

Saturday 11AM Storm Update

Hurricane Harvey made landfall Friday evening near Port Aransas, Texas. Harvey has been downgraded to a category 1 storm with 75 MPH sustained winds with 90 MPH gusts. The system tracked further inland than what was originally forecasted, which in turn changed the expected track to west of the Houston area. We are still forecasted to receive 18 to 24 inches of rainfall through mid-week. The Crosby facility is currently in Phase 3 of our Hurricane Preparedness Plan, production has ceased in the units and they are stabilized. We have taken action to divert most of the rainwater from entering the Waste Water Treatment Plant to prevent overwhelming the system. The storm ride out crew will be activated during the day today, the main driver for implementation of the ride out crew is expected lack of access to the site due to significant flooding. I will keep the site informed of changing conditions via Send Word Now, as well as provide a daily update on conditions to the BU Management Team. We have begun to experience minor flooding on site, and storm water ditches on the outside perimeter of the site are very near over-topping. Attached are some photos of minor flooding on the site.

- No current people issues, everyone was able to report to work this morning.
- Batch and Continuous units have been idled and cleared.
- Backup generators and refrigerated trailers have been topped off with diesel, and arrangements have been made to acquire a backup supply of fuel to be stored on site, nitrogen skid was serviced and topped off.
- There are no current site accessibility issues, but storm water ditches in the area are very full.
- Steady rain for much of the morning, with heavy rain in the storm bands, but no significant localized flooding issues to report as of yet, significant flooding is expected in the general area over the next several days, and several locations on the site are prone to flooding, actions have been taken to minimize the potential impact of flooded areas.
- Many roadways in the greater Houston area have incurred flooding and we have a list of current road closures (map attached below – thanks Janet).
- No environmental impact to report, guidance was issued to the shift supervisors for reporting any incident which has off-site impact.
- We are still awaiting our back up supply delivery of diesel, we have contacted the vendor and are awaiting a response.
- We will re-evaluate the return to normal staffing on a daily basis.



Saturday – 6 PM

Just an FYI – the Crosby phone lines are down, we are not able to call out, or receive outside calls. If you need to reach the plant, please use the following mobile numbers:



Sunday – 9:37 AM

It's been a long, tough night at the Crosby facility. Tropical Storm Harvey spent most of Saturday night practically stalled, dumping double digit rainfall totals all over the region (we received an excess of 20 inches in the past 24 hours). Harvey is moving toward the south-southwest near 1 mph, and a slow southeastward to east-southeastward motion is expected over the next couple of days. On the forecast track, the center will remain inland or move very near the coast of southeastern Texas through Monday. Harvey is expected to produce additional rain accumulations of 15 to 25 inches over the middle and upper Texas coast through Thursday. Isolated storm totals may reach around 40 inches in this area. Rainfall of this magnitude will cause catastrophic and life-threatening flooding. Much of the Crosby site suffered significant flooding during the night, we had to take actions to sandbag a dike wall in the Waste Water Treatment Plant, and move cold storage product (Lup11M75 to building 8) before electrical circuits for a refrigeration unit were exposed to rising water (building 3). Refrigeration compressors and control power have been disconnected. Transformers for Bldg. 5 (chlorine injection for fresh water) and the water well pump had to be raised to prevent submersion. Loss of phone service for the plant. This also shut down the PI server for MPU. This requires us to take manual readings for all environmental data at 1 hour intervals and to retrieve freezer building temperatures locally. This puts all of us out in the weather more frequently. Rainwater is not separated from process wastewater putting an incredible strain on well operations. The increased injection rates means the loss of filtration at a higher rate. The pre-coating of diatomaceous earth has to be washed out and applied once or twice in a 24 hr. period and is done out in the elements. Under normal operation the pre-coating (or turning the filter around in WWT jargon) is only needed once every 4 days. The well operator has about 7 sumps to keep up with, each with a back-up diaphragm pump that has to be started and monitored. Roads inside the plant are currently impassable without trucks – and some areas are completely impassable. As the water began to accumulate, operations discovered several underground leaks on our nitrogen header to the plant – those leaking areas have been flagged for follow-up. We have also ran across a snake in the flood waters.

I will continue to keep site personnel informed of changing conditions via Send Word Now, as well as provide a daily update on conditions to the BU Management Team. Storm water ditches on the outside perimeter of the site are over-topping the roadways around the facility. We are now experiencing another torrential downpour as I write this communication.

- No current people issues, the ride out crew was able to report to work on Saturday afternoon.
- Batch and Continuous units have been idled and cleared.
- Monitoring all sump levels and tank containments.
- High levels in sanitary sumps has resulted in the restriction of the use of bathroom facilities.

- Backup generators and refrigerated trailers have been topped off with diesel, our shipment of the backup supply of diesel arrived on site Saturday afternoon.
- There is significant flooding in the greater Houston area and Harris county, many roads are closed, and many local communities were affected by catastrophic flooding overnight.
- Heavy rain for the majority of the night on site, we are experiencing moderate flooding across the site.
- Many roadways in the greater Houston area have incurred flooding and we have a list of current road closures.
- No environmental impact to report, guidance was issued to the shift supervisors for reporting any incident which has off-site impact.
- We will re-evaluate the return to normal staffing on a daily basis – this appears to be a long term deployment for the ride out crew.

