

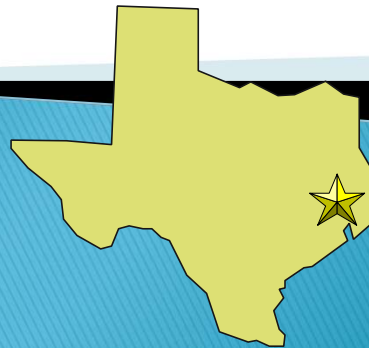
DPCAC Annual Report on Emissions

2022 Calendar Year Data



DRAFT 10-20-2023 - As Mailed

TCEQ AIR EMISSIONS INVENTORY (EI)
and
EPA TOXICS RELEASE INVENTORY (TRI)
for
DEER PARK PLANTS



Presented by
Gary Jackson, P.E. - Vopak

Deer Park CAC Plants

Reports both TCEQ Emissions Inventory (EI) and EPA Toxics Release Inventory (TRI)

- Clean Harbors
- Dow Chemical
- GEO Specialty Chemicals
- Lubrizol
- OxyVinyls Deer Park PVC/Caustic
- OxyVinyls Deer Park VCM
- Pemex
- Shell Deer Park
- Vopak
- Westlake Epoxy (was Hexion)

Reports EPA TRI, not required to report TCEQ EI

- Evonik
- Novvi
- Texas Molecular
- Valvoline

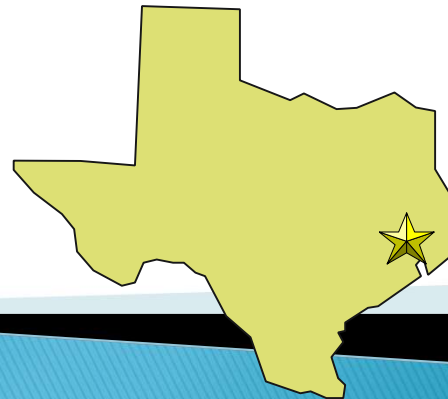
Not required to report EPA TRI or TCEQ EI

- Vopak Moda

ITC has not submitted data since 2018. They have been entirely removed from this report, but their data has been retained.



2022 Air Emissions Inventory



Emissions Inventory of Criteria Pollutants and Ozone Precursors

Criteria Pollutants Include:

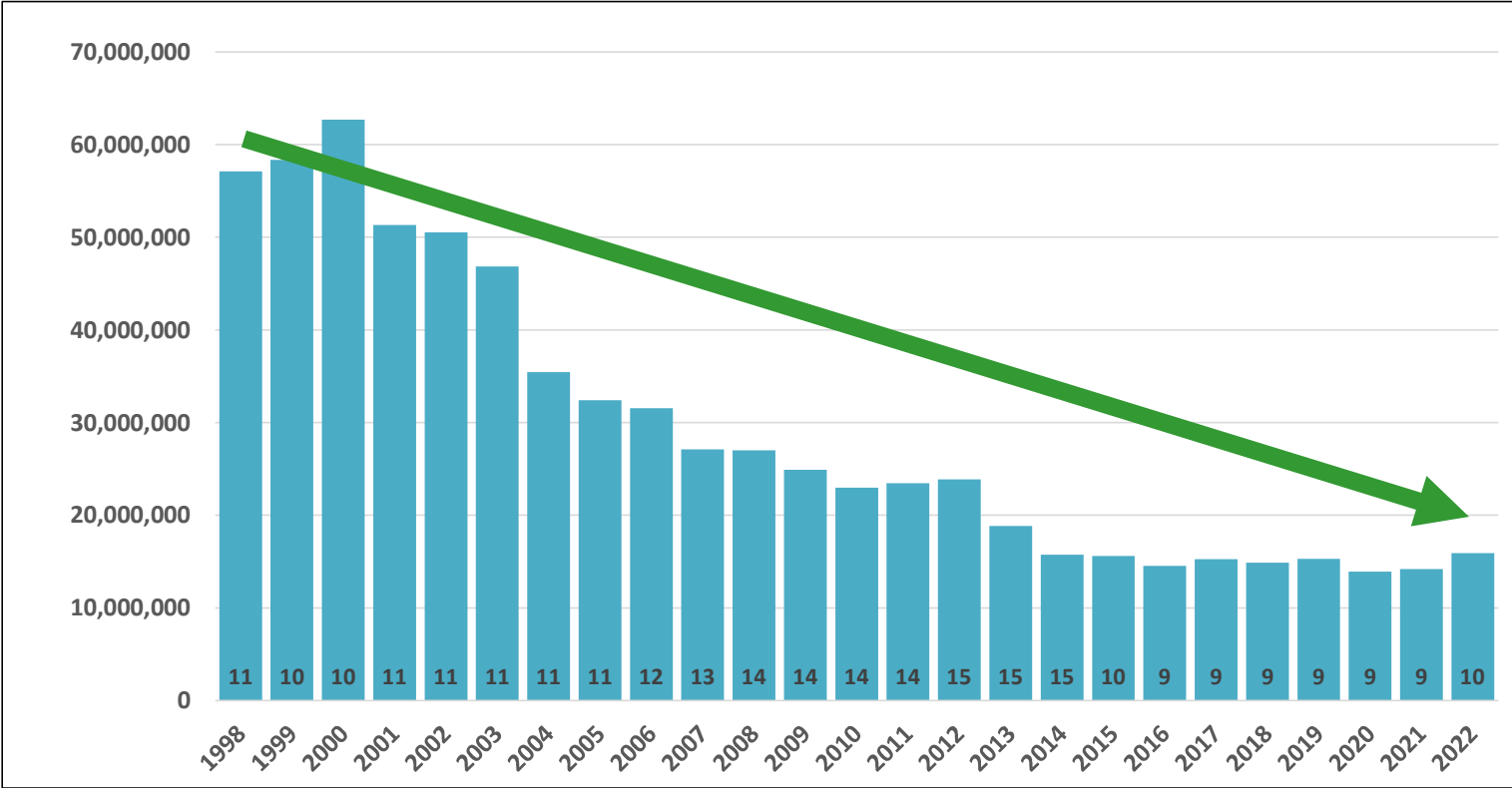
- Nitrogen Oxides (NO_x) {ozone precursor}
- Volatile Organic Compounds (VOCs) {ozone precursor}
- Carbon Monoxide (CO)
- Sulfur Oxides (SO_x)
- Total Suspended Particulates (TSP)

Highlights in this presentation provide explanations from the plants for any changes in emissions from previous year that are 10% or greater or more than 10,000 pounds.

Plants are presented in order by most to least pounds of emissions.

Criteria Pollutants – Our History

(all values in lbs.)

