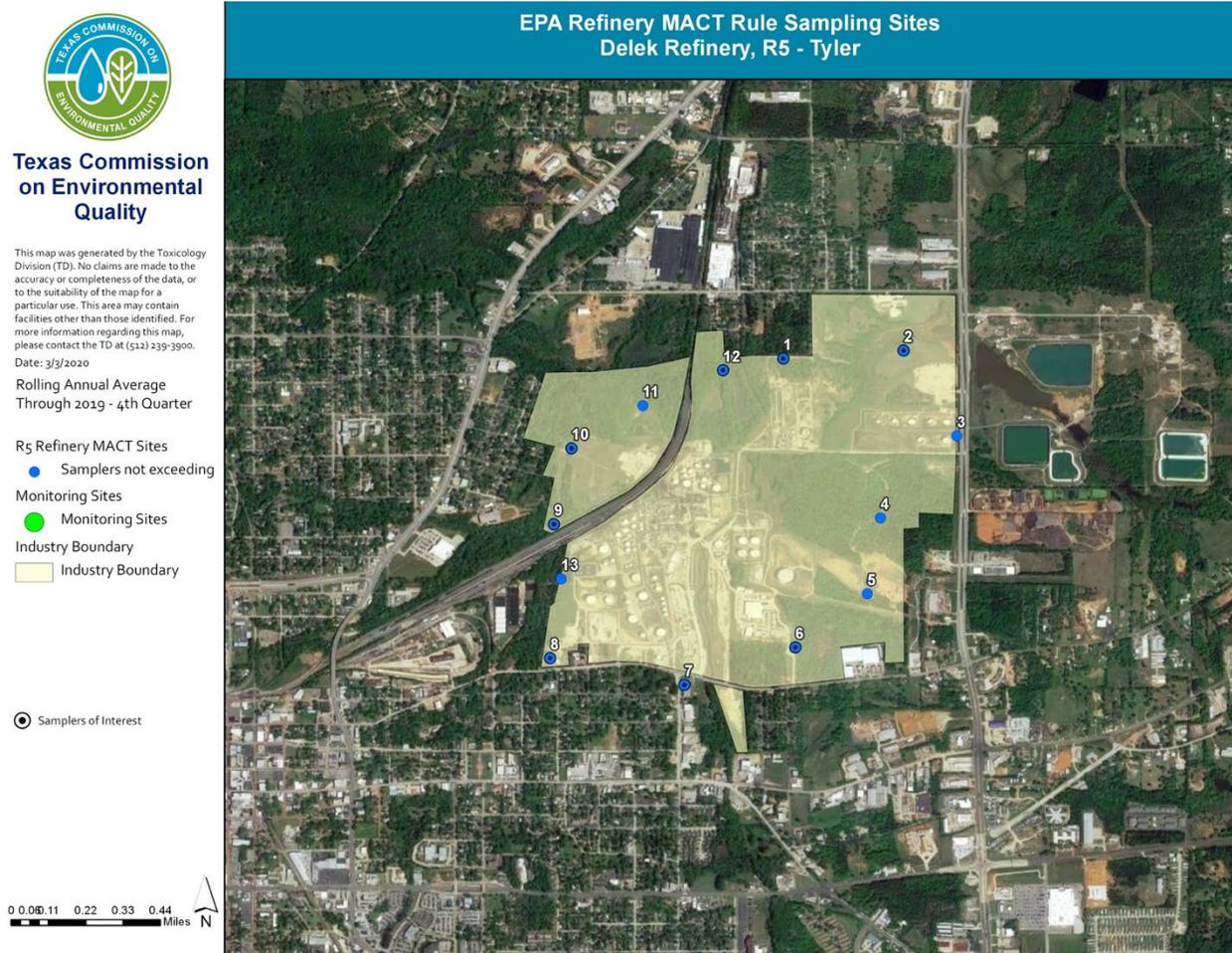
Region 5 – Tyler

Delek Tyler Refinery – RN100222512

The Delek Tyler Refinery is capable of processing 75,000 barrels/day of crude oil, and also produces gasolines, distillates and propane products. This refinery is located in the city of Tyler, just northeast of the center of the city, without much buffer between the facility and the neighboring residents (Figure 6). Although there is some vacant land to the east, the Delek Tyler Refinery has residential areas to the north, west, and south of the facility. There are no stationary air monitors in the area.

The Delek Tyler Refinery is situated in the metropolitan area of Tyler, with neighboring residents surrounding nearly every side of the facility, and therefore the TCEQ identified samplers all around the facility as SOIs. Currently, the identified **SOIs include Samplers 1-2, 6-10, and 12**. As of 2023Q2, none of the samplers are or ever have been over the long-term AMCV for benzene.

Figure 6. Sampler position around the Delek Refinery – 2023Q2 (no change in map since 2019Q4)



Region 6 – El Paso

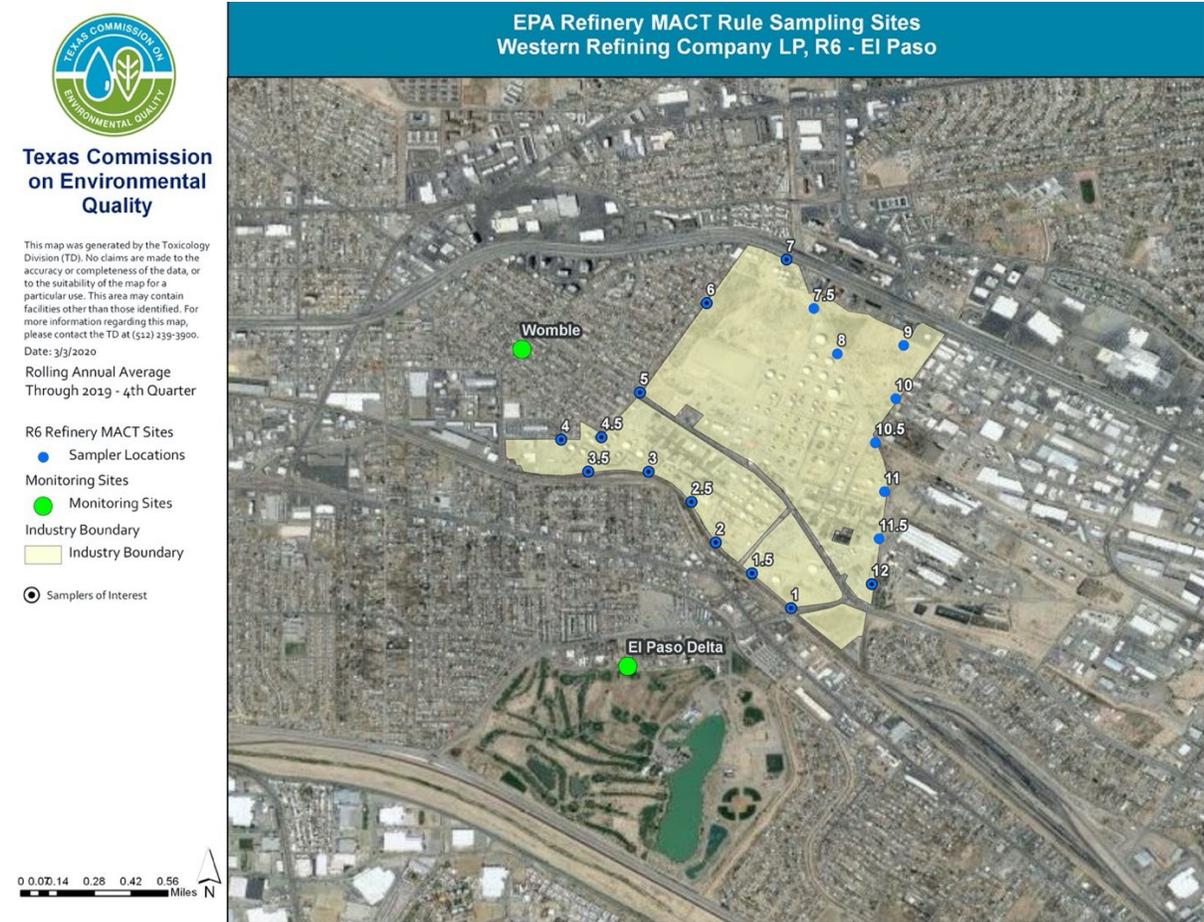
Western Refining – RN100213016

Western Refining Company, located about three miles east of downtown El Paso, has a crude oil capacity of approximately 131,000 barrels/day. This refinery, a part of Marathon Petroleum, is situated in a mixed-use area, with highly populated residential areas to the west and more industrial uses to the east (Figure 7). The south side of the refinery property line runs along the Franklin Canal, a little over a mile from the Rio Grande River and the Mexican border, with Ascarte Park and Golf Course situated in between. There are currently two stationary monitoring sites in the area that monitor for benzene, a canister at Womble and an autoGC at El Paso Delta, and neither of the monitors is currently above the long-term AMCV for benzene.

Western Refining is located in a highly populated area of El Paso, with dense residential areas surrounding the western fenceline, and therefore the TCEQ identified the samplers along the north- and southwestern fenceline of the facility as SOIs. Currently, the identified **SOIs include**

Samplers 1-7, and 12. As of 2023Q2, none of the samplers are or ever have been over the long-term AMCV for benzene.

Figure 7. Sampler position around the Western Refining Company – 2023Q2 (no change in map since 2019Q4)