Sunday – 4:39 PM

The Crosby site continued to receive heavy rain for most of the day today. We now only have only 1 freezer building remaining on electrical power (building 27). The remaining freezer buildings have had their electrical power supply and or cooling units inundated with flood waters. We have low temperature products stored in refers and chill cabinets & building 27. We have set up the liquid nitrogen back up system just in case we lose power to the site. The nitrogen lines were under water, so we had to break the lines to blow out water to prevent immediate freezing when put in service. Which brings me to another issue of concern, the main power transformers for the site are about a foot or so from taking on water (see attached picture). This could cause a site wide power outage and require the use of backup nitrogen and moving the product from the chill cabinets to a spare refer. We have no internet/intranet access at the site, and we are relying on cell phones for our only communication means. We have also started a list of potentially damaged equipment and other costs associated with this event. This effort of our ride out crew has been nothing short of heroic. We are keeping safety in the forefront at all times, working outside using the buddy system, and not taking unnecessary risks.



Monday – 4:17 AM

Another difficult night for the Crosby team, we received more heavy rain and a significant increase in site water levels. We began taking on water in MCC 39, we cut the power which resulted in the loss of all power to the Waste Water Treatment Plant and Wells. Carolyn Hervey was notified of the potential to overflow waste water to the containment dike (this has not yet happened). We also lost power to the radio repeater and the radios were out of service until we hooked up our portable generator to supply power to the repeater. Building 16 (CPU) began taking on water, cut power to the building (it now has over a foot of standing water. Cut power to building 10 due to water reaching 480V transformer. With the flood waters getting very close to the site main power transformers, we decided to move all low temperature products to reefers. At approximately 2AM when began blowing transformers and lost all site power. 32GN-1 (building 29 backup generator) failed - generator appears to have been inundated with water. Currently in the process of moving all low temp material from building 27 to reefers (building still up on generator power). Building 21 is also up on generator power. Once water recedes, we will have do a complete site wide damage assessment, we have countless pieces of equipment, electrical circuits, cooling units, etc. under water. We currently have a break in the rain, but the water is continuing to rise. We are just beginning to take on water in building 29. Also - some of our ride

out team members have received water damage to their vehicles. Reefers - We have 3 empties on site, 2 will not run, and we can't use the other due to its position. We have 2 yard mules on site that have both been stranded in high water. We still have low temp product in building 27.

Monday – 2:50 PM

The generator providing power to B21 & B27 has been inundated with water and has shutdown. All of the 223S has been moved to a reefer.

Monday – 9:00 PM

Moved 48 pallets of cold temperature product from B27 to a reefer. We had to break down each pallet and hand stacked all containers into the reefer to accommodate all of the material – this process took approximately 5 hours.

While loading the reefer, we lost cooling capacity on one of our reefers in the laydown area.

Once we completed the off-loading of B27, we noticed that we lost cooling on reefer #7.

Consulted with the Crisis Team and decided to move from B21 back to B4, when moving to B4, noticed that we lost cooling on reefer #8.

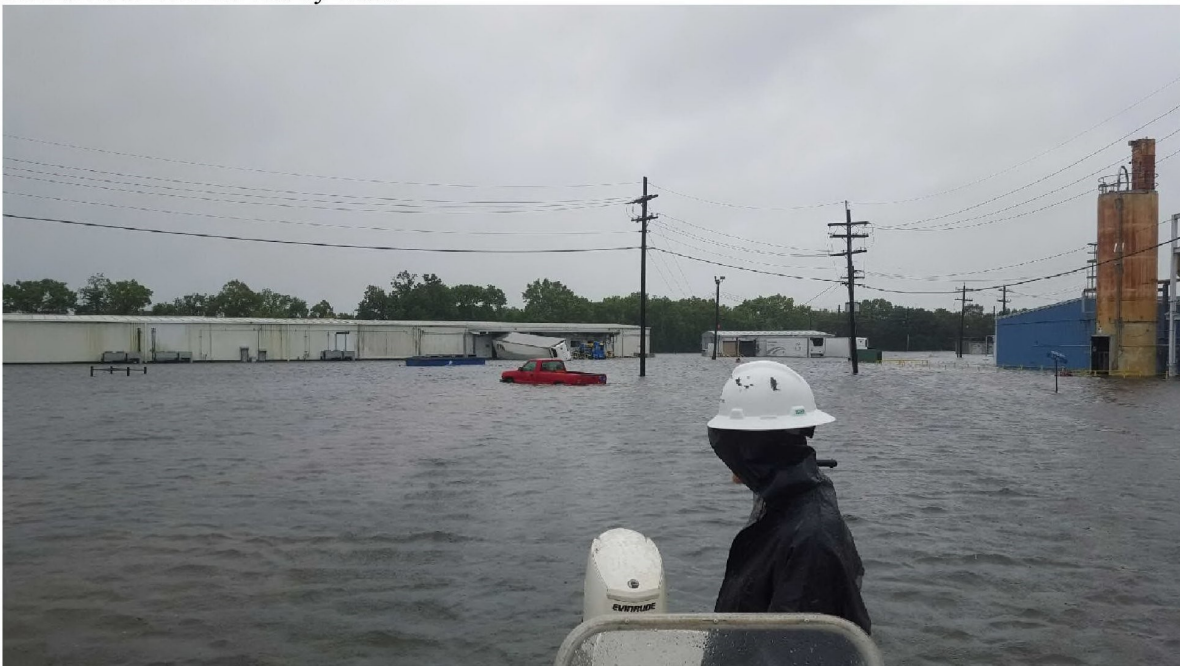
Tuesday – 7AM

Water rose overnight, now have 6” of water in B4. Consulted with Crisis Team and determined that it was time to arrange extraction.