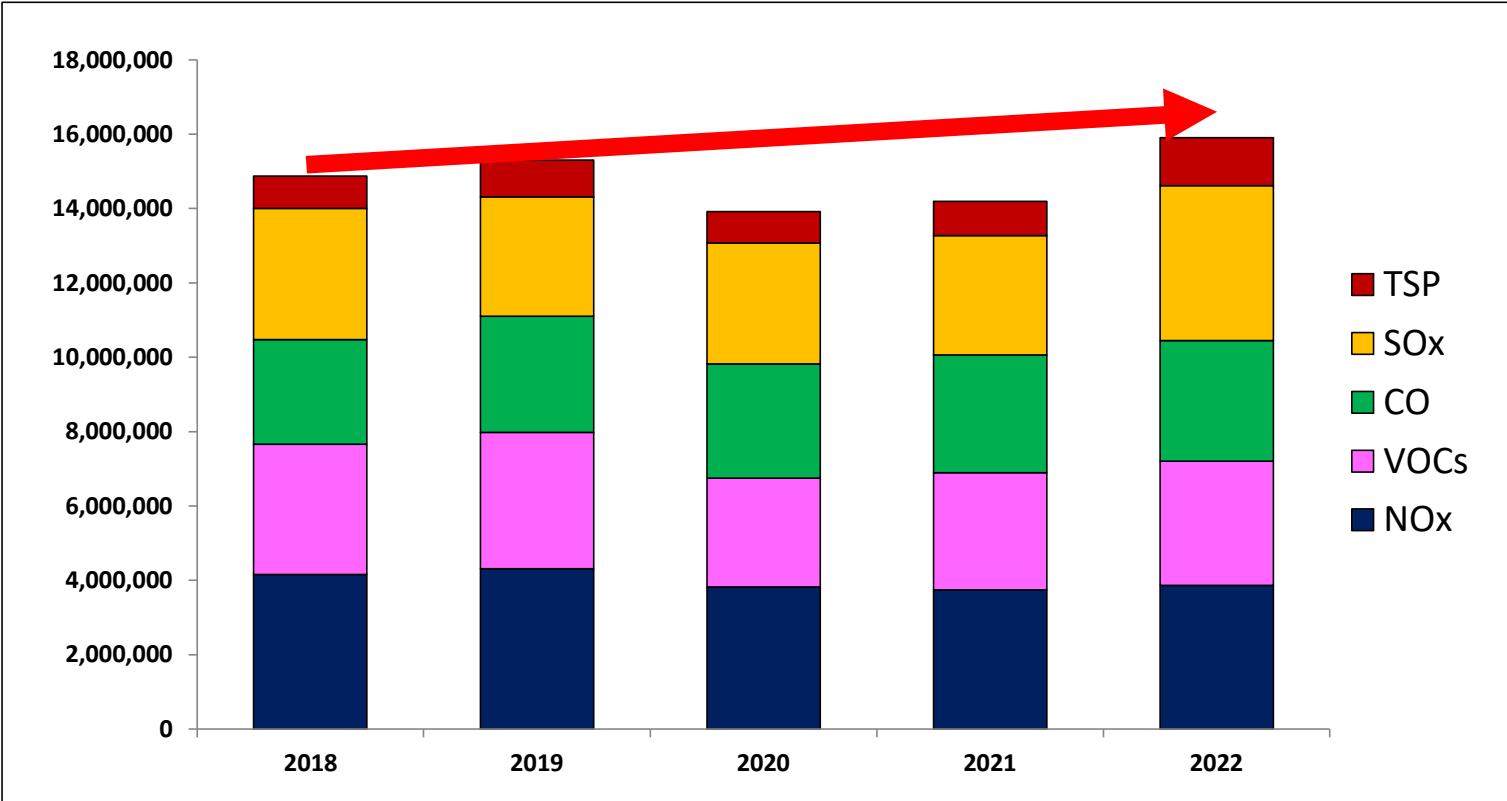


1998 → 2022: 72% Decrease

number of plants reporting on graph bars

Total Reported Criteria Pollutant Emissions

(all values in lbs.)



2018 → 2022: 7% Increase
2021 → 2022: 12% Increase

Total Reported Criteria Pollutant Emissions *By Pollutant*

(all values in lbs.)

Criteria Pollutant	2018	2019	2020	2021	2022	1 Year Change	
						Pounds	Percent
NOx	4,157,620	4,312,078	3,819,556	3,746,419	3,868,253	121,834	3%
VOCs	3,504,958	3,668,905	2,927,406	3,150,930	3,333,198	182,268	6%
CO	2,815,225	3,121,058	3,074,228	3,164,392	3,248,991	84,599	3%
SOx	3,521,714	3,211,987	3,251,240	3,208,662	4,166,900	958,238	30%
TSP	870,881	988,741	840,803	924,458	1,289,278	364,820	39%
Total	14,870,398	15,302,769	13,913,233	14,194,862	15,906,620	1,711,759	12%

Plants Reporting	9	9	9	9	10		
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5 Year Average Change = Most recent year compared to last five years (including most recent year) average.

2022 Criteria Pollutant Emissions Highlight Summary

NOX +3% (122k lbs.)

- A change in material sent by customers for incineration, and installation of new low NOx burners on a boiler.

VOCs +6% (182k lbs.)

- Increase is partially attributed to increased operation of boiler due to steam demand and increased loading to wastewater treatment plant and increase in fugitive leaks and painting emissions.

CO +3% (85k lbs.)

- Increase is mainly attributed to a Shell/Pemex issue.

SOx +30% (958k lbs.)

- Increase is mainly attributed to a Shell/Pemex issue.

TSP +39% (365k lbs.)

- Increase is mainly attributed to emergency engines that operated more hours due to weather events (freezing events) and increased operation of boilers due to steam demand.

Note: "k" equals 1,000
"MM" equals 1,000,000

Total Reported Criteria Pollutant Emissions *By Plant*

(all values in lbs.)

Company	2018	2019	2020	2021	2022	1 Year Change	
						Pounds	Percent
Pemex					6,005,439	6,005,439	NA
Dow Chemical	4,874,697	4,844,505	4,516,961	4,595,557	4,618,188	22,631	0%
Shell Deer Park	7,912,742	8,099,767	7,041,721	7,324,641	3,065,522	-4,259,119	-58%
Vopak	692,323	735,152	765,113	849,613	814,440	-35,173	-4%
Lubrizol	666,238	819,143	901,278	739,050	689,592	-49,458	-7%
Clean Harbors	184,111	272,840	177,774	177,774	261,267	83,493	47%
Westlake Epoxy	251,322	247,540	245,627	219,122	176,285	-42,837	-20%
OxyVinyls Deer Park PVC/Caustic	127,988	115,740	122,265	134,680	135,840	1,160	1%
OxyVinyls Deer Park VCM	132,156	139,864	120,577	139,475	125,899	-13,576	-10%
GEO Specialty Chemicals	28,820	28,219	21,231	14,949	14,148	-801	-5%
TOTAL Emissions	14,870,397	15,302,770	13,912,547	14,194,862	15,906,620	1,711,759	12%

= Not required to report
 = No Facility operations

2022 Criteria Pollutant Emissions *Individual Plant Highlights*

Shell Deer Park

All decreases noted below were due to Pemex acquiring full ownership of Shell Deer Park Refinery. Emissions from refinery sources were included in site's 2021 criteria pollutant emissions but not in 2022.

- NO_x -55% (1.45MM lbs.) due to improved utilization of furnaces and CAT cracker.
- VOC -41% (632k lbs.)
- CO -64% (1.19MM lbs.)
- SO_x -87% (519k lbs.)
- TSP -68% (469k lbs.)

Dow Chemical

- NO_x +2% (14k lbs.) due to emergency engines operating more hours due to weather events and increased operation of boilers due to steam demand.
- VOC +9% (38k lbs.) due to increased operation of boilers due to steam demand and increased loading to wastewater treatment plant
- CO -11% (85k lbs.) due to updates to calculation methodologies to match permit representations.
- SO_x +2% (46K lbs.) due to a increased production in sulfuric acid recovery unit.
- TSP +13% (10k lbs.) due to emergency engines operating more hours due to weather events and increased operation of boilers due to steam demand.

Note: "k" equals 1,000
"MM" equals 1,000,000

2022 Criteria Pollutant Emissions

Individual Plant Highlights

Vopak

- NO_x -26% (8k lbs.) due to change in customer inventory
- VOC -2% (15k lbs.) due to flare optimization
- CO -6% (10k lbs.) due to change in customer inventory and flare optimization
- TSP -92% (1.2k lbs.) due reduced use of diesel fuel

Lubrizol

- NO_x -16% (18k lbs.) due to a decrease in production.
- CO -9% (19k lbs.) due to a calculation changed as a result of updated heather emission factor due to stack testing.
- SO_x -12% (2k lbs.) due to a decrease in production.
- TSP -21% (6k lbs.) due to a decrease in production.

Westlake Epoxy *(was Hexion)*

- SO_x -60% (33k lbs.) due to recovery of sulfur from flare feeds.
- TSP -16% (6k lbs.) due to variation in volumes of solids handled.