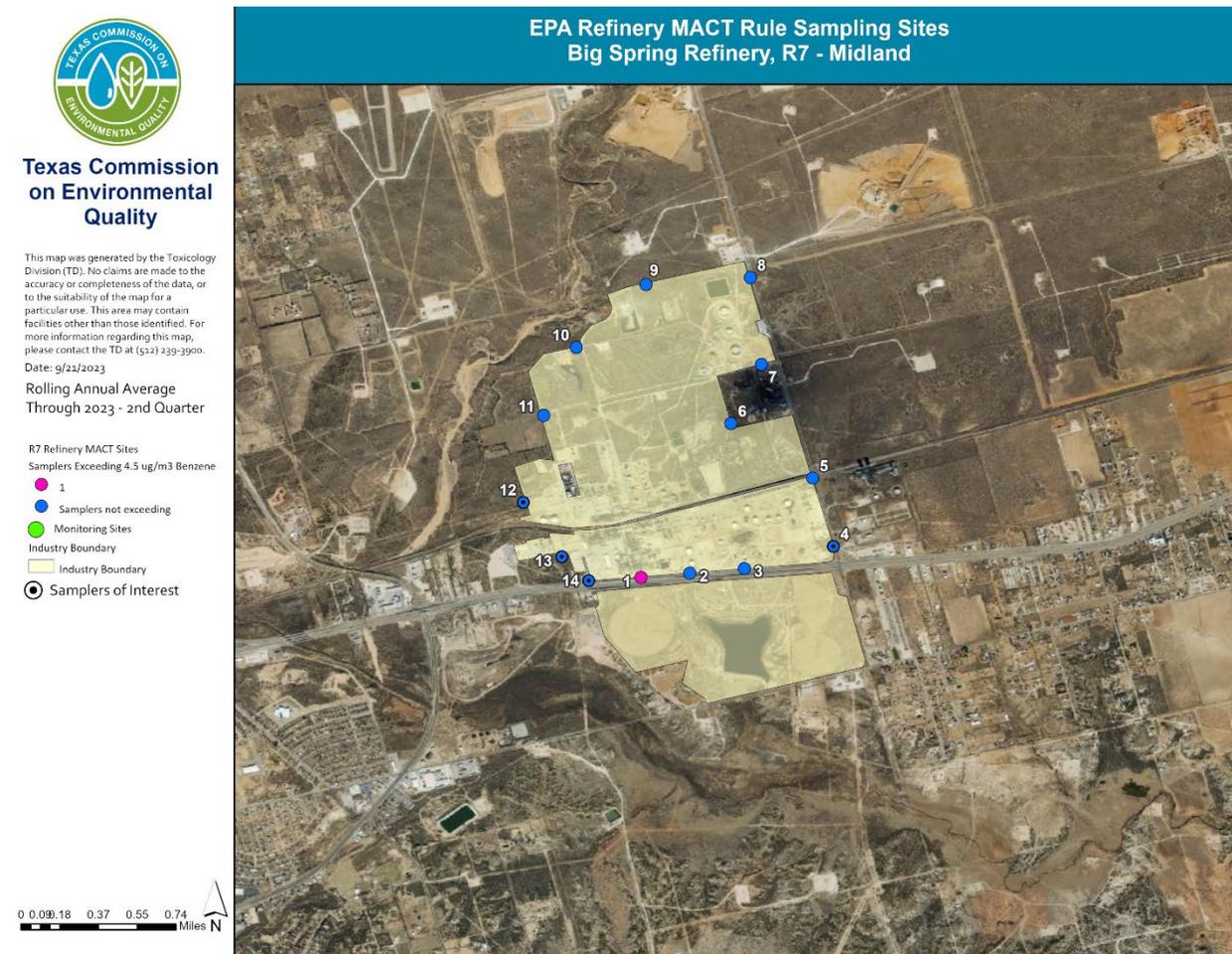
Region 7 – Midland

Big Spring Refinery – RN100250869

Big Spring Refinery is located in Big Spring, approximately 40 miles from Midland, Texas, and has a crude oil capacity of 73,000 barrels/day. The refinery is located to the east of the main city of Big Spring, and it is surrounded mostly by vacant land (Figure 8). The southern fenceline of the refinery runs along I-20, and there are RV parks to the west and east of the refinery along the interstate. There are no stationary air monitors in the area.

Although the Big Spring Refinery is mostly surrounded by vacant property, there are RV parks to the southwest and southeast of the facility, and therefore the TCEQ identified the samplers closest to these areas as SOIs. Currently, the identified **SOIs include Samplers 4 and 12-14.** As of 2023Q2, none of the SOIs are over the long-term AMCV for benzene.

Figure 8. Sampler position around the Big Spring Refinery – 2023Q2



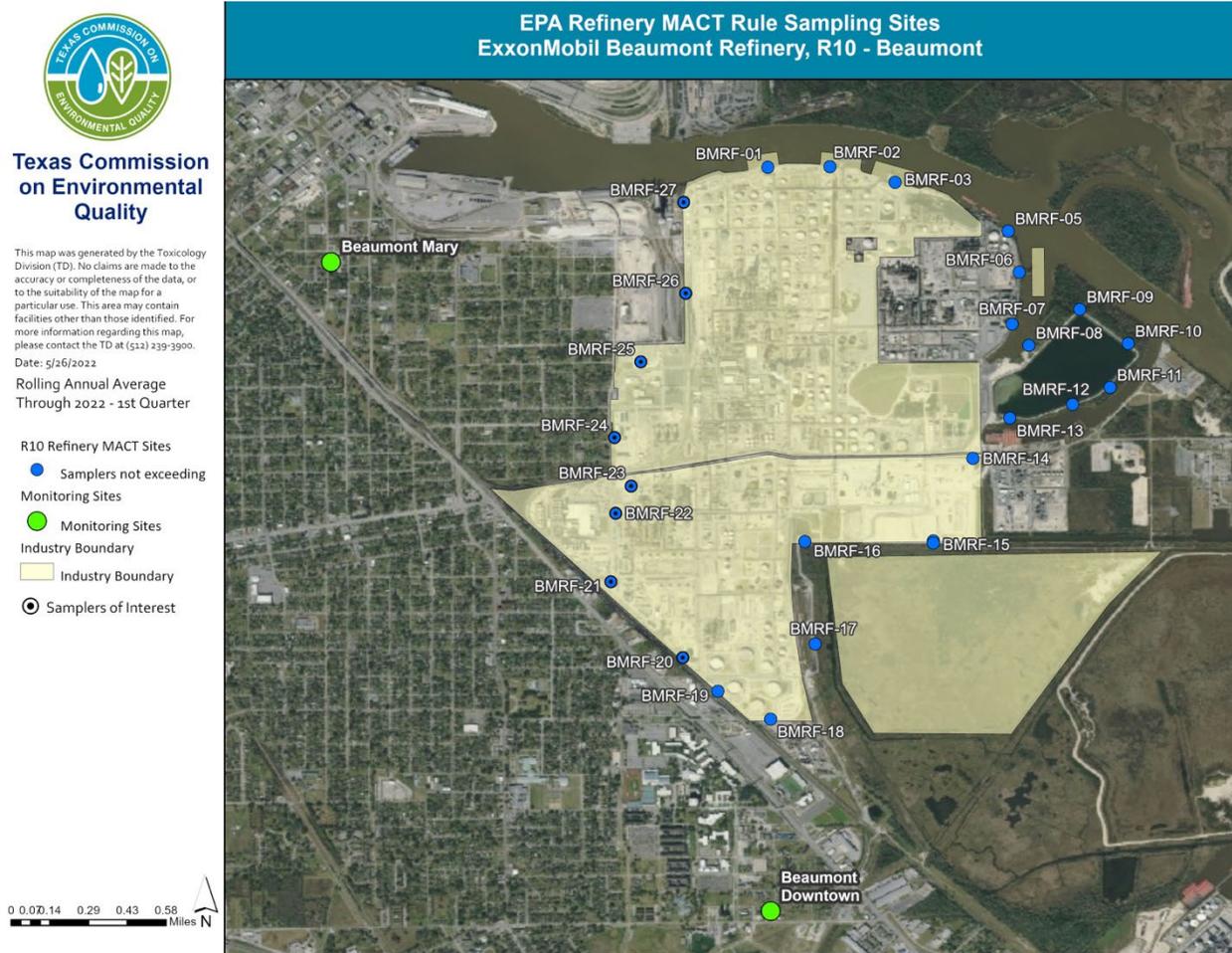
Region 10 – Beaumont

ExxonMobil Beaumont – RN102450756

The ExxonMobil Beaumont Refinery is an approximately 2,700-acre site located along the Neches River, and processes 366,000 barrels of crude oil per day and produces 2.8 billion gallons of gasoline annually. The ExxonMobil Refinery is located just east of downtown Beaumont, with residential neighborhoods lining the western border of the facility (Figure 9). To the north and east, the Neches River runs along the fenceline of the facility, allowing barge traffic to reach the gulf, and across the river is mostly vacant land with a few industrial plots. There are currently two stationary monitoring sites in the vicinity of the ExxonMobil Beaumont Refinery, a canister at Beaumont Mary, and a canister and autoGC at Beaumont Downtown, and none of them are currently above the long-term AMCV for benzene.

The ExxonMobil Beaumont Refinery is located in the heart of the city, with heavily populated residential areas to the west of the facility, and therefore the TCEQ identified the samplers along the western fenceline as SOIs. Currently, the identified **SOIs include Samplers BMRF20 – BMRF27**. As of 2023Q2, none of the samplers are over the long-term AMCV for benzene.

Figure 9. Sampler position around the ExxonMobil Beaumont Refinery – 2023Q2 (no change in map since 2022Q1)

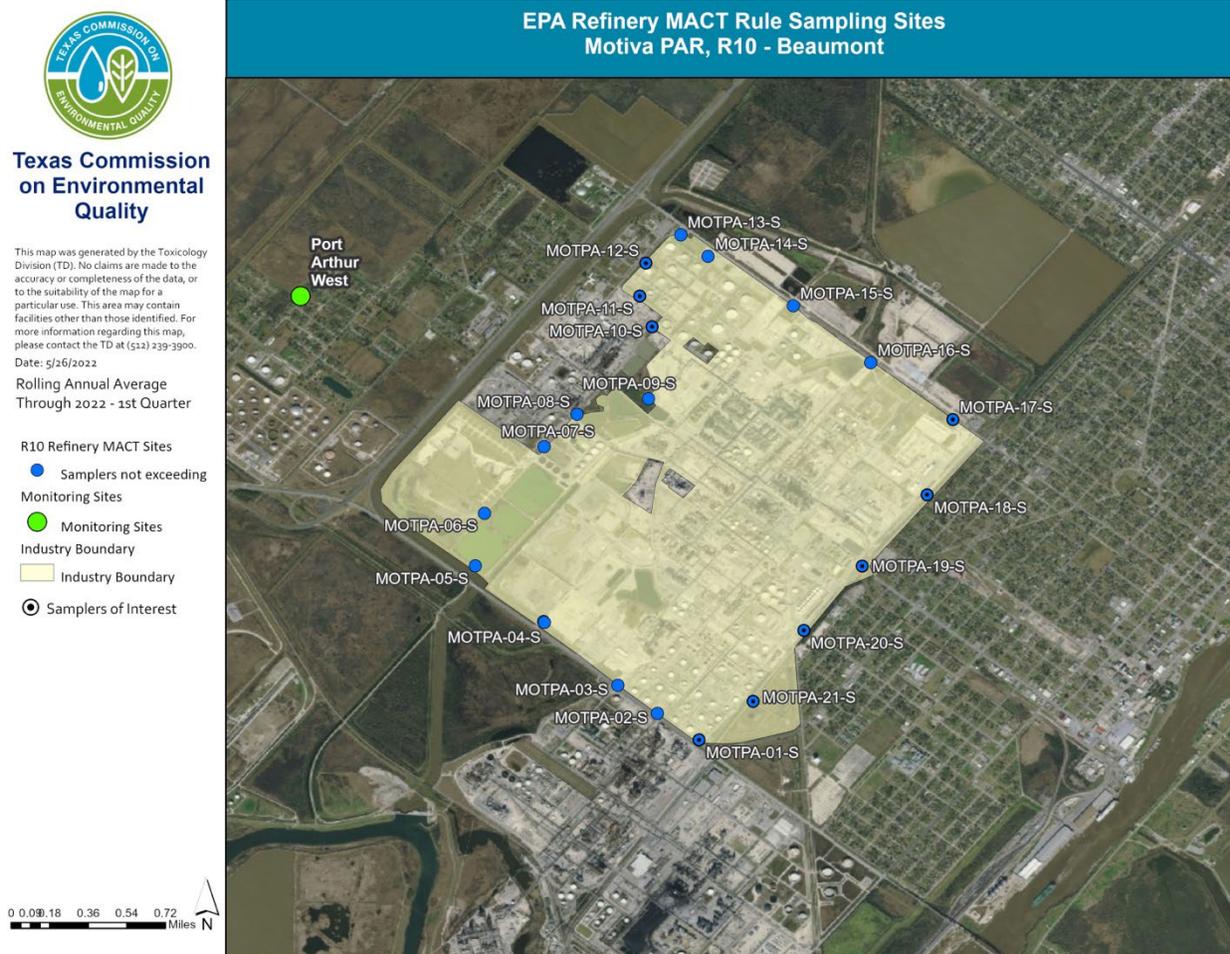


Motiva Port Arthur Refinery – RN100209451

The Motiva Port Arthur Refinery is the largest refinery in North America, with a facility that sits on over 1,400 acres and a crude oil capacity of more than 630,000 barrels/day. The Motiva Refinery is located just east of the city of Port Arthur in a mixed land use area (Figure 10). The refinery is surrounded by residential areas to the east-southeast and northwest, the Valero Port Arthur Refinery to the south, and vacant land to the north and southwest. There is currently one stationary canister monitor in the vicinity of the Motiva Port Arthur Refinery, Port Arthur West, located about a mile from the western fenceline, and it is not currently above the long-term AMCV for benzene.