Completed site assessment:

- Water now up to the bottom of reefers #6, 7, and 8.
- Reefer #6 was moved by water (see photo below)
- WWT plant main dike at 2A & 2B were breached by flood water from outside of the dike, level equalized at approximately 8:15AM

Reefer near B21 moved by water



Water breaching the railroad track, which will stop the level increase on site. Water flow on site increased greatly when this happened.

Planned to make a reconnaissance trip to get trailer numbers, but the rescue team arrived and would not allow us to check the trailers.

Extraction

Second Response to EPA Information Request Pursuant to the Clean Air Act
Section 114(a), for the Arkema Crosby Plant, received Sept. 7, 2017

Enhanced Timeline – Hurricane Harvey Event

This document has been prepared at EPA's request. It is based on Arkema's current knowledge and understanding of events and is subject to change. An investigation is ongoing and Arkema will amend this time line, if necessary, as additional or different information becomes known. This timeline generally presents the information most relevant to respond to the specific requests of EPA regarding Hurricane Harvey and the Crosby facility, and does not describe all of the actions taken by Arkema personnel to prepare for Hurricane Harvey, nor to respond to the effects of the flooding over the course of the event.

On Friday night, August 25, Hurricane Harvey made landfall between Port O'Connor and Port Aransas, Texas as a major Category 4 hurricane.¹ It slammed the beach communities, and as video and photographs attest, destroyed many homes and businesses. Harvey subsequently moved northeastward toward Houston and Harris County, ultimately becoming a tropical storm. While the associated winds with Harvey were substantially reduced, Harvey became stuck in a meteorological anomaly, hovering over the Houston and Southeast Texas areas for days, and depositing torrential rainfall in the area. As the storm slowly moved toward Louisiana, it shifted slightly toward the Gulf of Mexico, where Harvey gathered more moisture.

Tropical Storm Harvey dumped tremendous volumes of water on Harris County. The storm is without peer, one of the worst natural disasters in the history of the United States.² As of September 14, 2017, 82 people died in the storm.³ One third of the nation's refining capacity was impacted by the storm.⁴ The City of Beaumont lost the ability to provide potable water to an entire city of 120,000 people, finally lifting its "boil water" notice after 8 days without drinkable water.⁵ The Port of Houston, the nation's second busiest port by tonnage, closed at noon on Friday, August 25 and remained closed through 7 a.m. September 1 when it reopened for some container ships.⁶ To date it has been estimated that the flooding destroyed or damaged over 99,000 homes in Harris County alone⁷ and a million cars.⁸ During this devastation, industrial plants released huge quantities of pollutants into the environment, including

¹ See generally <http://www.nhc.noaa.gov/archive/2017/HARVEY.shtml?>

² <https://www.climate.gov/news-features/event-tracker/reviewing-hurricane-harveys-catastrophic-rain-and-flooding>

³ https://www.washingtonpost.com/national/texas-officials-hurricane-harvey-death-toll-at-82-mass-casualties-have-absolutely-not-happened/2017/09/14/bff3ffea-9975-11e7-87fc-c3f7ee4035c9_story.html?utm_term=.5561fe17802a

⁴ <https://www.ft.com/content/0ba86722-8ddd-11e7-9084-d0c17942ba93>

⁵ <http://kfdm.com/news/local/texas-environmental-agency-lifts-boil-water-notice-in-beaumont>

⁶ <https://qz.com/1067032/hurricane-harvey-the-port-of-houston-is-reopening-after-being-spared-by-the-storm/>

⁷ <https://www.bizjournals.com/houston/news/2017/09/14/this-is-how-many-homes-were-damaged-by-harvey-in.html>

⁸ <https://www.worldvision.org/disaster-response-news-stories/hurricane-harvey>

known human carcinogens like benzene, almost all of them without providing any prior warning to the public. On September 3, Texas state governor Greg Abbott estimated that damages will be between \$150 billion and \$180 billion, surpassing the \$120 billion that it took to rebuild New Orleans after Katrina.⁹

Arkema's Crosby plant is located in a rural area of Harris County approximately 25 miles northeast of Houston. The Crosby plant sat in the "bulls-eye" of Harvey's torrential downpours. The National Weather Service has reported that a rain gauge in the Cedar Bayou watershed, which includes Crosby, measured a total of 51.88 inches for the Harvey event, which marked a new record in the continental United States.¹⁰ In comparison, the average *yearly* rainfall for George Bush Intercontinental Airport is 49.77 inches.¹¹ The National Weather Service revised its color charts to properly account for Harvey's rainfall totals. Below are links to articles that point to the unprecedented nature of this hurricane.

http://www.huffingtonpost.com/entry/harvey-rain-record_us_59a5ae08e4b063ae34d94bae

<https://www.theatlantic.com/photo/2017/08/hurricane-harvey-leaves-houston-under-water/538215/>