Note: "k" equals 1,000
"MM" equals 1,000,000

2022 Criteria Pollutant Emissions *Individual Plant Highlights*

Clean Harbors

Changes due to material variation from customers for incineration.

- NOx +32% (40k lbs.)
- VOC -71% (9k lbs.)
- CO -33% (5k lbs.)
- SOx -78% (6k lbs.)
- TSP +345% (63K lbs.)

OxyVinyls - VCM

- VOC -11% (2k lbs.) due to decreased fugitive emissions.
- CO -28% (9k lbs.) due to decreased furnace decoking.
- SOx -12% (94 lbs.) due to decreased production rates.

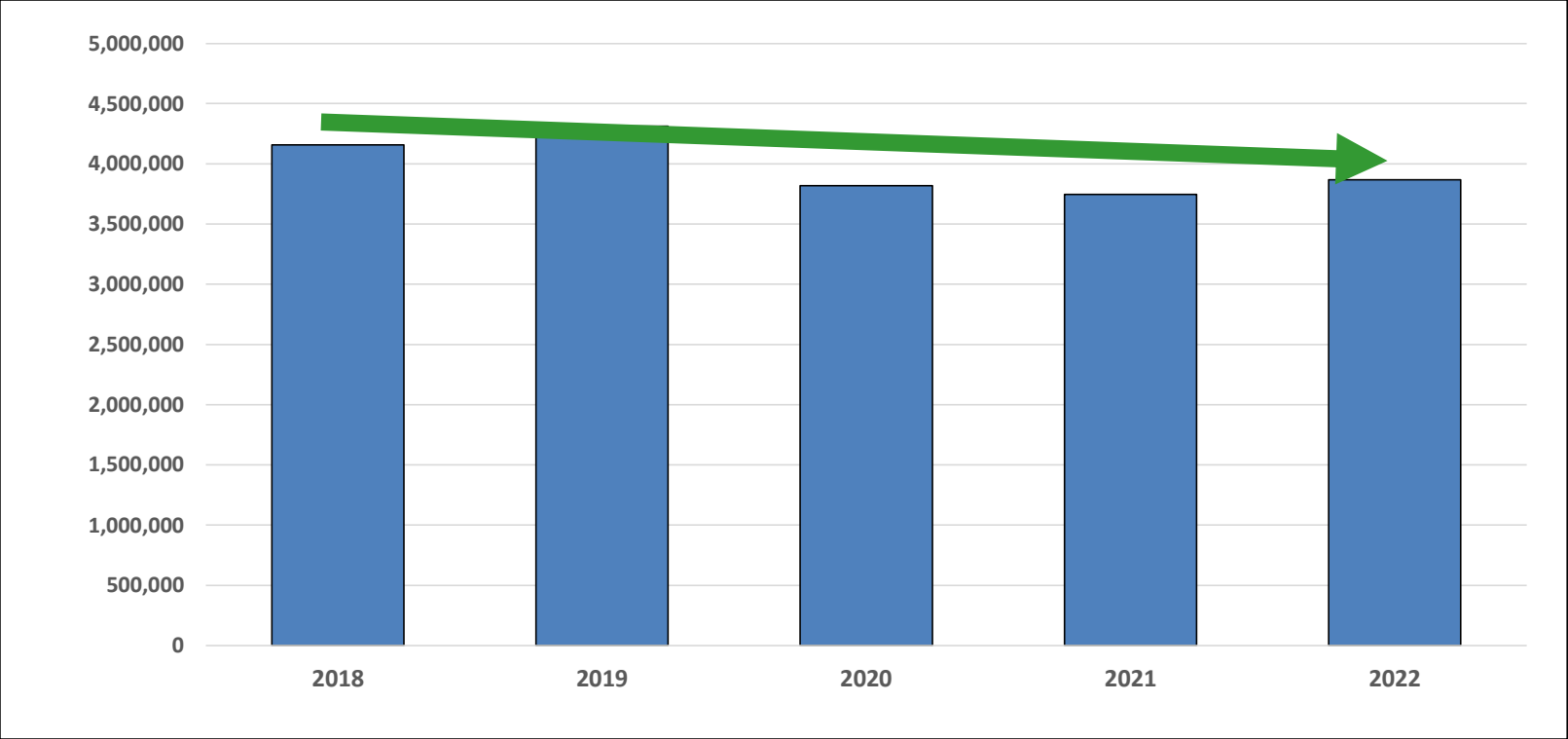
OxyVinyls – Deer Park PVC/Caustic

- VOC +11% (3k lbs.) due to a increase in process fugitive emissions and painting emissions

Note: “k” equals 1,000
“MM” equals 1,000,000

Reported NOx Emissions

(all values in lbs.)



2018 → 2022: 3% Decrease
2021 → 2022: 3% Increase

Reported NOx Emissions

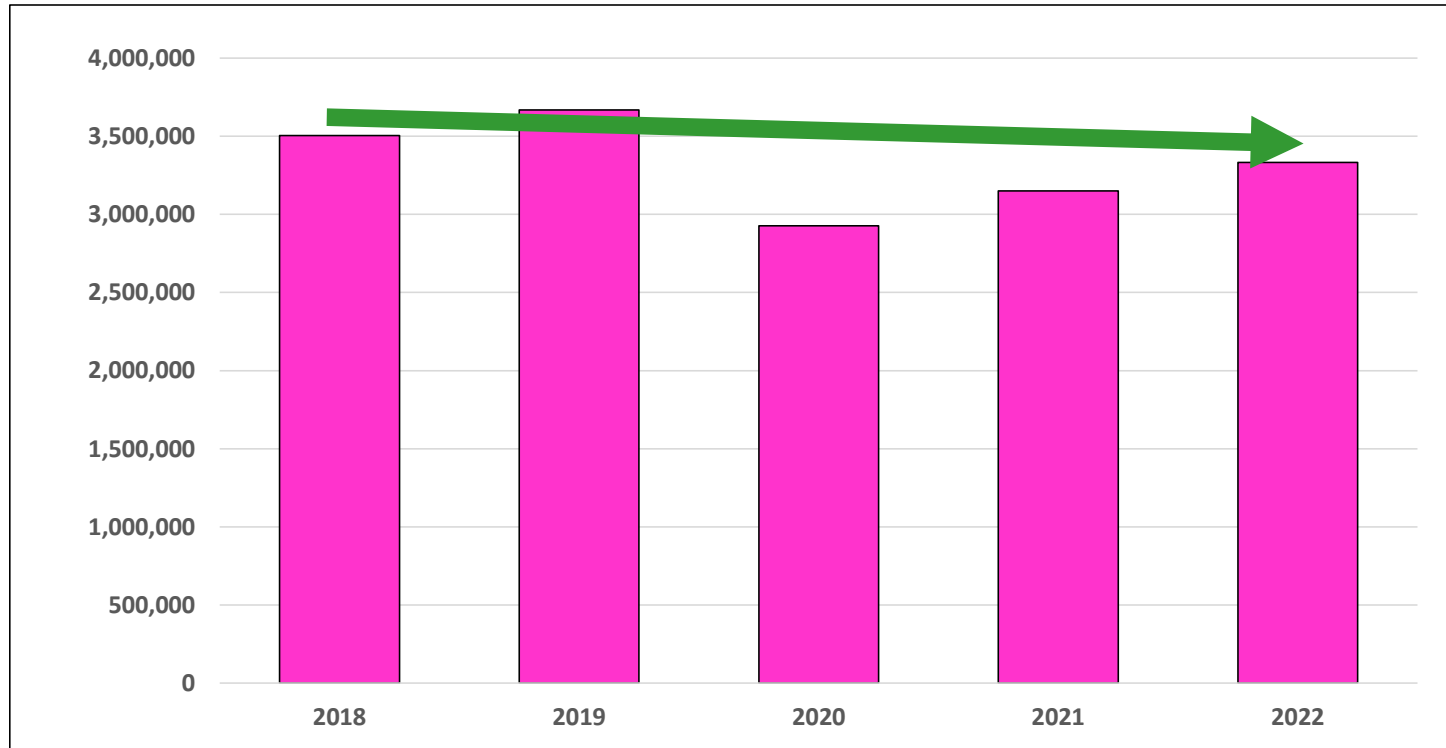
(all values in lbs.)