The Motiva Port Arthur Refinery has a large residential area along the southeastern fenceline, and a smaller residential area along the northwestern fenceline. Therefore, the TCEQ identified the samplers along these fencelines of the facility as SOIs. Currently, the identified **SOIs include Samplers MOTPA-1-S, MOTPA-10-S – MOTPA-12-S, and MOTPA-17-S – MOTPA-21-S**. As of 2023Q2, none of the samplers are over the long-term AMCV for benzene.

Figure 10. Sampler position around the Motiva PAR Refinery – 2023Q2 (no change in map since 2022Q1)



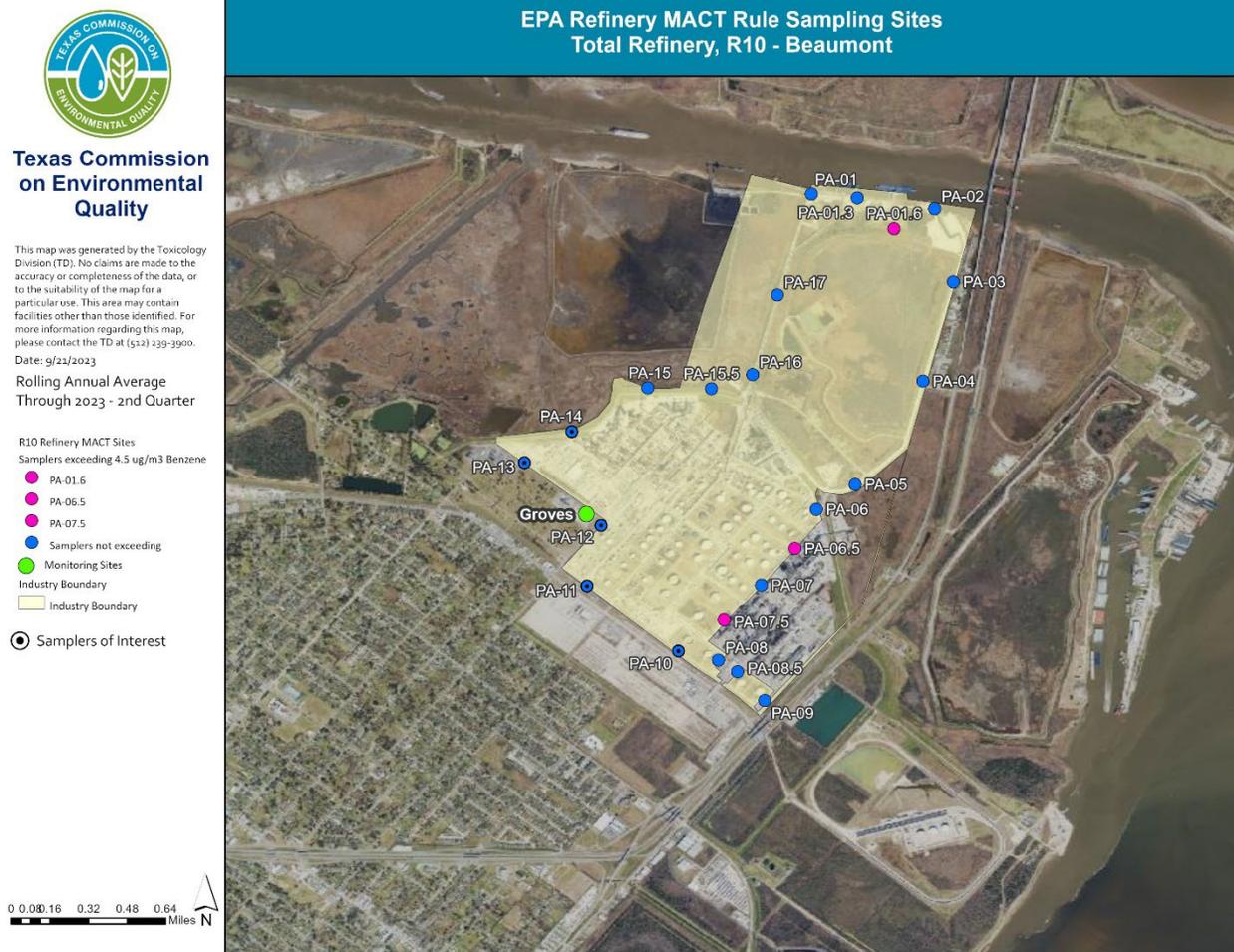
Total Port Arthur Refinery – RN102457520

The Total Port Arthur Refinery, located along the Neches River, has a refining production capacity of 185,000 barrels/day. The facility is mostly surrounded by vacant land, with empty lots to the east and west and the Neches River to north (Figure 11). The city of Groves, situated along the southwestern fenceline of the facility, is the third largest city in Jefferson County and just north of Port Arthur. This highly populated residential area is separated from the main refinery by a section of the facility not included in the sampling plan on the southern half of the fenceline, and a mostly vacant greenery area on the most western half of the fenceline; there are, however, several houses located in this greenery area. There is currently one stationary canister monitor in the vicinity of the Total Port Arthur Refinery, Groves, located along the southwestern fenceline of the facility, and it is not currently above the long-term AMCV for benzene.

The Total Port Arthur Refinery is located to the northeast of the city of Groves, and therefore the TCEQ identified the samplers along the southwestern fenceline as SOIs. Currently, the

identified **SOIs include Samplers P10-P14**. As of 2023Q2, none of the SOIs are over the long-term AMCV for benzene.

Figure 11. Sampler position around the Total Refinery – 2023Q2

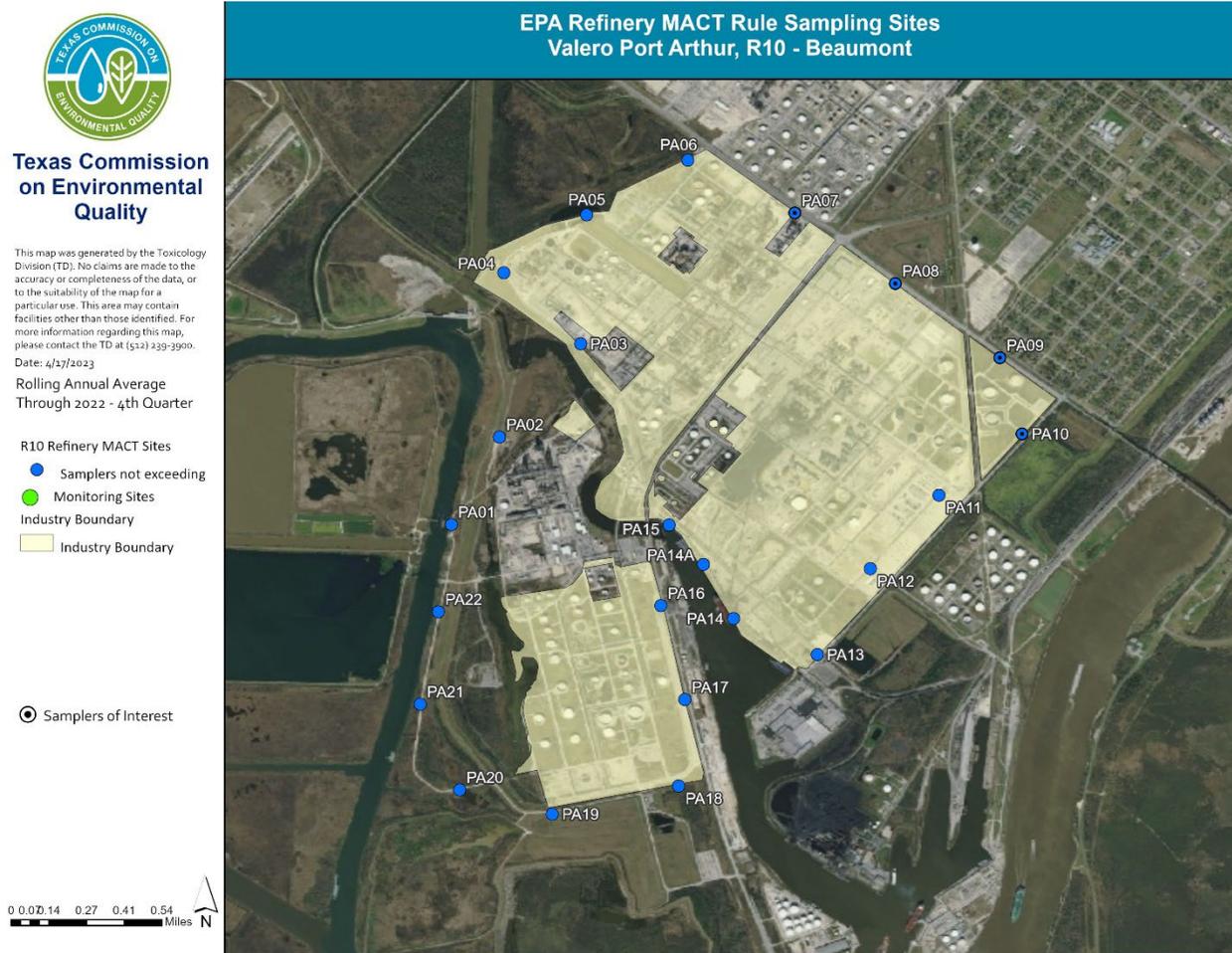


Valero Port Arthur – RN102584026

The Valero Port Arthur Refinery, which has a crude oil throughput capacity of 310,000 barrels/day, is located on the Texas Gulf Coast, approximately 90 miles east of Houston. The refinery is situated around the West Basin off the Taylor Bayou, which eventually leads to the Port Arthur Ship Channel and the Gulf Coast (Figure 12). The refinery is surrounded mostly by vacant land and waterways, while the city of Port Arthur sits to the northeast of the facility, directly across TX-82. There are no stationary air monitors in the area.

The Valero Port Arthur Refinery is located to the southwest of the city of Port Arthur, and therefore the TCEQ identified the samplers along the northeastern fenceline of the facility as SOIs. Currently, the identified **SOIs include Samplers PA07-PA10**. As of 2023Q2, none of the samplers are over the long-term AMCV for benzene.