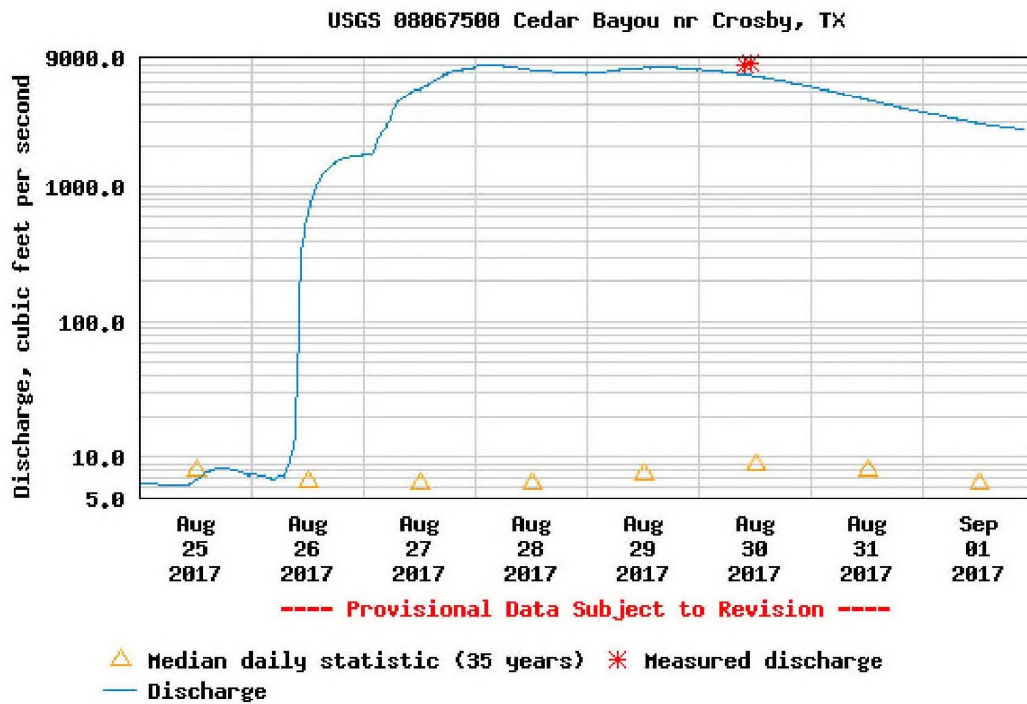
<http://www.cnn.com/2017/08/27/us/harvey-impact-by-the-numbers-trnd/index.html>

⁹ <http://www.bbc.com/news/world-us-canada-41143979>

¹⁰ <https://weather.com/storms/hurricane/news/tropical-storm-harvey-forecast-texas-louisiana-arkansas>

¹¹ http://www.weather.gov/hgx/climate_iah_normals_dec

As noted, Crosby is in the Cedar Bayou water shed. The extreme all time high on the Cedar Bayou gauge was measured during Harvey.



Create [presentation-quality](#) / [stand-alone](#) graph. Subscribe to [WaterAlert](#)

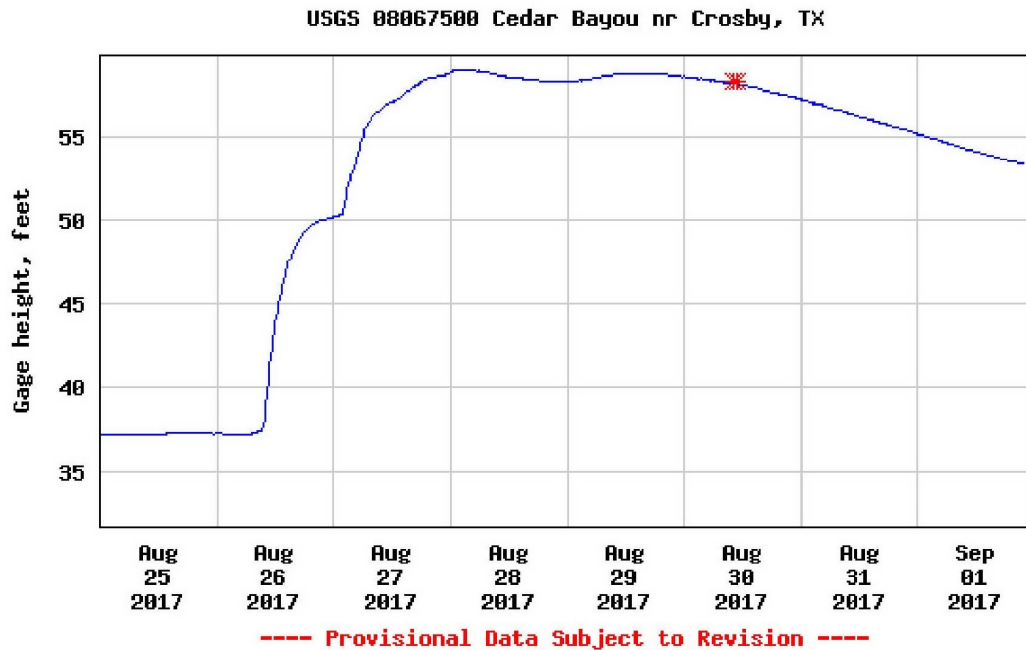
[+ Share this graph](#) | [G](#) [f](#) [t](#) [e](#)

**Daily discharge, cubic feet per second -- statistics for Sep 1
based on 35 years of record [more](#)**

Min (2011)	25th percen- tile	Median	75th percen- tile	Mean	Max (1981)	Most Recent Instantaneous Value Sep 1
0.00	1.4	6.4	19	65	1070	2650

Gage height, feet

Most recent instantaneous value: 53.34 09-01-2017 21:30 CDT



The recorded stream flow in Cedar Bayou for several days was approximately 8 times the previous recorded high in 1981.