Company	2018	2019	2020	2021	2022	1 Year Change	
						Pounds	Percent
Pemex					1,548,199	1,548,199	NA
Shell Deer Park	3,223,004	3,231,792	2,738,131	2,622,452	1,172,492	-1,449,960	-55%
Dow Chemical	555,272	658,372	705,489	751,564	765,534	13,970	2%
Clean Harbors	152,167	154,028	124,344	124,344	164,200	39,856	32%
Lubrizol	94,204	126,357	117,784	114,499	96,204	-18,295	-16%
OxyVinyls Deer Park VCM	65,250	62,133	62,319	66,751	63,468	-3,283	-5%
OxyVinyls Deer Park PVC/Caustic	28,225	26,107	27,862	28,360	27,860	-500	-2%
Vopak	24,040	38,753	29,455	29,800	22,140	-7,660	-26%
GEO Specialty Chemicals	13,258	12,374	11,929	6,305	5,800	-505	-8%
Westlake Epoxy	2,200	2,162	2,243	2,344	2,356	12	1%
TOTAL NOx	4,157,620	4,312,078	3,819,556	3,746,419	3,868,253	121,834	3%

= Not required to report
 = Facility not operating

Reported VOC Emissions Trends

(all values in lbs.)



2018 → 2022: 5% Decrease

2021 → 2022: 6% Increase

Reported VOC Emissions

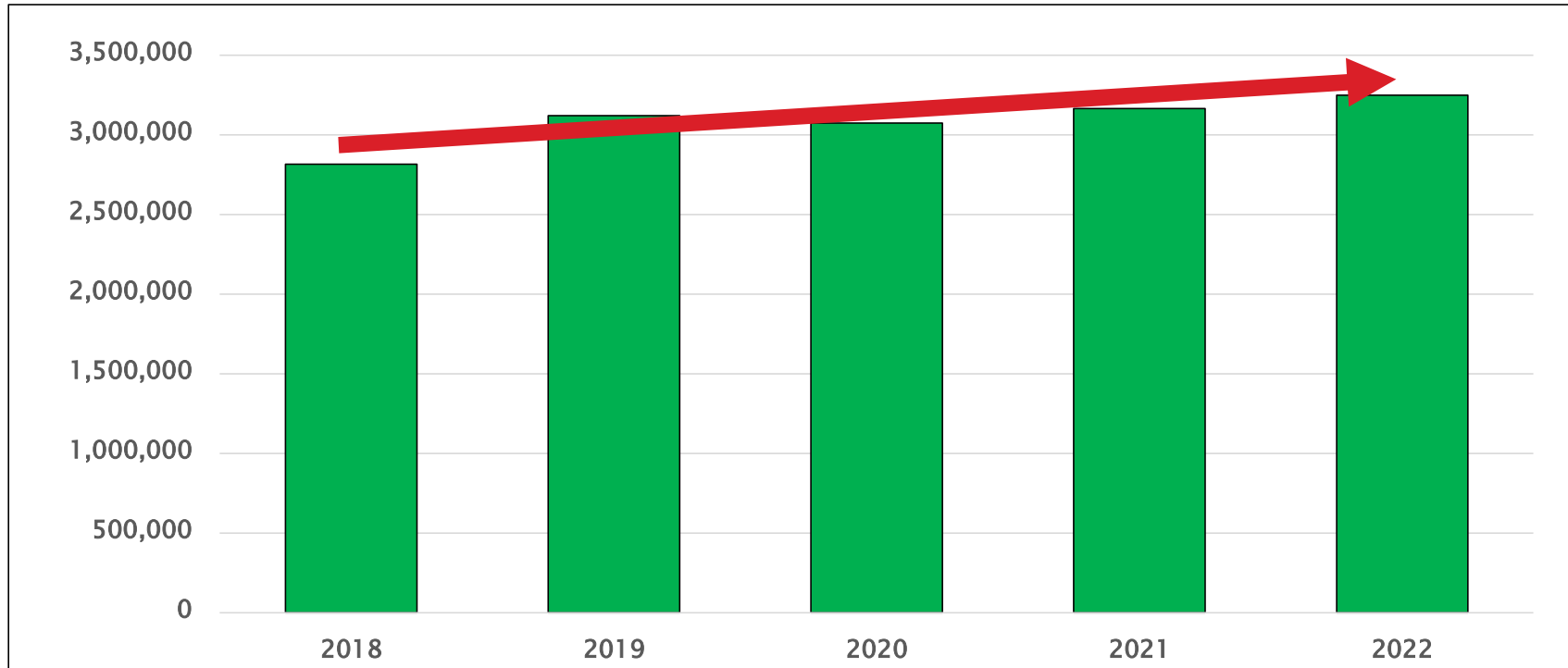
(all values in lbs.)

Company	2018	2019	2020	2021	2022	1 Year Change	
						Pounds	Percent
Shell Deer Park	1,944,886	1,849,771	1,322,664	1,541,992	910,028	-631,964	-41%
Pemex					808,558	808,558	NA
Vopak	485,401	482,127	530,398	629,140	613,700	-15,440	-2%
Dow Chemical	547,879	697,866	484,625	439,629	477,641	38,011	9%
Lubrizol	369,897	459,746	429,036	373,391	368,924	-4,467	-1%
Westlake Epoxy	100,600	100,767	99,859	102,470	98,944	-3,526	-3%
OxyVinyls Deer Park PVC/Caustic	25,757	23,307	23,245	25,660	28,600	2,940	11%
OxyVinyls Deer Park VCM	22,841	24,877	19,833	21,334	19,061	-2,273	-11%
GEO Specialty Chemicals	3,180	2,883	4,426	3,994	3,890	-104	-3%
Clean Harbors	4,517	27,561	13,320	13,320	3,853	-9,467	-71%
TOTAL VOCs	3,504,958	3,668,905	2,927,406	3,150,930	3,333,198	182,268	6%

= Not required to report
 = Facility not operating

Reported CO Emissions

(all values in lbs.)