Figure 12. Sampler position around the Valero Port Arthur Refinery – 2023Q2 (map has not changed since 2022Q4)



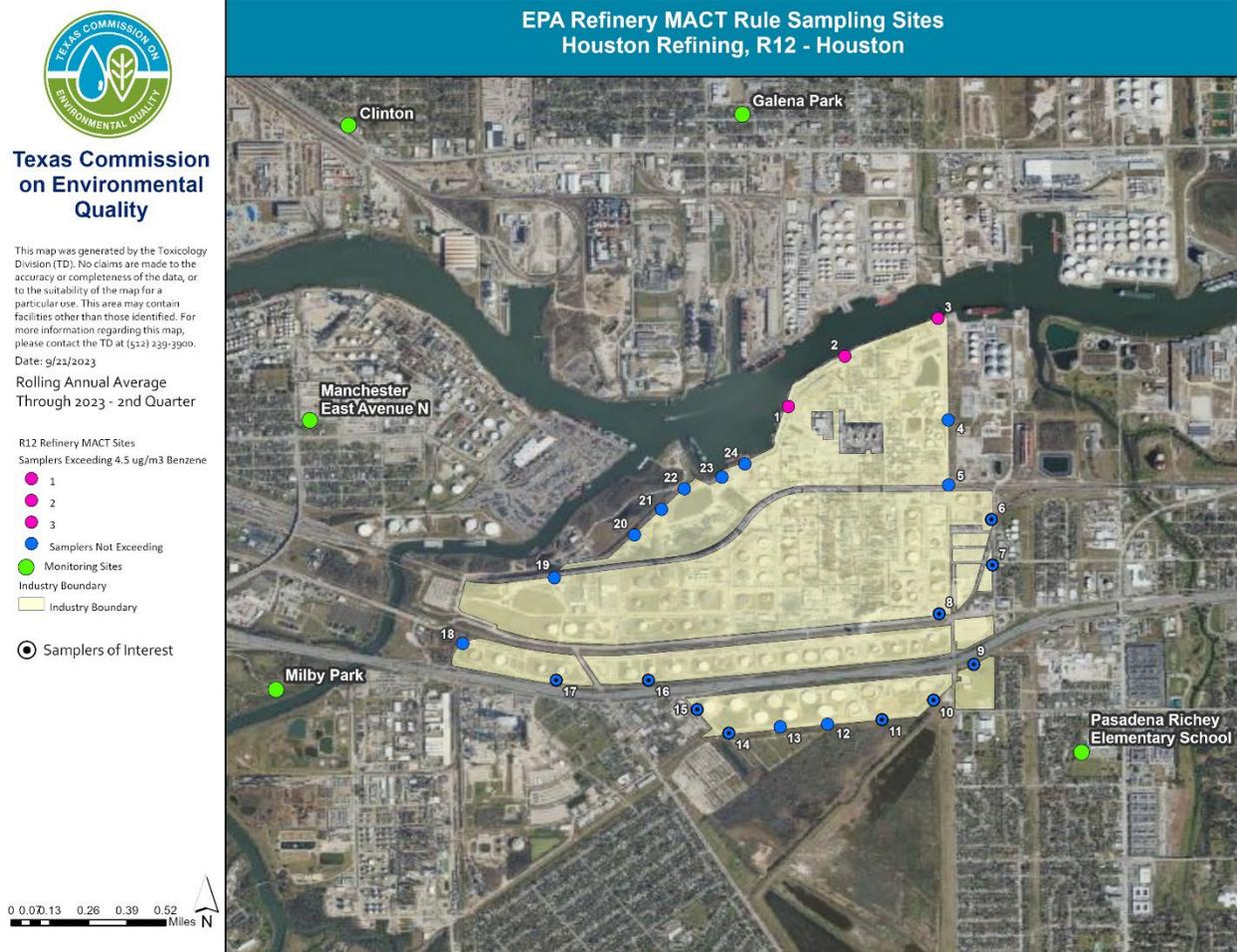
Region 12 – Houston

Houston Refining – RN100218130

Houston Refining LP, formerly Lyondell-Citgo Refining, is located along the Houston Ship Channel and is capable of processing 270,000 barrels/day. Although industrial facilities reside along the Houston Ship Channel, Houston Refining is located in a heavily populated area of Houston, surrounded by several prominent neighborhoods, including Manchester, Pasadena, and Galena Park (Figure 13). This refinery has the ship channel to the north, Valero Houston Refining to the west, and a mix of residential, vacant, and industrial areas to the south and east. Due to the heavily industrialized nature of this populous area, monitoring along the Houston Ship Channel is much greater in some areas than others. There are currently five stationary monitoring sites in the area that monitor for benzene, a canister and autoGC at Galena Park, an autoGC at Clinton, Manchester East Avenue N, Milby Park, and Pasadena Richey Elementary School, and none of the monitors are currently above the long-term AMCV for benzene.

Houston Refining is located in the center of several Houston cities, and therefore the TCEQ identified the samplers along the southern border as SOIs. Currently, the identified **SOIs include Samplers 6-11 and 14-17**. As of 2023Q2, none of the SOIs are over the long-term AMCV for benzene.

Figure 13. Sampler position around the Houston Refining Facility – 2023Q2

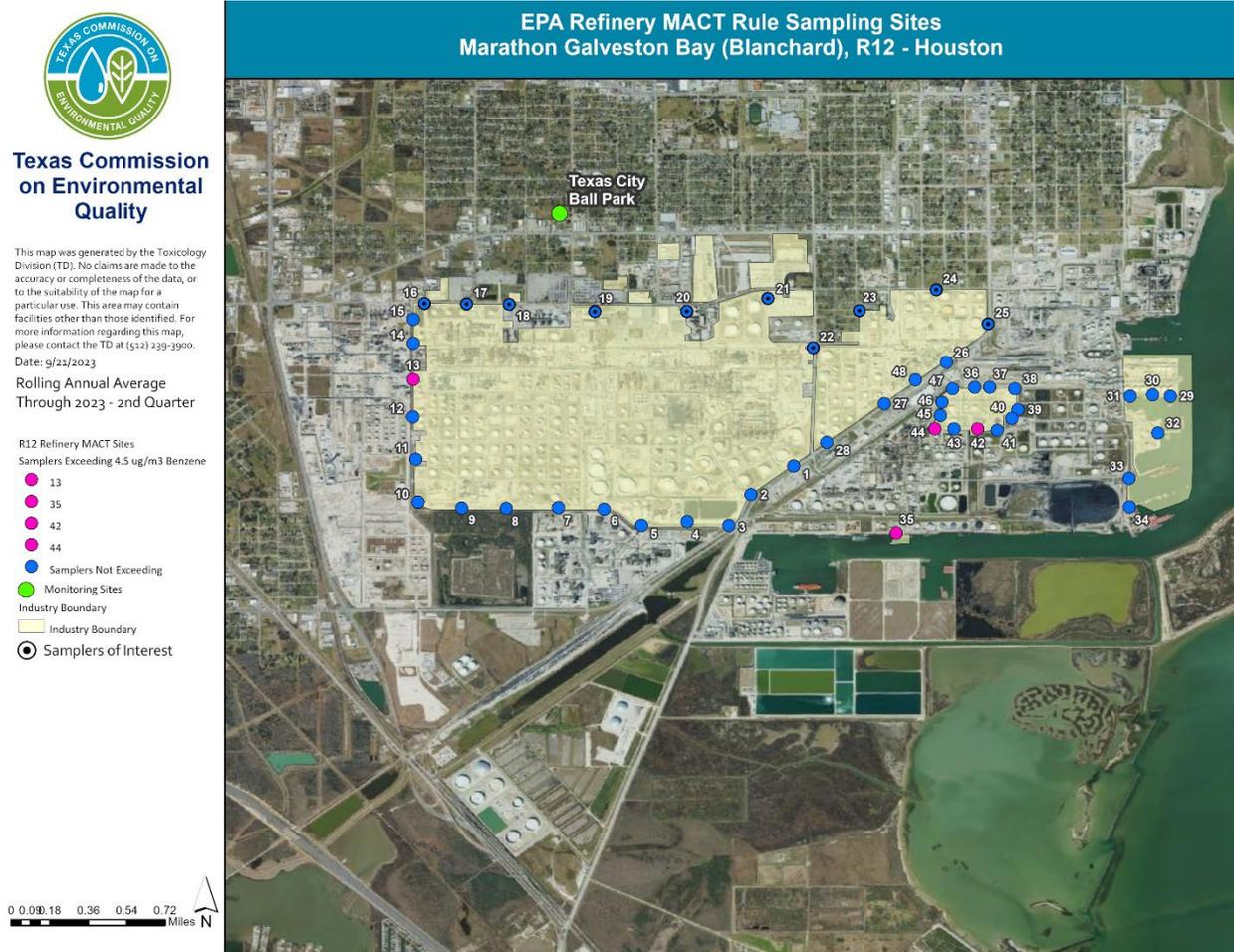


Marathon Galveston Bay Refinery – RN102535077

The Marathon Galveston Bay Refinery, located in Texas City at the entrance of the Houston Ship Channel, has a crude oil refining capacity of 585,000 barrels/day. Texas City, in Galveston County, is approximately 40 miles from Houston and situated along the Galveston Bay. The Marathon Galveston Bay Refinery is located in a mixed-use area, with a mix of industrial sites, vacant plots, and a canal forming the western, southern, and eastern borders (Figure 14). To the north, the heavily populated residential neighborhoods of Texas City line up against the refinery’s fence line without much buffer. There is currently one stationary canister monitor in the vicinity of the Marathon Refinery, Texas City Ball Park, located about half a mile north of the facility, and it is not currently above the long-term AMCV for benzene.

The Marathon Galveston Bay Refinery is located south of Texas City, and therefore the TCEQ identified the samplers along the northern fenceline as SOIs. Currently, the identified **SOIs include Samplers 16-25**. As of 2023Q2, none of the SOIs are over the long-term AMCV for benzene.

Figure 14. Sampler position around the Marathon Galveston Bay Refinery – 2023Q2



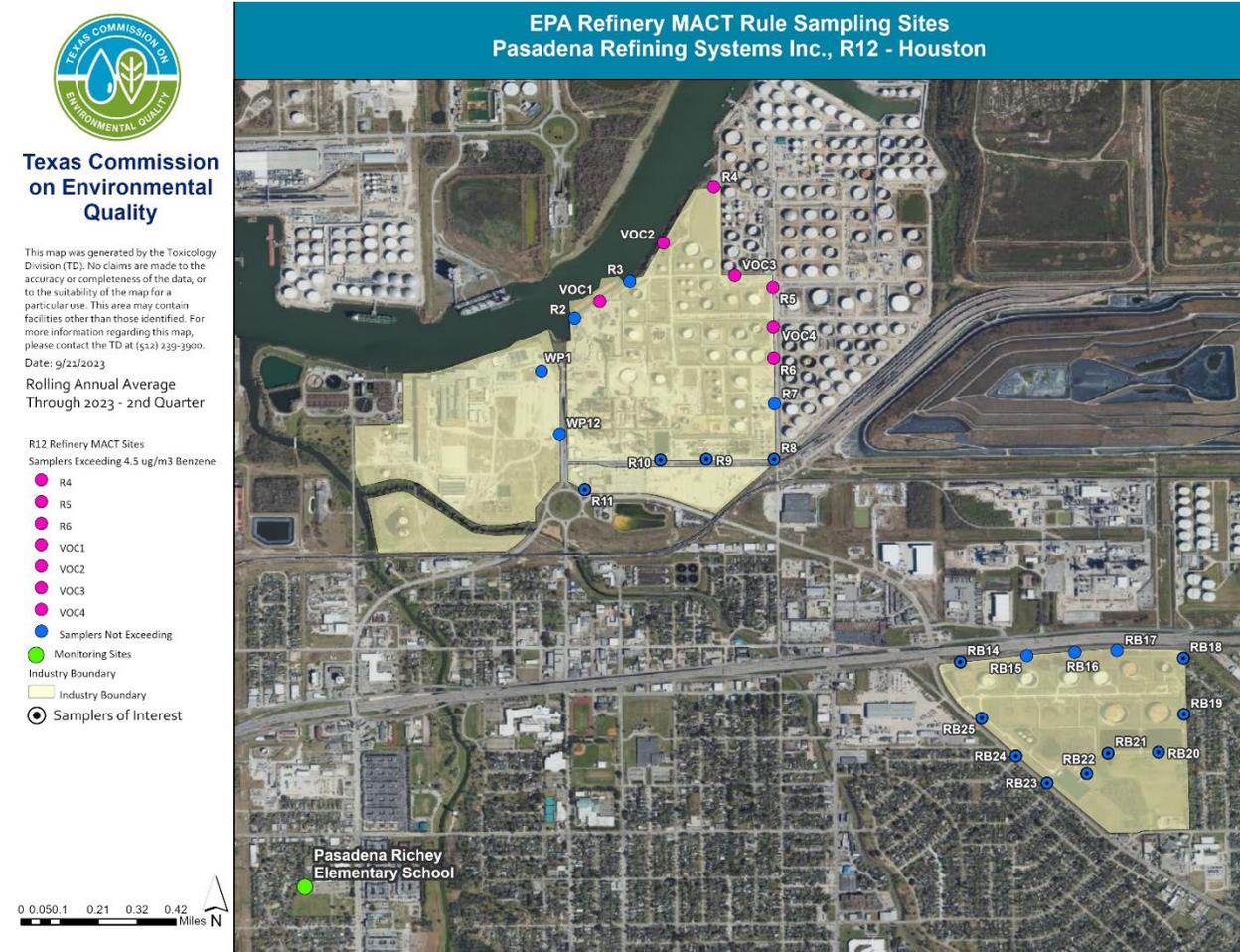
Pasadena Refining – RN100716661

The Pasadena Refinery, a subsidiary of Chevron Corp., is comprised of a 323-acre refinery capable of processing 110,000 barrels of crude oil per day, a tank farm with a storage capacity of 5.1 million barrels, and 143 acres of additional land. The main part of the Pasadena Refinery is situated along the Houston Ship Channel in a mostly industrial area with some residents to the south, while the additional tank farm to the southeast is mostly surrounded by residential areas with some industrial land to the north (Figure 15). There is currently one stationary canister monitor in the vicinity of the Pasadena Refinery, Pasadena Richey Elementary School, and it is not currently above the long-term AMCV for benzene.