The Crosby plant property was acquired in 1960. Warehouses and production processes were constructed in the 1960s and have been expanded over the years. Hurricanes and tropical storms have been a part of the plant's life since its construction. The plant is not near a stream or river, and does not experience flooding as a result of bank overflows. Plant employees, some of which have been employed there for 40 years, identify Tropical Storm Alison in 2001 as the previous benchmark for flood waters at the Crosby plant. During that event, the flooding was minor enough that pickup trucks were still able to traverse the plant site. That makes sense in comparison to Harvey. As one article noted about Harvey, "[t]he average rainfall within the Harris County Emergency Management network exceeded that of Tropical Storm Allison (2001) in almost half of the time (2 to 3 days versus 5 days)."¹² More recently, Hurricanes Ike and Rita, which also deposited significant rainfall in the Houston area, both made landfall significantly closer to Crosby than Harvey. Even during those hurricanes, the plant never experienced flooding anywhere close to the magnitude suffered in Harvey.

¹² <https://weather.com/storms/hurricane/news/tropical-storm-harvey-forecast-texas-louisiana-arkansas>

The Crosby plant took action to prepare for the storm. In fact, the plant planned well in advance for hurricanes, power outages and other potential emergencies.

The plant is regulated under OSHA's Process Safety Management (PSM) regulations, and therefore performed Process Hazard Analyses (PHAs) for the operations at the plant. The Crosby plant used the proper layers of protection analysis required under the PSM program for its PHA for the storage of organic peroxides at the facility.¹³

The Crosby plant has defined and appropriate operating procedures for the storage of organic peroxides. These procedures are periodically reviewed and updated under management of change procedures to account for modifications in the facility's operations. The plant's operating procedures also include a hurricane preparedness plan and a Storage Building Limits and Safety Guidelines ("SBLSG") procedure, the latter of which was modified on August 5, 2016 to include guidelines around use of refrigerated trailers in an emergency situation, and which was followed by plant personnel during the Harvey event.¹⁴

Personnel at the facility recognized that the 2017 hurricane season began in June, and had multiple meetings beginning June 13 to (a) ensure that everyone at the plant was trained according to the hurricane preparedness plan; (b) establish procedures for staffing a group of employees who would remain at the plant during a hurricane, called "ride-out crews"; (c) reactivate emergency equipment, such as satellite phones, in advance of the Hurricane season; (d) secure an emergency generator; and (e) perform other tasks to ensure hurricane preparedness at the plant.

As the threat of Hurricane Harvey neared, plant personnel took additional measures. These measures included, for example, tracking weather reports regarding the expected trajectory and severity of the storm, topping off all generators with diesel fuel, filling all portable totes with diesel fuel, and ensuring the diesel tank was full.

On August 23, phase 1 of the hurricane preparedness plan was implemented. Tracking of the storm by site personnel continued as it progressed through the Gulf of Mexico. As the storm's track became more certain, it was noted that it would make landfall well away from Crosby, and that the site was not

¹³ A copy of the latest Crosby PHA for the storage of organic peroxides was previously provided to EPA in Arkema's initial response (see ARK_EPA_0000017-60).

¹⁴ The SPLSG further includes a procedure in the event of loss of electricity and loss of a back-up generator which was followed by plant personnel we remained on site during Harvey (the "ride-out crew") as detailed in Appendix 1 ("[s]tart back-up generators. Keep generators full of diesel.") For loss of back-up generators, personnel should "[m]ove the product to trailers, refrigerated containers, or other storage units without loss of power and generator." This was likewise performed by the ride-out crew (See Appendix 2). Finally, "[i]f no other alternative available, place N2 on building using 'N2 Transfer Procedure' PROP 2603. Sign out the nitrogen feed valve and transfer line cap locks from the QC Laboratory." The refrigerated trailers were available and the ride-out crew went to that step prior to going to nitrogen per plant procedures. Still, the ride-out crew proactively made efforts to preserve the nitrogen back-up by placing an extended pipe to the storage unit feeds before the headers went underwater. (See Appendix 1). Even the 12-18" extension pipe eventually was underwater and rendered this back-up system unusable. The SPLSG is attached as Appendix 1.

in the hurricane's "cone." On August 24, the plant manager noted that the site was expected to receive 8–18 inches of rainfall.

On August 24, the Crosby team began the necessarily gradual process to shut down production, starting with the continuous unit and ending with the batch process unit. By Friday August 25, all production on site had ceased and the Crosby plant secured operations in shut-down mode. Site personnel continued to check the latest weather reports. Additionally, the plant crew made efforts to prep the nitrogen line for use as a back-up refrigeration system if power was lost, ensured that supplemental diesel fuel was delivered, conducted a site walk around to ensure everything was secured, brought in food for the ride out crew, obtained the satellite phone and cards for the ride-out crew leader, and ordered an off road forklift. To maximize the freeboard associated with secondary containment dikes, plant personnel disposed of water into the underground injection control system.