2018 → 2022: 15% Increase
2021 → 2022: 3% Increase

Reported CO Emissions

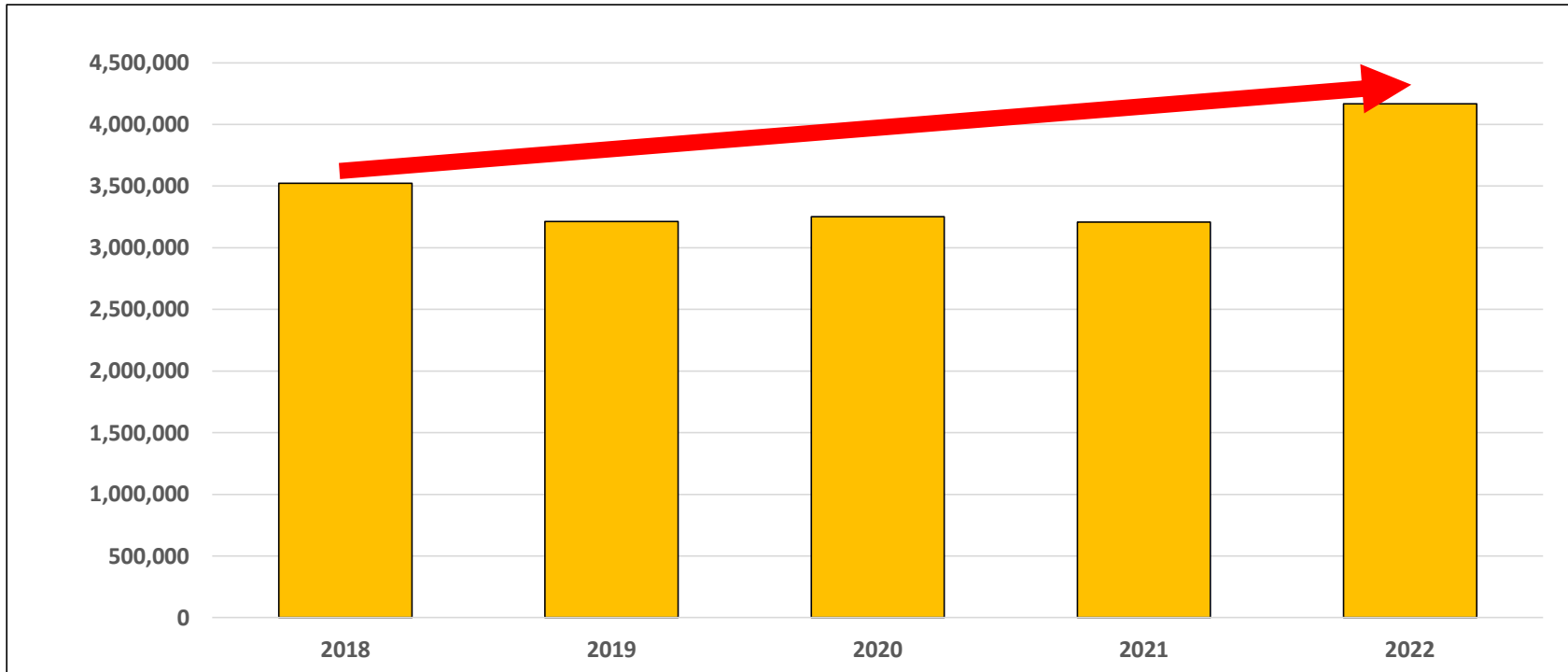
(all values in lbs.)

Company	2018	2019	2020	2021	2022	1 Year Change	
						Pounds	Percent
Pemex					1,403,042	1,403,042	NA
Dow Chemical	581,906	598,319	636,239	797,647	712,359	-85,289	-11%
Shell Deer Park	1,825,994	2,050,460	1,839,809	1,870,977	681,373	-1,189,604	-64%
Lubrizol	140,768	165,415	311,249	208,202	189,254	-18,948	-9%
Vopak	173,989	203,096	196,625	185,020	174,560	-10,460	-6%
OxyVinyls Deer Park PVC/Caustic	33,879	30,559	32,658	33,340	33,060	-280	-1%
OxyVinyls Deer Park VCM	25,034	33,406	21,025	32,711	23,677	-9,034	-28%
Westlake Epoxy	19,222	18,535	19,232	20,036	20,199	163	1%
Clean Harbors	3,605	9,791	14,670	14,670	9,828	-4,842	-33%
GEO Specialty Chemicals	10,828	11,477	2,721	1,789	1,640	-149	-8%
TOTAL CO	2,815,225	3,121,058	3,074,228	3,164,392	3,248,991	84,599	3%

= Not required to report
 = Facility not operating

Reported SOx Emissions

(all values in lbs.)




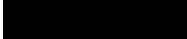
2018 → 2022: 18% Increase

2021 → 2022: 30% Increase

Reported SOx Emissions

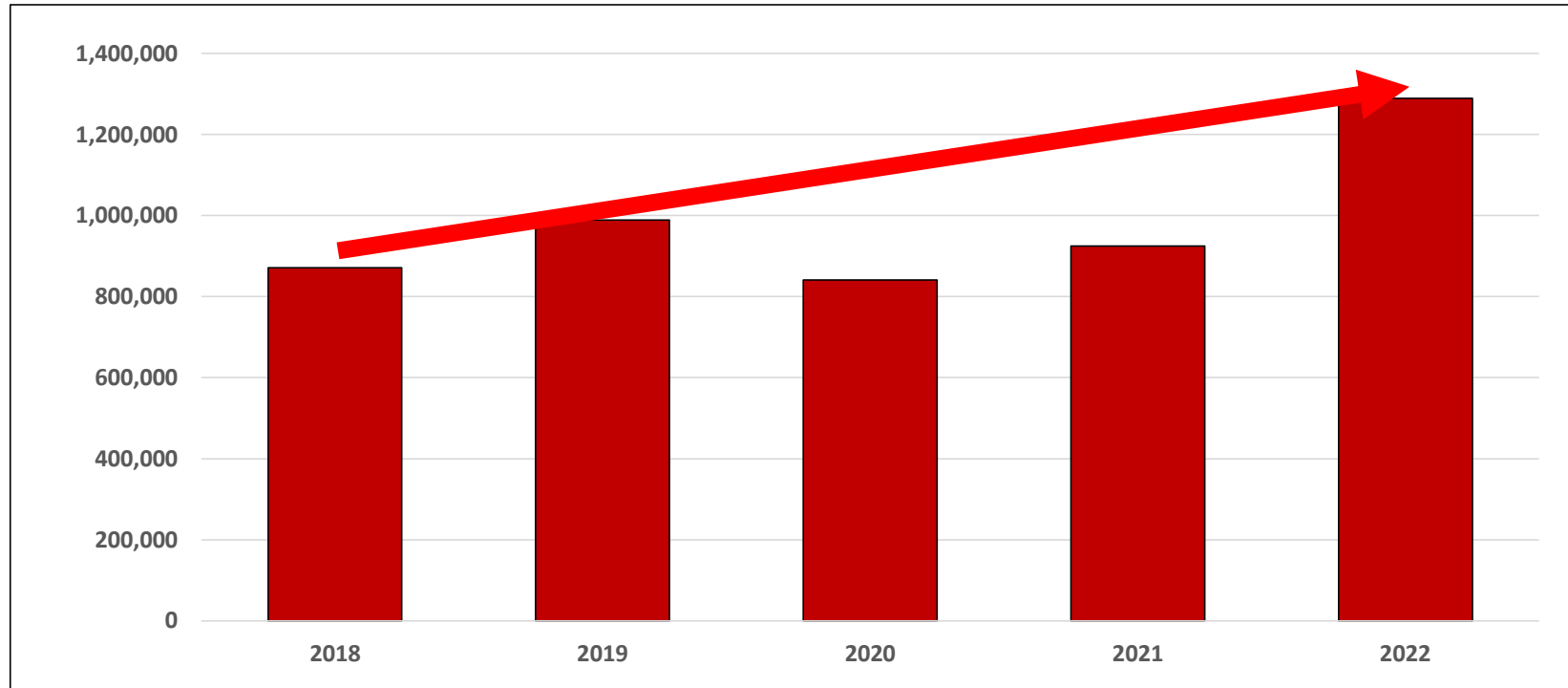
(all values in lbs.)

Company	2018	2019	2020	2021	2022	1 Year Change	
						Pounds	Percent
Dow Chemical	2,976,875	2,663,113	2,593,545	2,531,776	2,578,115	46,339	2%
Pemex					1,471,240	1,471,240	NA
Shell Deer Park	418,779	406,172	562,317	595,841	77,158	-518,683	-87%
Westlake Epoxy	82,700	90,804	70,462	55,156	22,049	-33,107	-60%
Lubrizol	37,766	43,963	12,380	13,479	11,911	-1,568	-12%
Vopak	4,701	5,927	4,643	4,320	3,940	-380	-9%
Clean Harbors	464	1534	7,040	7,040	1,531	-5,509	-78%
OxyVinyls Deer Park VCM	293	278	692	810	716	-94	-12%
OxyVinyls Deer Park PVC/Caustic	136	196	161	240	240	0	0%
GEO Specialty Chemicals	0	0	0	0	0	0	#DIV/0!
TOTAL SOx	3,521,714	3,211,987	3,251,240	3,208,662	4,166,900	958,238	30%

 = Not required to report
 = Facility not operating

Reported TSP Emissions

(all values in lbs.)