The main Pasadena Refinery complex has residential areas to the south, while the additional tank farm has residential areas to the southwest and southeast, and therefore the TCEQ

identified the samplers along these fencelines as SOIs. Currently, the identified **SOIs include Samplers R8-R11, R14, and R18-25**. As of 2023Q2, none of the SOIs are over the long-term AMCV for benzene.

Figure 15. Sampler position around the Pasadena Refining Facility – 2023Q2

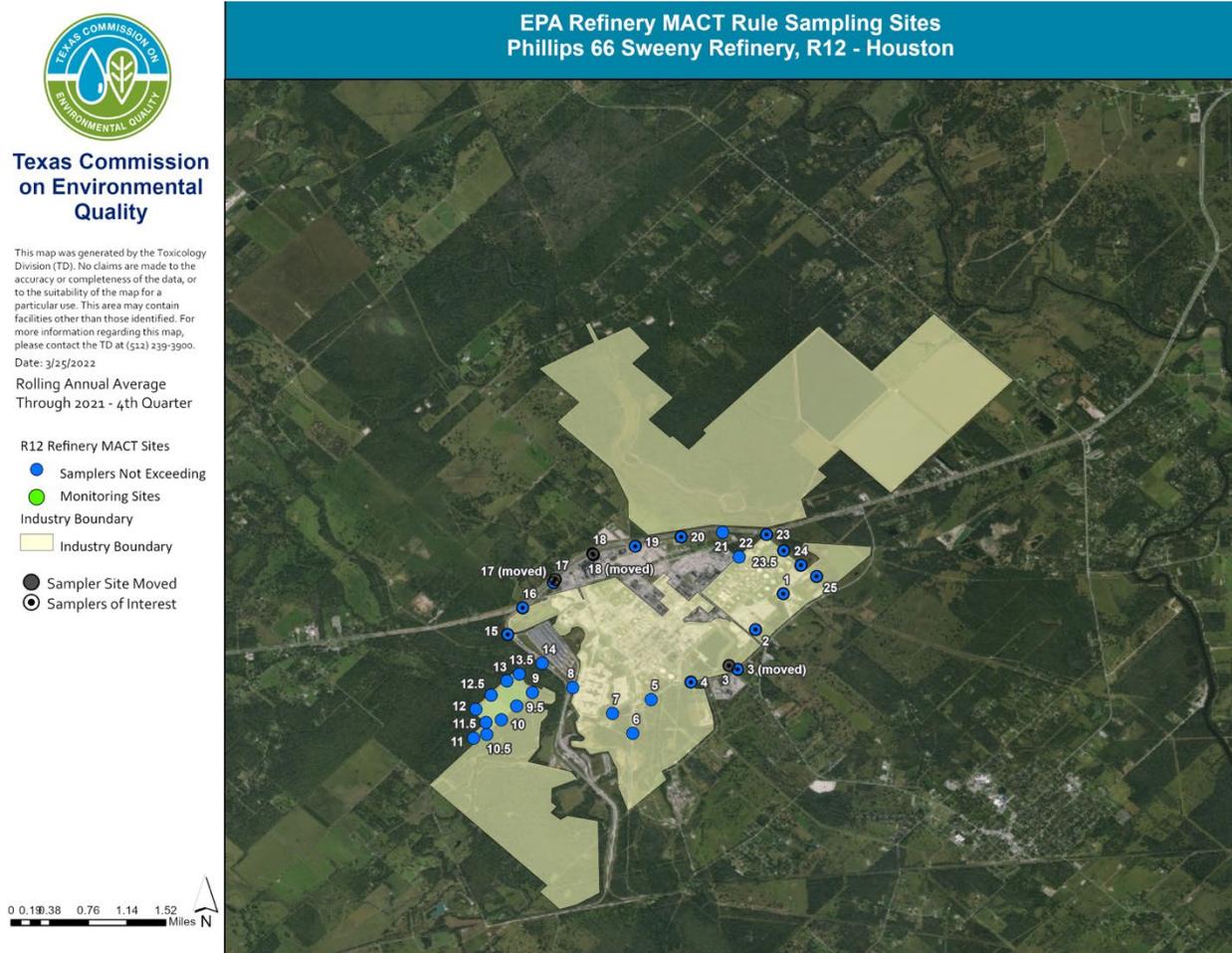


Phillips 66 Sweeny Refinery – RN101619179

The Phillips 66 Sweeny Refinery is located in the city of Old Ocean, about 65 miles southwest of Houston, on approximately 14,000 acres land, with a total capacity of 305,000 barrels/day. The refinery is approximately 5 miles from the city of Sweeny, and surrounded by mostly rural, vacant property (Figure 16). Sparse residential complexes are located to the east and west of the refinery, but they tend to be spread out and in singles or small groups. There is currently one stationary autoGC monitor in the vicinity of the Phillips 66 Sweeny Refinery, Danciger, and it is not currently above the long-term AMCV for benzene.

The Phillips 66 Sweeny Refinery has some residential areas along the western and eastern fencelines, and therefore the TCEQ identified the samplers along these fencelines as SOIs. Currently, the identified **SOIs include Samplers 1-4, 15-20, and 23-25**. As of 2023Q2, none of the samplers are or ever have been over the long-term AMCV for benzene.

Figure 16. Sampler position around the Phillips 66 Sweeny Refinery – 2023Q2 (no change in map since 2021Q4)



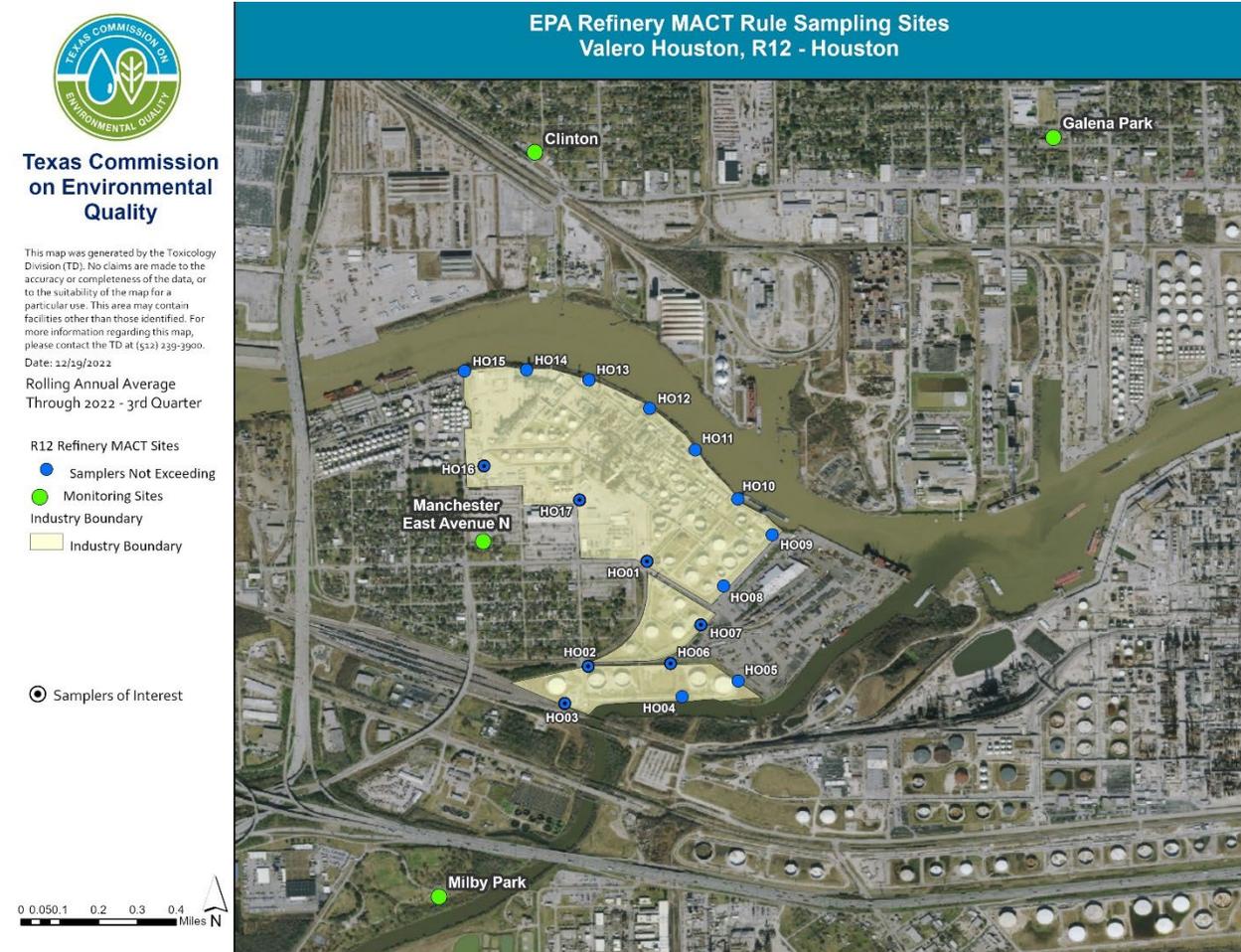
Valero Houston – RN100219310

The Valero Houston Refinery is located along the Houston Ship Channel, has total throughput capacity of 235,000 barrels/day and produces a wide range of petroleum products. Valero is situated adjacent to Houston Refining in a heavily populated area of Houston, surrounded by several prominent neighborhoods, including Manchester and Galena Park (Figure 17). The Valero Houston Refinery is mostly surrounded by industry, with the ship channel to the north, and industrial areas across the channel, to the east, and to the south. The neighborhood of Manchester resides to the east of the refinery, with houses sitting across the fence line from tanks on the southern border. There are currently four stationary monitoring sites in the area that monitor for benzene, a canister and autoGC at Galena Park, an autoGC at Clinton, Manchester East Avenue N, and Milby Park, and none of the monitors are currently above the long-term AMCV for benzene.

The Valero Houston Refinery is located to the east of the Manchester neighborhood, and therefore the TCEQ identified the samplers closest to the residences as SOIs. Currently, the

identified SOIs include Samplers HO01-HO03, HO06-HO07, and HO16-HO17. As of 2023Q2, none of the samplers are or ever have been over the long-term AMCV for benzene.