On Saturday August 26, the Crosby plant was still forecast to receive between 18-25 inches of rain through mid-week. In fact, the plant manager reported that by Sunday the plant had received approximately 20 inches of rain in a single 24 hour period. Forecasters were by then predicting certain isolated areas of the Houston region could receive as much as 40 inches in total.

In connection with its response to EPA's Information Request Pursuant to the Clean Air Act Section 114(a), received September 7, 2017, Arkema has already provided EPA with a timeline of emissions events that occurred at the site and some of the activities prior to and after those events. But there is a much more compelling story of the efforts that the ride-out crew made in an effort to keep the organic peroxide materials secure. Rather than summarize those efforts, Arkema has attached the log created by the plant manager, narrating the ride out crew's efforts.¹⁵ This log discusses issues identified by EPA's section 114 request, including (a) primary power failure; (b) use of backup power supply and subsequent failure; (c) removal of organic peroxides material to each of the nine refrigerated trailers, and which specific organic peroxides materials were placed in each trailer; (d) relocation of each of the nine refrigerated trailers; and (e) failure of primary and backup refrigeration systems in trailers.

The log identifies the proactive measures taken by the ride-out crew to stay ahead of the storm events that were rapidly overtaking the site. In torrential rain and sometimes in waist deep water, the ride out crew took every measure available to it to keep the peroxide products refrigerated. The U.S. Chemical Safety and Hazard Investigation Board (CSB) has taken audio-recorded interviews of site personnel and ride-out crew members, which should further enhance the description of these events. CSB denied Arkema's requests to make its own recordings or transcripts of those CSB interviews, but Arkema will supply such transcripts or recordings to EPA when they are finalized and released to Arkema.

Ultimately, on Tuesday August 29, the ride out crew was forced to evacuate the plant. They left the plant by boat, riding over a six foot chain link fence that was topped by another foot of barbed wire. In all, when the ride-out crew left, the plant had been inundated with over 7 feet of flood water. Arkema no longer had access to the site, and would not regain access until after the final fire on Sunday September 3.

¹⁵ A copy of the ride out crew log is attached as Appendix 2.

Arkema worked with an array of governmental authorities to secure the site, inform the public that fires would occur at the site prior to them actually happening, and to establish an evacuation perimeter of 1.5 miles surrounding the plant (EPA was instrumental in assisting with the modeling necessary to establish this perimeter zone). This so-called Unified Command included the Harris County Fire Marshall's Office; Harris County Sheriff's Department; Crosby Volunteer Fire Department; U.S. Environmental Protection Agency; Texas Commission on Environmental Quality (TCEQ); U.S. Department of Homeland Security; Harris County Security & Emergency Management Agency; and Harris County Pollution Control Services Department. The Federal Emergency Management Agency also participated at times, and the Federal Bureau of Investigation provided some assistance with enforcement of the 1.5 mile perimeter.

Arkema provided the Unified Command with the information available to Arkema and necessary for the Unified Command to assess the situation at the plant, including: all chemical and other materials on site, their volumes, their locations, and all information the Unified Command requested to enable it to make informed decisions. It should be noted that many of the governmental authorities represented in the Unified Command already had been provided by Arkema with emergency response information required by regulations, such as Tier II inventories and RMP plans. All on-site activities at the Crosby Plant from August 29 through September 3 were vetted through this Unified Command.

Other public officials were also informed of or provided information about the incident, and/or were provided with updates as events progressed, including some on numerous occasions throughout the duration of the event. These included members of Congress; Congressional staff members and Congressional committees; the White House National Economic Council; U.S. Environmental Protection Agency headquarters; Texas Governor's office; Texas legislators; TCEQ; Pipeline and Hazardous Materials Safety Administration; U.S. Coast Guard; Harris County Department of Health; and the U.S. Army Corps of Engineers.

As noted on the timeline that Arkema has already provided to EPA, on Thursday, August 31, the first trailer ignited and the organic peroxide materials combusted. On September 1, EPA/TCEQ issued the following:

"Today, one of nine refrigerated trailers of organic peroxide caught fire at the Arkema facility in Crosby, Texas. Following this fire, EPA sent aerial surveillance aircraft to test resulting smoke and did ground-level air quality monitoring. EPA's plane instrumentation is capable of measuring 78 different chemicals, including peroxides. Neither testing methods found toxic concentration levels in areas away from the evacuated facility."

Two more trailers ignited and combusted on Friday September 1. Because it was deemed unsafe to permit anyone on the site itself, Arkema and the Unified Command faced the challenge of getting incomplete information of the status of the site, including the status of the remaining six trailers holding peroxide products. Aerial observation by personnel from the Unified Command on Saturday September 2 noted smoke emanating from some of the remaining six trailers, indicating that decomposition of the peroxide materials stored in those trailers was continuing. Aerial photos also indicated that the

decomposing products were beginning to leak from the trailers onto the ground. However, no fire was observed.