2018 → 2022: 48% Increase
2021 → 2022: 39% Increase

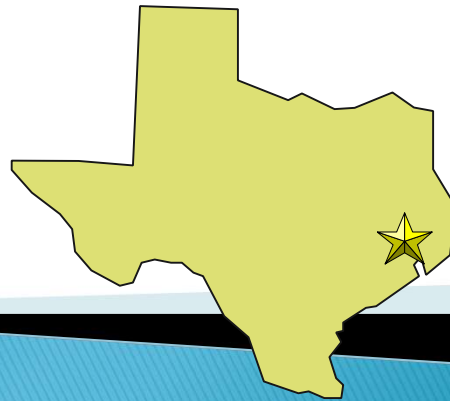
Reported TSP Emissions

(all values in lbs.)

Company	2018	2019	2020	2021	2022	1 Year Change	
						Pounds	Percent
Pemex					774,400	774,400	NA
Shell Deer Park	500,080	561,572	578,800	693,380	224,472	-468,908	-68%
Dow Chemical	212,765	226,835	97,063	74,940	84,540	9,600	13%
Clean Harbors	23,358	79,926	18,400	18,400	81,855	63,455	345%
OxyVinyls Deer Park PVC/Caustic	39,991	35,570	38,339	47,080	46,080	-1,000	-2%
Westlake Epoxy	46,600	35,272	53,830	39,116	32,737	-6,379	-16%
Lubrizol	23,603	23,662	30,829	29,479	23,299	-6,180	-21%
OxyVinyls Deer Park VCM	18,738	19,170	16,708	17,869	18,977	1,108	6%
GEO Specialty Chemicals	1,554	1,485	2,842	2,861	2,818	-43	-2%
Vopak	4,192	5,249	3,992	1,333	100	-1,233	-92%
TOTAL TSP	870,881	988,741	840,803	924,458	1,289,278	364,820	39%

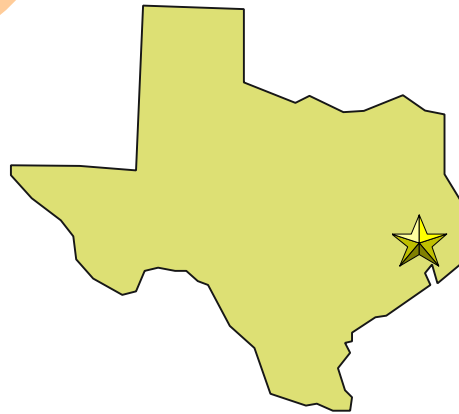
= Not required to report
 = Facility not operating

Questions?





2022 TRI Releases to Air



Toxic Release Inventory (TRI) *Releases To The Air*

TRI Pollutants Include:

- ~800 Chemicals (*reported if threshold is exceeded*)

TRI Thresholds: (*quantities are annual amounts*)

- Plant manufacturers, imports, or processes 25,000 lbs.*
- Plant otherwise uses 10,000 lbs.*

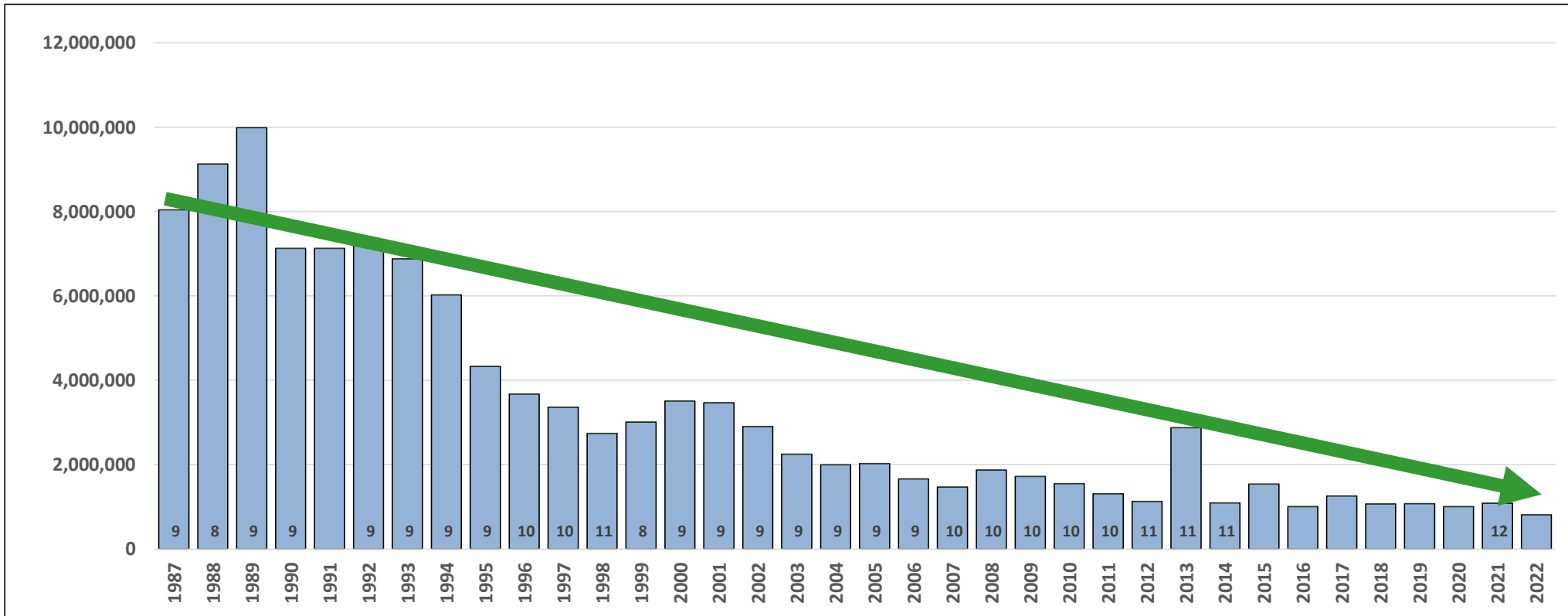
**Persistent bio accumulative toxics have lower reporting thresholds.*

Highlights in this presentation provide explanations from the plants for any changes in emissions from previous year that are 10% or greater or more than 10,000 pounds.

Plants are presented in order by most to least pounds of emissions.

TRI Air Releases – Our History

(all values in lbs.)