Figure 17. Sampler position around the Valero Houston Refinery – 2023Q2 (no change in samplers since 2019Q4, monitors updated on map 2022Q3)



Region 14 – Corpus Christi

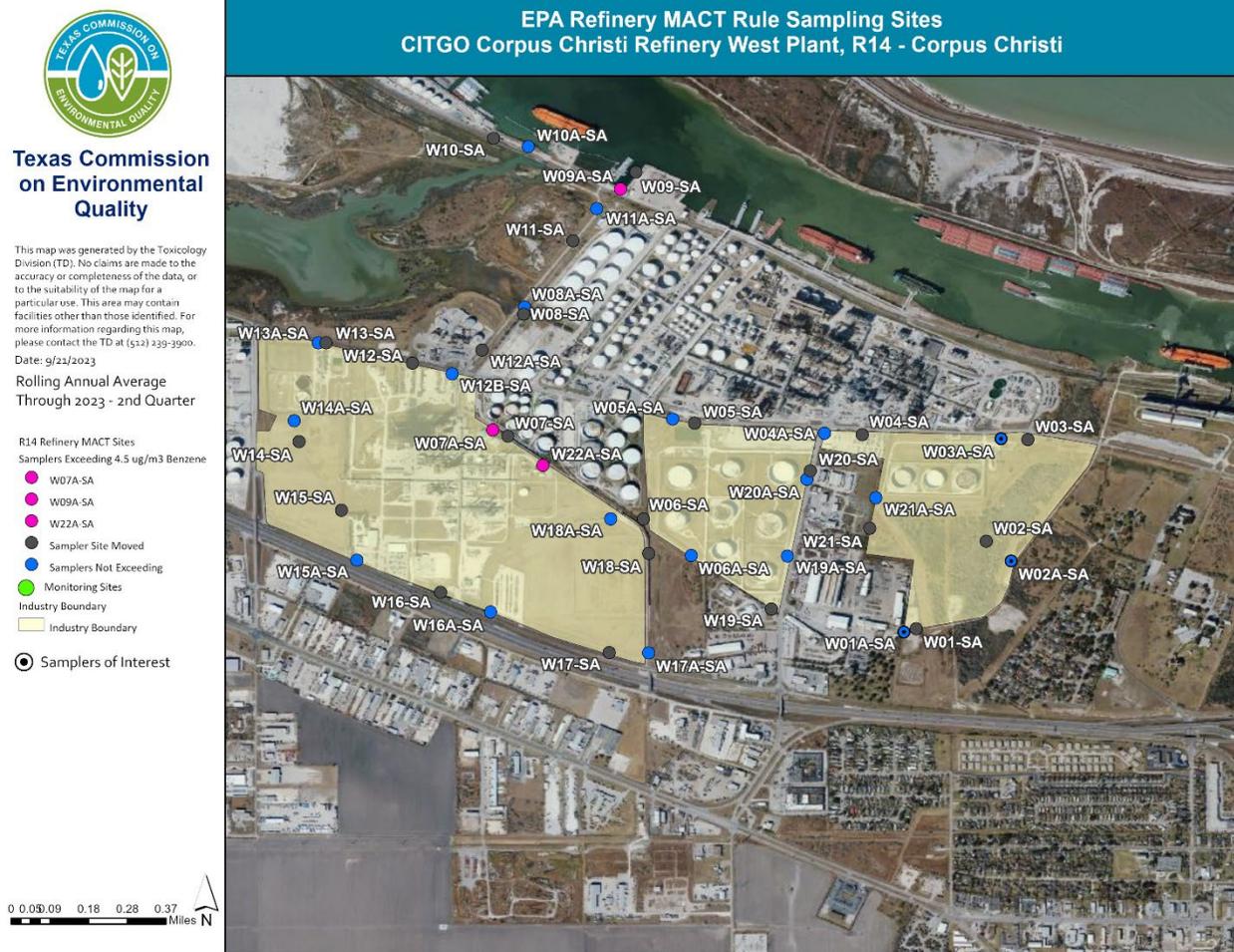
CITGO Corpus Christi Refinery West Plant – RN100238799

The CITGO Refinery West Plant sits on 230 acres towards the end of the Corpus Christi Ship Channel, and together with the East Plant, has a crude refining capacity of approximately 167,000 barrels/day. The refinery is situated in a mostly industrialized area, with Valero West Plant to the north and Flint Hills West Plant to the west. The city of Corpus Christi is located southeast of the refinery, with residential areas situated east and southeast of the facility (Figure 18). There are no stationary air monitors in the area.

The CITGO Refinery West Plant has residential areas to the south and east of the facility, and therefore the TCEQ identified the samplers along these fencelines as SOIs. Currently, the

identified SOIs include Samplers W01A-SA – W03A-SA. As of 2023Q2, none of the SOIs are over the long-term AMCV for benzene.

Figure 18. Sampler position around the CITGO Corpus Christi West Plant Refinery – 2023Q2



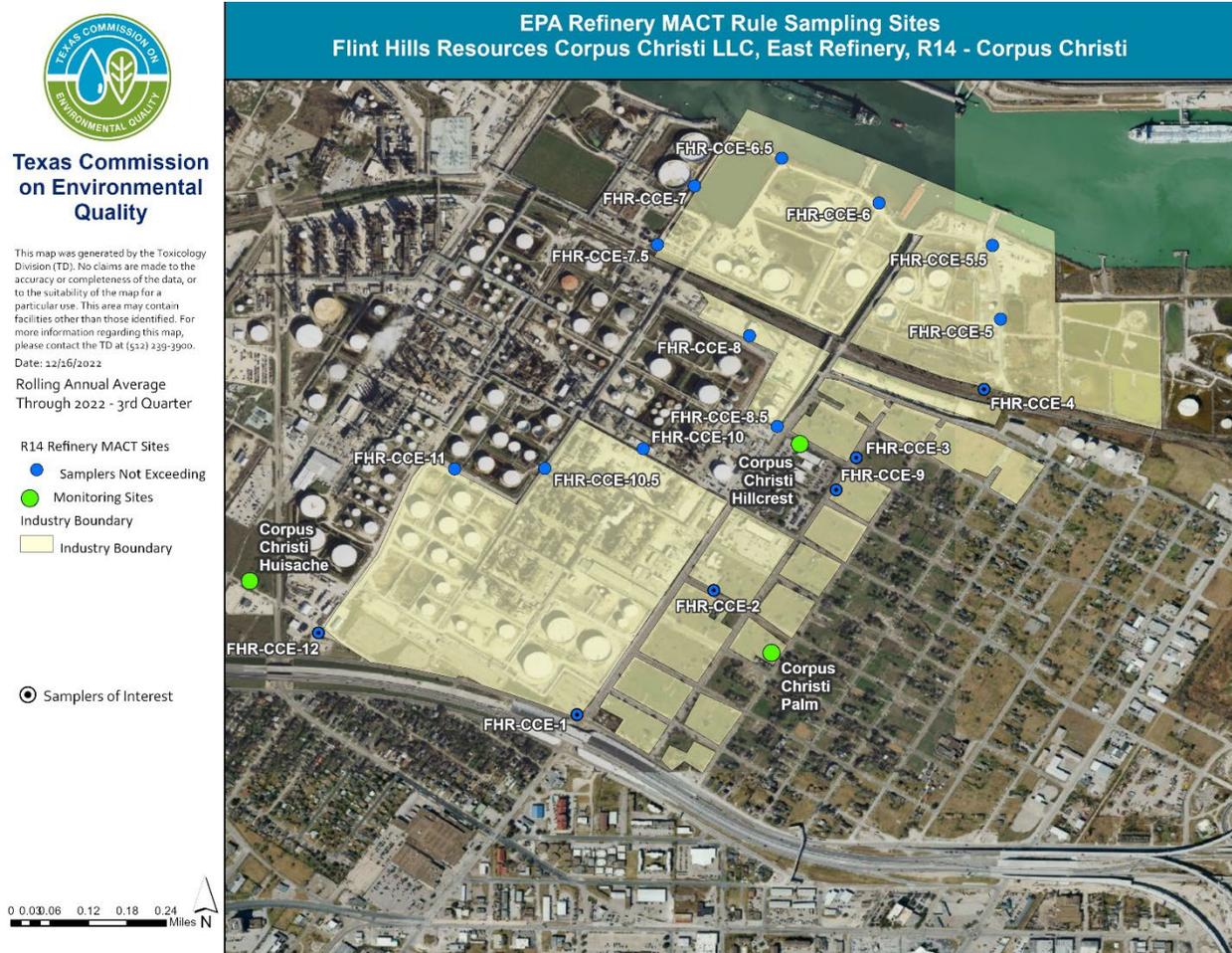
Flint Hills Resources Corpus Christi, East Refinery – RN102534138

The Flint Hills East Refinery, the smaller of the two Flint Hills plants, sits near the entrance of the Corpus Christi Ship Channel and has a total capacity of about 70,000 barrels/day. The refinery is situated in a mixed-use area, with CITGO East Plant to the west and residential areas to the east and south. The city of Corpus Christi is located southeast of the refinery, with residential areas lining the south side of I-37 and to the east nearly all the way to the ship channel (Figure 19). There are currently three stationary monitoring sites in the area that monitor for benzene, an autoGC at Corpus Christi Palm, and a canister at Corpus Christi Hillcrest and Corpus Christi Huisache, and none of the monitors are currently above the long-term AMCV for benzene.

The Flint Hills East Refinery has residential areas to the south and east of the facility, and therefore the TCEQ identified the samplers along these fencelines as SOIs. Currently, the

identified SOIs include Samplers FHR-CCE-1 – FHR-CCE-4, FHR-CCE-9, and FHR-CCE-12. As of 2023Q2, none of the samplers are over the long-term AMCV for benzene.

Figure 19. Sampler position around the Flint Hills Corpus Christi East Refinery – 2023Q2 (no change in map since 2022Q3)