On Saturday afternoon, Unified Command approached Arkema representatives with a plan to insert a team of experts from a special unit of the Houston Police Department (supported by representatives from the Houston Mayor's Office Securing The Cities program) to initiate a controlled burn of the six trailers. There was considerable discussion about how that could be safely accomplished. Using a shot was deemed unsafe as it could create a ricocheted projectile and an uncontrolled incident. The special unit would use a "charge," the sort of entry device it would use to breach the door of a locked building; the charge would create smoke and heat, but no explosion, and it could be remotely activated. This charge would have to be placed by hand on the wall of each of the refrigerated trailers, in a location that would ignite each of the remaining trailers without compromising other material at the site. After much safety discussion between company and Unified Command personnel, the mission was approved. However, immediately prior to the entry of the special unit members onto the site, it is believed that thermal imaging, aerial photos and human observations indicated that some of the trailers had begun to smoke again, requiring the team to abort the mission. Aerial reconnaissance indicated a possible fire on site, suggesting that additional decomposition had occurred. It was fully expected that overnight Saturday, or at least early on Sunday, the remaining six trailers would begin to aggressively burn. After waiting and observing for more than 12 hours, it was concluded that the materials were continuing to decompose, but no self-ignition resulted.

On Sunday, Unified Command once again began a mission to have the special unit from the HPD enter the site to place charges on the trailers to initiate the controlled burn. The mission was expanded to include members of Specialized Recovery Solutions, LLC (a private corporation working with Arkema), and Arkema Inc. to verify the integrity of certain organic peroxide products that did not require refrigeration and were stored at ambient temperatures in Building 21, and of the isobutylene tank. This mission was undertaken. The peroxide products observed in Building 21 showed no signs of decomposition, and the isobutylene tank was observed to be intact and safely out of the potential fire area caused by the leaking decomposing product emanating from the trailers. The weather, with very little wind, was deemed to present a good condition under which to initiate a controlled burn. The charges were placed and the mission members exited the site. After Unified Command reviewed the situation, the charges were remotely initiated in sequence. The ignitions started with the trailer that was farthest from the isobutylene tank, and the others then burned individually in seriatim. The flame shot straight up towards the sky. The controlled burn was successful, and the materials were consumed without additional impact to any other products or raw materials on the site. Late Sunday evening, Unified Command lifted the 1.5 mile evacuation zone. Along with many other governmental authorities, EPA officials were part of the Unified Command, and attended the meetings of the Unified Command, including the debriefing of the controlled burn.

On September 8, EPA issued the following statement:

"The Airborne Spectral Photometric Environmental Collection Technology (ASPECT) aircraft found no exceedances of the Texas comparison values. ASPECT conducted a screening level

assessment to evaluate the unreported or undetected releases of hazardous materials or contaminants at the Arkema plant in Crosby, Texas from August 30, 2017 through September 7, 2017. The screening level results from ASPECT were compared to the ASPECT list of Texas Commission on Environmental Quality (TCEQ) short-term Air Monitoring Comparison Values (AMCVs) and found no exceedances of the short-term AMCVs. In addition, the ASPECT was requested to monitor for peroxide which was the source material for the fire.”

Arkema’s air sampling results were similar. The daily community air monitoring performed by Arkema during the fire events through September 7, 2017 indicated that virtually all compounds were present at non-detect levels with the exception of PM2.5, which is always present in Houston air and would have been expected during the fires themselves.¹⁶

Arkema collected and analyzed ash samples from the fires. Those samples show that the method quantitation levels and the concentrations of detected potential constituents of concern were all well below (generally, several orders of magnitude below) the most stringent action levels ($^{Tot}Soil_{Comb}$) for the most conservative exposure scenario (residential land use, 0.5 ac area) under the Texas Risk Reduction Program (TRRP) rules (30 TAC Chapter 350).¹⁷

In light of this environmental data collected during and after the event, this event differs significantly from the reported releases of numerous carcinogenic and hazardous materials like benzene and gasoline from numerous other Harris County industrial facilities prior to, during and after Harvey. Those facilities gave no warning to neighbors, and imposed no evacuation zones. While their releases were not accompanied by fires, nor were they shown on television, and therefore lacked the drama of those at Arkema, they were much more impactful on human health and the environment.

Moreover, this event differs significantly from the massive explosion at the fertilizer plant that occurred in West, Texas or Texas City, Texas explosions. At Crosby, there were no fatalities. There was no concussion impact. There are no impact craters at the site. There was no shrapnel. There was no blast damaging buildings and impacting neighbors or the community. Other than flame scorching, there was no impact to buildings or production units at the plant. There were three large fires that burned straight into the air and which destroyed the trailers.¹⁸

Tropical Storm Harvey impacted the Crosby plant in a manner that could not have been anticipated in light of previous hurricane events there. The plant had emergency plans and procedures that were in compliance with existing laws. The plant executed its emergency plans, which were based on prior experience. As the storm built, the ride-out crew took exceptional measures in an effort to protect the environment and surrounding community. The air monitoring data obtained during and immediately after the event and in the weeks following the event, both by regulatory authorities and Arkema, indicate that the effect of the air releases from the fires was extremely limited.

¹⁶ A copy of these results are provided in Appendix 3.

¹⁷ The sample locations and analyses of the ash that are available to date are presented in Appendix 4.