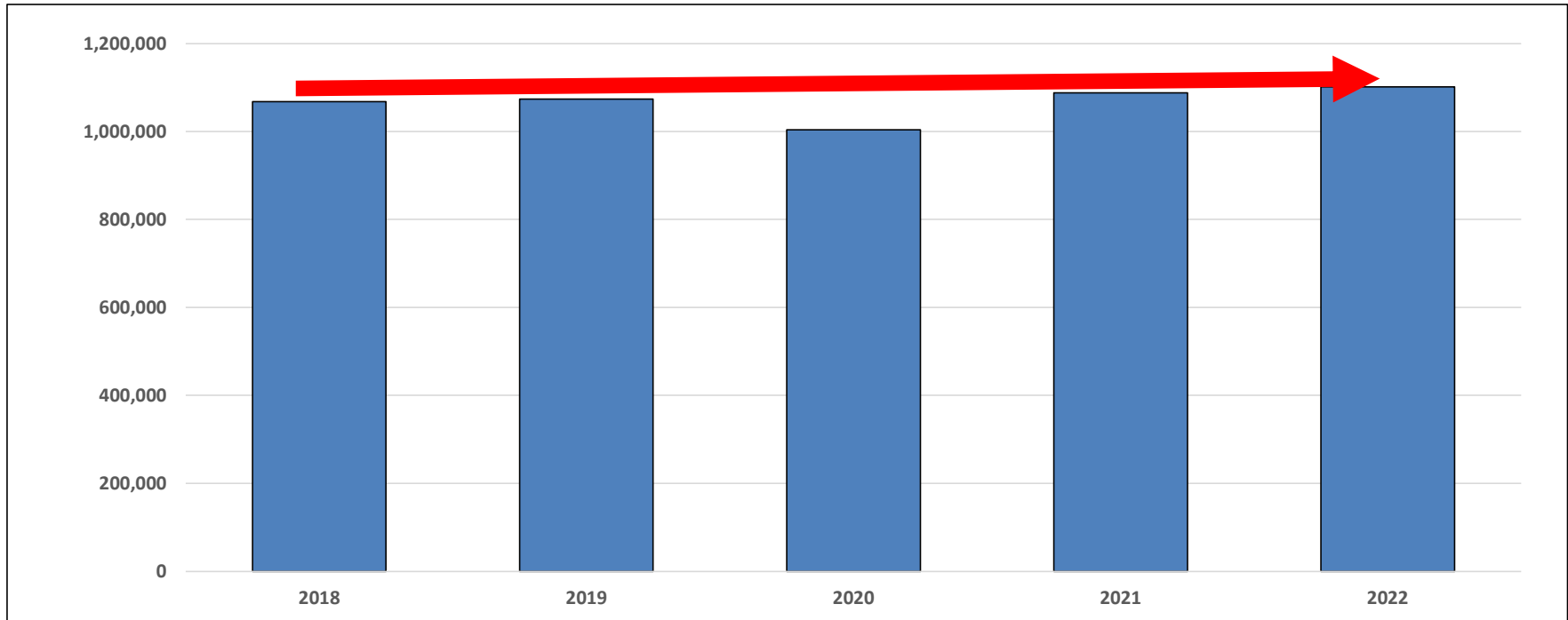


1987 → 2022: 90% Decrease

number of plants reporting on graph bars

Reported TRI Air Releases

(all values in lbs.)



2018 → 2022: 3% Increase
2021 → 2022: 1% Increase

Reported TRI Air Releases

(all values in lbs.)

Company	2018	2019	2020	2021	2022	1 Year Change	
						Pounds	Percent
Shell Deer Park	638,075	605,796	541,846	647,549	368,296	-279,253	-43%
Pemex					286,020	286,020	NA
Dow Chemical	243,622	244,795	247,452	213,920	242,994	29,074	14%
Westlake Epoxy	46,500	46,708	52,895	51,021	46,617	-4,404	-9%
OxyVinyls Deer Park PVC/Caustic	31,849	32,567	36,997	41,876	39,695	-2,181	-5%
Vopak		25,721	16,312	26,620	36,157	9,537	36%
OxyVinyls Deer Park VCM	39,605	41,882	36,905	37,961	34,988	-2,973	-8%
Lubrizol	35,693	37,138	34,454	44,565	31,565	-13,000	-29%
GEO Specialty Chemicals	25,479	15,827	13,909	10,043	10,520	477	5%
Clean Harbors	4,961	19,574	19,574	12,259	3,058	-9,201	-75%
Evonik	1,397	1,409	1,381	1,357	1,709	352	26%
Valvoline	1	1	1	1	3	2	213%
Texas Molecular	916	2,103	2,154	439	1	-438	-100%
Novvi				--	--	--	--
TOTAL TRI to AIR	1,068,098	1,073,521	1,003,880	1,087,611	1,101,623	14,012	1%

Facility Count	11	12	12	12	13
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= Not required to report
 = Facility operations ceased

2022 TRI Air Releases *Highlight Summary*

TRI Air Releases +1% (14k)

- Increases were due to:
 - Updated calculation methodology
 - Customer driven inventory
- Decreases were due to:
 - Updated calculation methodology
 - A variation of materials for incineration from customers.
 - Less volatile compounds received from customers.

TRI Air Releases

Individual Plant Highlights

Dow

- **+14% (29k lbs.)** due updated calculation methodology for Sulfuric Acid mist.

Lubrizol

- **-29% (13K lbs.)** due to change in calculation methodology for waste water emissions.

Vopak

- **+36% (9k lbs.)** customer driven inventory.

Clean Harbors

- **-75% (9k lbs.)** due to a variation of materials for incineration from customers

Evonik

- **+26% (352 lbs.)** due to an increase in production rates

Note: "k" equals 1,000

TRI Air Releases

Individual Plant Highlights

Valvoline

- **+213% (2 lbs.)** due to emissions are minimal due to low vapor pressure of raw materials and products

Shell Deer Park

- **-43% (279k lbs.)** Emissions from refinery sources were included in the site's 2021 TRI but were not included in the site's 2022 TRI

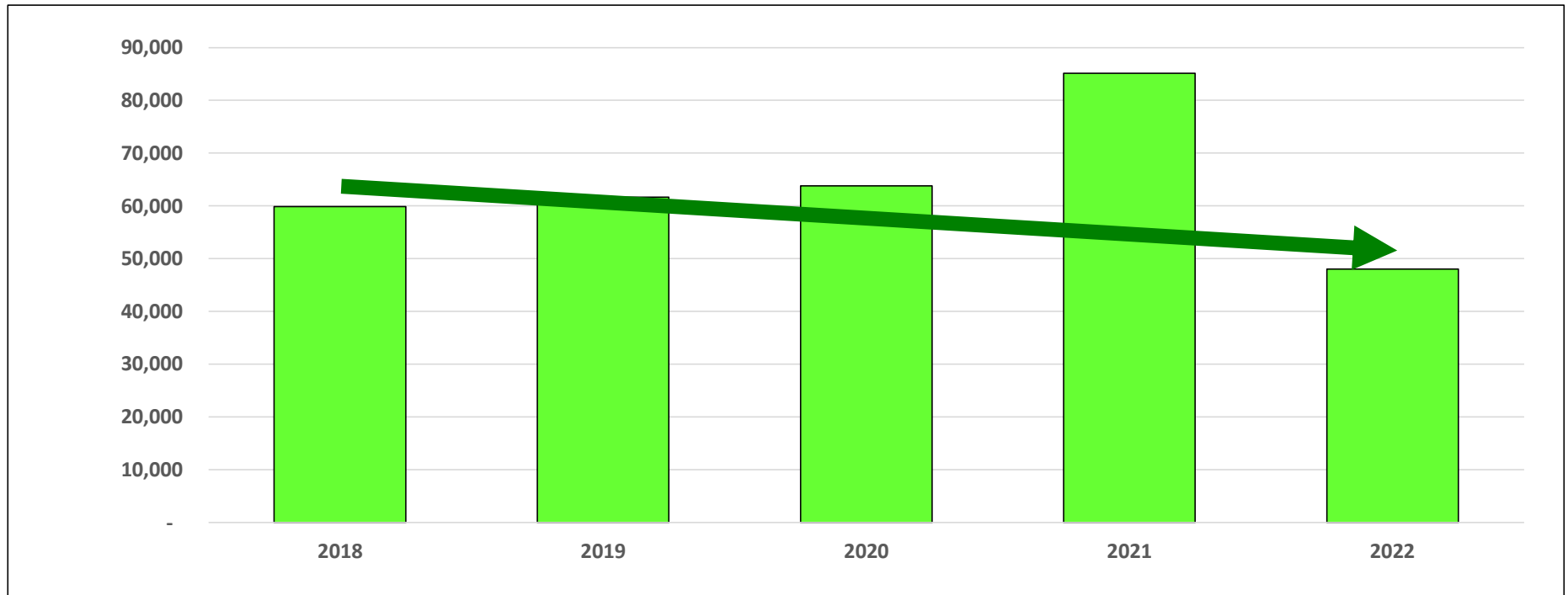
Texas Molecular

- **-100% (438 lbs.)** Received less volatile compounds in 2022

Note: "k" equals 1,000

Reported Benzene Air Releases

(all values in lbs.)



2018 → 2022: 20% Decrease

2021 → 2022: 44% Decrease

Reported Benzene Air Releases

(all values in lbs.)