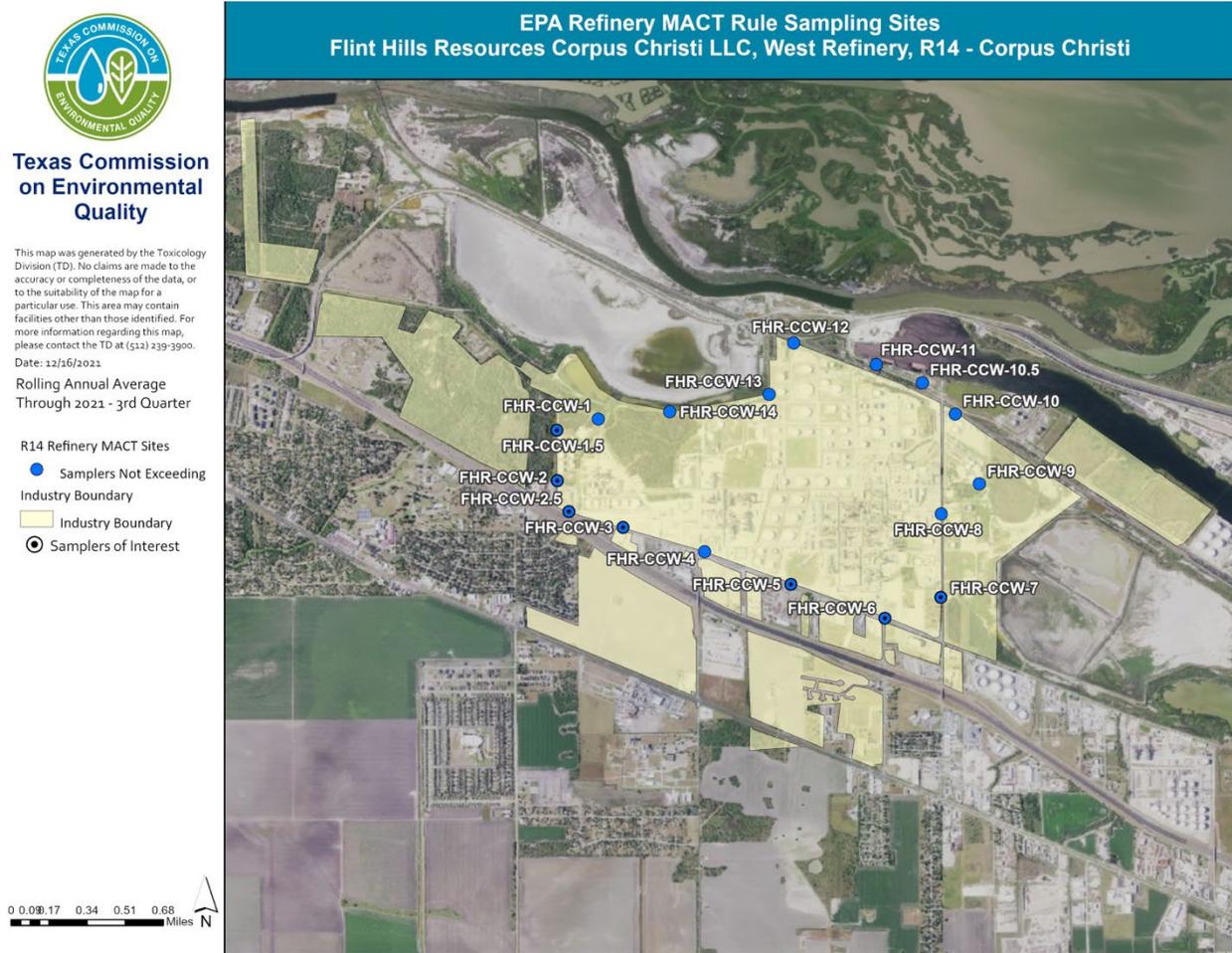


Flint Hills Resources Corpus Christi, West Refinery – RN100235566

The Flint Hills West Refinery, the larger of the two plants, sits at the end of the Corpus Christi Ship Channel and has a total capacity of about 230,000 barrels/day. The refinery is situated in a mixed-use area, with industrial and vacant land north of I-37 and a mix of industrial, residential and vacant land south of I-37 (Figure 20). The city of Corpus Christi is located southeast of the refinery, and residential neighborhoods can be found to the southwest and to the southeast of the refinery’s fencelines. There are no stationary air monitors in the area.

The Flint Hills West Refinery has residential areas to the southwest and southeast of the facility, and therefore the TCEQ identified the samplers along these fencelines as SOIs. Currently, the identified SOIs include Samplers FHR-CCW-1.5 – FHR-CCW-3 and FHR-CCW-5 – FHR-CCW-7. As of 2023Q2, none of the samplers are over the long-term AMCV for benzene.

Figure 20. Sampler position around the Flint Hills Corpus Christi West Refinery – 2023Q2 (no change in map since 2021Q3)

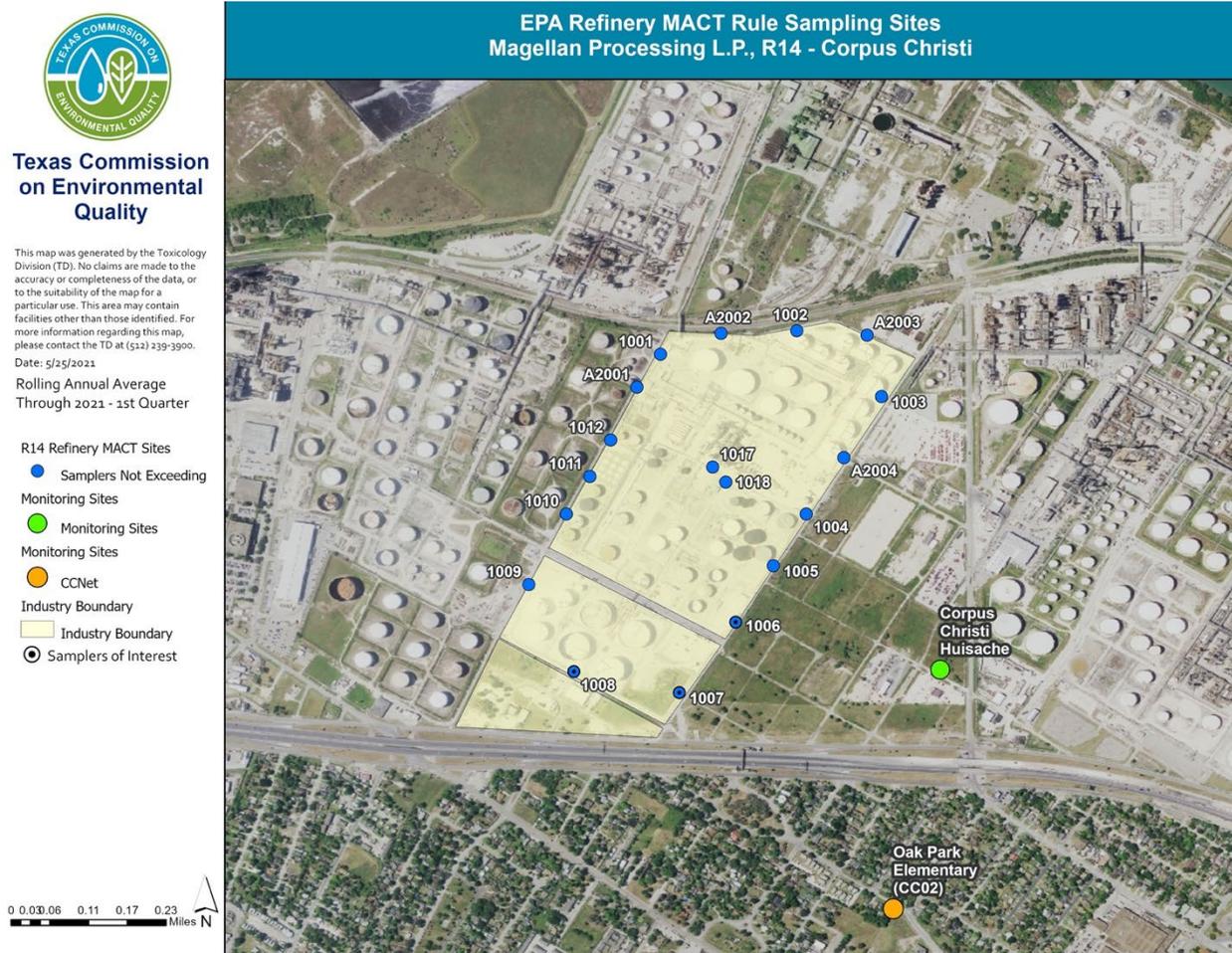


Magellan Processing L.P. – RN102536836

Magellan Processing L.P., a wholly owned subsidiary of Magellan Midstream Partners LP, owns a 100,000 barrels/day condensate splitter, which was constructed on the company’s existing bulk petroleum storage terminal in Corpus Christi. The facility is located just south of the Corpus Christi Ship Channel and is surrounded on three sides by heavily industrialized properties (Figure 21). To the south, across I-37, the land use is primarily residential, with neighborhoods, churches, and restaurants located directly adjacent to the major highway. There are two stationary canister monitors located in the area, Oak Park Elementary and Corpus Christi Huisache, and neither monitor is currently above the long-term AMCV for benzene.

The Magellan Processing facility is just north of the city of Corpus Christi, and therefore the TCEQ identified the samplers along the northeastern fenceline of the facility as SOIs. Currently, the identified **SOIs include Samplers 1006-1008**. As of 2023Q2, none of the samplers are over the long-term AMCV for benzene.

Figure 21. Sampler position around the Magellan Processing Facility – 2023Q2 (no change in map since 2021Q1)



Valero Corpus Christi Refinery, East Plant – RN100211663

The Valero Refinery East Plant, located on the south side of the Corpus Christi Ship Channel, is capable of processing 115,000 barrels/day of heavy, high-sulfur crude oil into light products. This facility is flanked to the north by the Corpus Christi Ship Channel and to the east by Magellan Processing (Figure 22). To the south/southwest is the city of Corpus Christi, with portions of the residential/suburban areas extending north of I-37 and sitting adjacent to the facility. In fact, an RV park is located directly across Up River Rd from sampler CCEP-08A, less than 100 meters away. There are three stationary canister monitors located in the Corpus Christi area, Dona Park, Oak Park Elementary, and Corpus Christi Huisache, and none of the monitors are currently above the long-term AMCV for benzene.

The Valero Refinery East Plant facility is just north of the city of Corpus Christi, and therefore the TCEQ identified the samplers along the southern fenceline and west side of the facility as SOIs. Currently, the identified **SOIs include Samplers CCEP-04 – CCEP-10**. As of 2023Q2, none of the SOIs are over the long-term AMCV for benzene.

Figure 22. Sampler position around the Valero Refinery Corpus Christi East Facility – 2023Q2

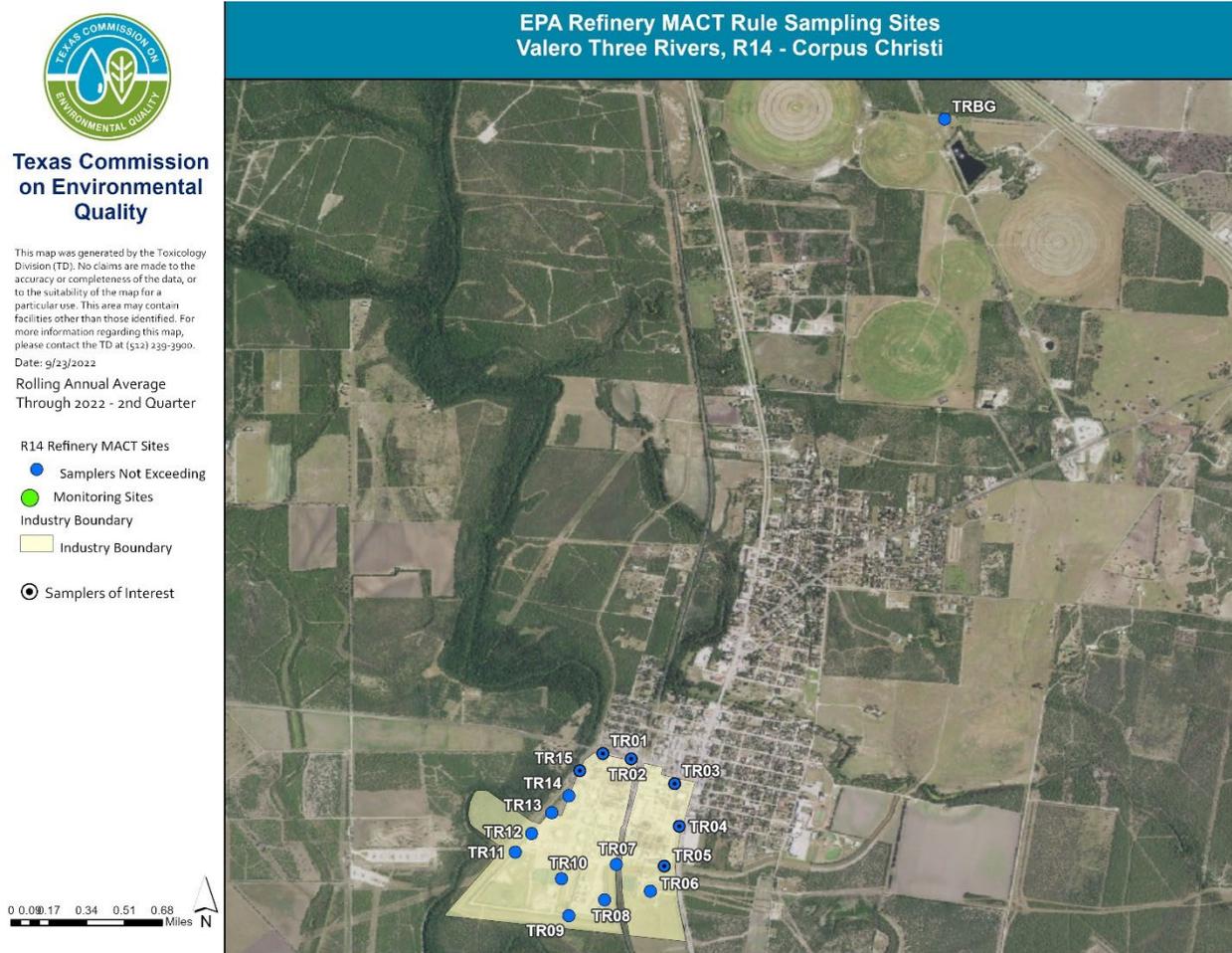


Valero Corpus Christi Three Rivers Refinery – RN100542802

The Valero Three Rivers Refinery is located about halfway between San Antonio and Corpus Christi in the center of the Eagle Ford Shale. It is mostly surrounded by uninhabited land to the west, south, and southeast, but situated directly adjacent to the north/northeast is the city of Three Rivers (Figure 23). The city and residential areas are basically on top of the industrial area, with not much more than a small road separating the two boundaries. A public city and RV park, Tips Park, is on the northwest corner of the Valero boundary (near sampler TR15), while several churches, restaurants, and a school line the northeast border. There are no stationary air monitors in the area.

The Valero Three Rivers Refinery facility is just southwest of the city of Three Rivers, and therefore the TCEQ identified the samplers along the northeastern fenceline of the facility as SOIs. Currently, the identified **SOIs include Samplers TR01-TR05 and TR15**. As of 2023Q2, there are no samplers that are over the long-term AMCV for benzene.

Figure 23. Sampler position around the Valero Three Rivers Refinery – 2023Q2 (no change in map since 2022Q2)



Facilities with No Identified SOIs

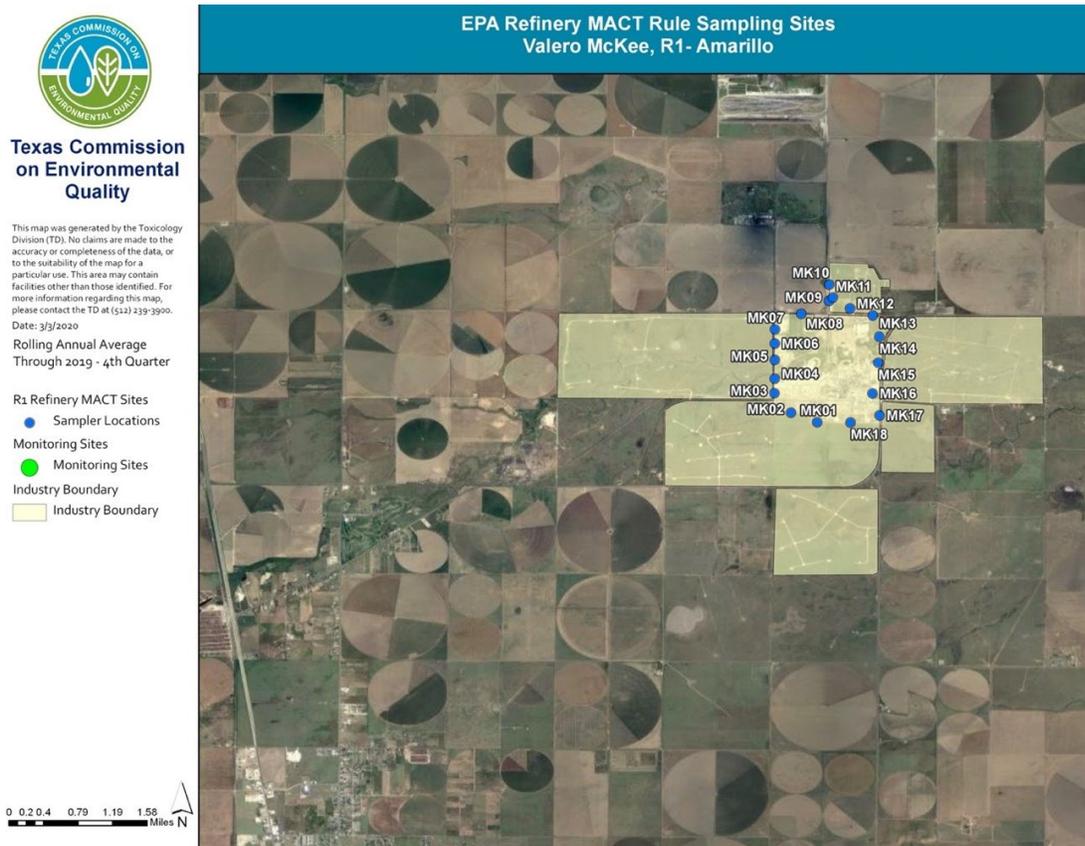
Region 1 – Amarillo

Valero McKee Refinery – RN109518639

The Valero McKee Refinery is located in Sunray, a small town located in the Texas panhandle about 45 miles north of Amarillo. This facility is capable of processing 200,000 barrels/day of a wide variety of refined petroleum products, and accesses pipelines from several surrounding states. Valero McKee Refinery owns approximately 5,000 acres of land, with the majority of the refinery being located in the center of the surrounding vacant areas (Figure 24). The city of Sunray is approximately 5 miles northeast of the refinery, while the city of Dumas is approximately 4 miles southwest of the Valero McKee Refinery. There are no stationary air monitors in the area.

The Valero McKee Refinery is located in a very rural area near the city of Sunray, with no residential areas within the vicinity of the facility. Currently, there are **no samplers that have been identified as SOIs**.

Figure 24. Sampler position around the Valero McKee Refinery – 2023Q2 (no change in map since 2019Q4)



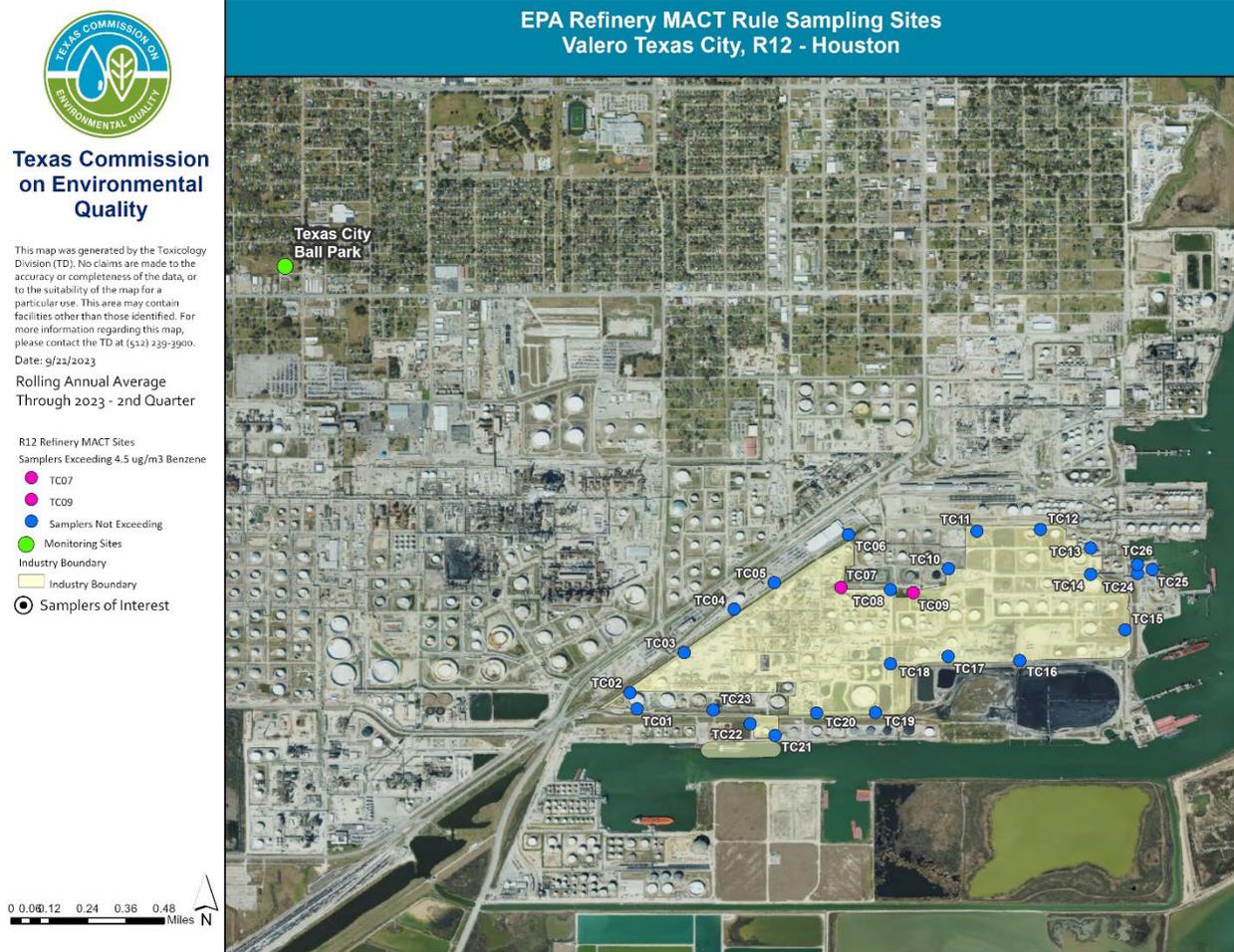
Region 12 – Houston

Valero Texas City – RN100238385

The Valero Texas City Refinery, located on the Texas City Ship Channel, is capable of processing 260,000 barrels/day of total feedstock. This facility is flanked to the south and east by the ship channel, and to the north and west by another refinery, Marathon Galveston Bay (Figure 25). Marathon is also required to conduct benzene fence-line monitoring, and a few of their monitors are positioned between Valero Texas City and the residential areas to the north. There is currently one stationary canister monitor in the vicinity of Valero Texas City, Texas City Ball Park, and it is not currently above the long-term AMCV for benzene.

The Valero Texas City Refinery is located in a highly industrialized area, just north of the Texas City Ship Channel. While there are residential areas to the north of the facility, the Marathon Galveston Bay Refinery is situated between the Valero Texas City Refinery and the neighboring residents. Currently, there are **no samplers that have been identified as SOIs**.

Figure 25. Sampler position around the Valero Texas City Refinery – 2023Q2



Region 14 – Corpus Christi

Valero Corpus Christi Refinery, West Plant – RN1000214386

The Valero Refinery West Plant, located on the south side of the Corpus Christi Ship Channel, specializes in the production of environmentally clean fuels and products, primarily reformulated gasoline (RFG) and ultra-low-sulfur diesel. This facility is flanked to the north by the ship channel, and to the south by the CITGO West Plant (Figure 26). The CITGO West Plant Refinery is also required to conduct benzene fence-line monitoring, and a few of their monitors are positioned between Valero Refinery West Plant and the residential areas to the southeast. There are no stationary monitors in the area.

The Valero Corpus Christi West Refinery is located in a highly industrialized area, just south of the Corpus Christi Ship Channel, and CITGO West Plant, sits between the refinery and the nearest residential area. Currently, there are **no samplers that have been identified as SOIs**.

Figure 26. Sampler position around the Valero Corpus Christi West Refinery – 2023Q2



Texas Commission on Environmental Quality

This map was generated by the Toxicology Division (TD). No claims are made to the accuracy or completeness of the data, or to the suitability of the map for a particular use. This area may contain facilities other than those identified. For more information regarding this map, please contact the TD at (512) 239-2900.

Date: 9/22/2023
 Rolling Annual Average Through 2023 - 2nd Quarter

- R14 Refinery MACT Sites
 Samplers Exceeding 4.5 ug/m3 Benzene
- CWR5
 - CWR5A
 - CWR6
 - Samplers Not Exceeding
 - Monitoring Sites
 - Industry Boundary
 - Industry Boundary

○ Samplers of Interest