Company	Activity	2018	2019	2020	2021	2022	1 Year Change	
							Pounds	Percent
Pemex	Refining					20,289	20,289	NA
Vopak	Storage/Loading	23,144	21,713	28,681	42,260	14,270	-27,990	-66%
Shell Deer Park	Production	36,371	39,002	34,651	42,746	13,271	-29,475	-69%
Clean Harbors	Waste Contaminant	171	583	106	45	148	103	231%
Lubrizol	Raw Material Contaminant	15	20	55	49	42	-7	-14%
Westlake	Reaction By-product	3	3	3	3	3	0	0%
OxyVinyls Deer Park VCM	Reaction By-product	4	4	2	2	2	0	0%
Texas Molecular	Waste Contaminant	147	288	279	3	-	-3	-100%
	TOTAL Benzene	59,855	61,613	63,777	85,108	48,025	-37,083	-44%

 = Not required to report

Highlight Summary

- **-44% (37k lbs.)** material variation from customers for incineration, and due to decreased flaring (freeze caused increase in 2021).

Benzene Air Release

Individual Plant Highlights

Shell Deer Park

- -69% (29k lbs.) due to emissions from refinery sources that were included in the site's 2021 EI but were not included in the site's 2022 EI.

Vopak

- -66% (28k lbs.) due to customer driven inventory.

Clean Harbors

- +231% (103 lbs.) due to material variation from customers for incineration.

Lubrizol

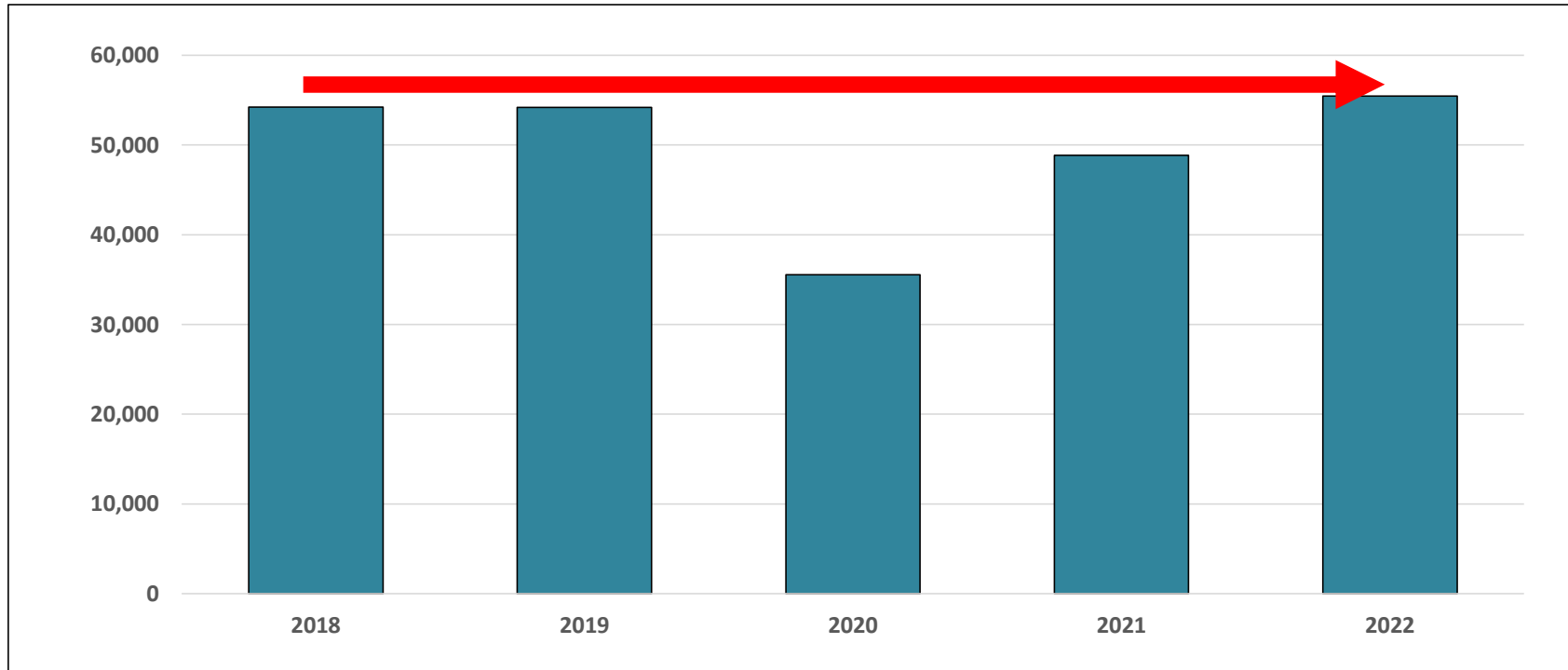
- -14% (7 lbs.) due to material variation from customers for incineration.

Texas Molecular

- -100% (3 lbs.) due to a new calculation methodology.

Reported 1,3-Butadiene Air Releases

(all values in lbs.)



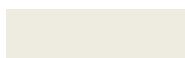

2018 → 2022: 2% Increase

2021 → 2022: 14% Increase

Reported 1,3-Butadiene Air Releases

(all values in lbs.)

Company	2018	2019	2020	2021	2022	1 Year Change	
						Pounds	Percent
Shell Deer Park	52,558	52,000	33,551	47,254	40,549	-6,705	-14%
Pemex					13,327	13,327	NA
Lubrizol	1,649	2,182	1,979	1,575	1,567	-8	-1%
Clean Harbors	0	0	0	0	0	0	0
TOTAL 1,3-Butadiene	54,207	54,182	35,530	48,829	55,443	6,614	14%

 = Not required to report
 = Facility not operating

1,3-Butadiene Air Releases

Individual Plant Highlights

Shell Deer Park

- -14% (7k lbs.) due to emissions from refinery sources were included in the site's 2021 EI but were not included in the site's 2022 EI

Lubrizol

- -1% (8 lbs.) due to a slight decrease in production.

Comparison With Other CACs 2010 – 2021

▶ BAYCAP (25 plants)

- TRI air - 38 %
- NOx - 9 %
- VOCs - 33 %

▶ Pasadena CAC (18 plants)

- TRI air - 64 %
- NOx + 14 %
- VOCs - 24 %

▶ Deer Park CAC (13 plants)

- TRI air - 32 %
- NOx - 26 %
- VOCs - 40 %

▶ La Porte CAC (47 reports)

- TRI air - 25 %
- NOx - 9 %
- VOCs - 5 %

2021 State and County Comparisons

▶ VOCs

- Texas 170,692,395 lbs.
- Harris Co. 43,694,143 lbs.
- DPCAC 3,333,198 lbs.

- 2% of state VOC Emissions Inventory from DPCAC plants
- 8% of county VOC EI from DPCAC plants

▶ NOx

- Texas 435,758,086 lbs.
- Harris Co. 64,881,113 lbs.
- DPCAC 3,703,276 lbs.

- 0.9% of state NOx Emissions Inventory from DPCAC plants
- 6% of county NOx EI from DPCAC plants

Number of facilities submitting an emissions inventory to TCEQ:
1,917 in Texas, 268 in Harris Co., 9 in DPCAC

A Year of Mostly Ups 2021 – 2022

Emissions Inventory

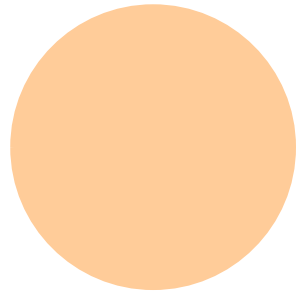
- NO_x +4% (165k lbs.)
- VOCs +6% (189k lbs.)
- CO +3% (90k lbs.)
- SO_x +30% (964k lbs.)
- TSP +30% (300k lbs.)

Toxics Release Inventory

- Air Emissions +1% (14k lbs.)

Other

- Benzene -44% (37k lbs.)
- 1,3-Butadiene +14% (7k lbs.)



Questions?