¹⁸ Arkema has retained Environmental Resources Management (ERM) to prepare a Sampling and Analysis Plan as an initial assessment of potential impacts from Hurricane Harvey and the trailer fires that occurred at the Plant property itself. A copy of this plan is included with this letter as Appendix 5.

Morgan Lewis

Christopher B. Amandes

Partner
+1.713.890.5735
christopher.amandes@morganlewis.com

September 22, 2017

By email murdock.james@epa.gov and US mail

Mr. Samuel Tates, Chief
Chemical Accident Enforcement Section (6EN-AS)
Air Enforcement Branch
Compliance Assurance and Enforcement Division
United States Environmental Protection Agency Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

RE: Arkema Inc. Crosby, Texas Facility
Second Response to EPA Information Request Pursuant to the Clean Air
Act Section 114

CONFIDENTIAL BUSINESS INFORMATION ENCLOSED

Dear Mr. Tates:

On behalf of the Arkema Inc. Crosby, Texas facility (Arkema), we are hereby submitting this second response to the United States Environmental Protection Agency (EPA) request to provide information pursuant to the Clean Air Act Section 114(a) (Information Request) that was received on September 7, 2017. The Information Request directed Arkema to provide the requested information within 10 days of receipt, and with your consent, Arkema submitted its initial response to the request on September 18, which was the next working day after the 10 day deadline.

Four days earlier, on September 14, 2017, Arkema requested an extension until December 8, 2017 to respond completely to the Information Request. On September 18, you sent me an email denying Arkema's request with respect to the following items, and you directed Arkema to respond to these questions no later than today:

- Question #1 with the exception of paragraph f;

Morgan, Lewis & Bockius LLP

1000 Louisiana Street
Suite 4000
Houston, TX 77002
United States

T +1.713.890.5000
F +1.713.890.5001

DB1/ 93711174.2

ARK_EPA_0000770

Mr. Samuel Tates
United States Environmental Protection Agency Region 6
September 22, 2017
Page 2

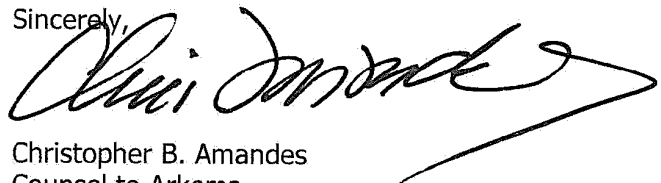
- Question #2 regarding operating procedures related to storage of organic peroxides; and
- Question #3, sub questions a., b., and c.

This second response is being submitted today as a result of your denial of Arkema's request for an extension as to these items, and it includes information to respond to the above-listed questions and more. However, for the reasons set out in Arkema's September 14 request for an extension, it is not possible to respond completely to the Information Request in the short time that EPA has specified. Arkema has responded in good faith to provide the information currently available to it, and it has made diligent efforts to ensure that this information is accurate. Arkema's investigation of the incident is ongoing, as are investigations by the Chemical Safety Board and others, and Arkema reserves the right to submit new or corrected information as it becomes available.

This response is submitted subject to all of the objections and qualifications set out in our initial response transmittal letter of September 18.

If you have any questions concerning this response, please do not hesitate to contact me or JeanMarie Cencetti at (610) 878-6632.

Sincerely,



Christopher B. Amandes
Counsel to Arkema

cc: all with attachments

Mr. Roberto Bernier, EPA Region 6
United States Environmental Protection Agency Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Mr. Samuel Bates
United States Environmental Protection Agency Region 6
September 22, 2017
Page 3

Mr. Ramiro Garcia, Jr., Deputy Director
Office of Compliance and Enforcement – MC-172
Texas Commission on Environmental Quality
P. O. Box 13087
Austin, Texas 78711-3087

Ms. Guadalupe Quiroz
TCEQ Region 12
5425 Polk Avenue, Suite H
Houston, Texas 77023

Mr. Craig Hill
Harris County Pollution Control Services Department
101 South Richey, Suite H
Pasadena, Texas 77506

**Arkema's Second Response to EPA Information Request
Pursuant to the Clean Air Act Section 114(a), for the Arkema
Crosby Plant, received Sept. 7, 2017**

III. QUESTIONS

1. Please provide a detailed description and timeline of the event. Include the best known start time and duration of the incident. The timeline should address in detail the following events as well as any other relevant points:
 - a. Primary power failure.
 - b. Use of backup power supply and subsequent failure.
 - c. Use of liquid nitrogen and related equipment and subsequent failure.
 - d. Removal of organic peroxides material to each of the nine refrigerated trailers, and which specific organic peroxides materials were placed in each trailer.
 - e. Relocation of each of the nine refrigerated trailers.
 - f. Temperature readings on each of the nine trailers.
 - g. Failure of primary and backup refrigeration systems in trailers.
 - h. Initial ignition and combustion of materials in each of the nine trailers.
 - i. Controlled burn of each trailers.
 - j. Other emergency response activities.

RESPONSE:

Please refer to the preliminary timeline of the event that was submitted with Arkema's initial response on September 18. The following additional information is submitted with this second response:

Please see the enclosed Enhanced Timeline – Hurricane Harvey Event and Materials Provided to EPA and Unified Command.

This response may be supplemented at a later date.

2. Please provide any documents associated with the identification of hazards posed by organic peroxides at your facility, operating procedures related to organic peroxides, and procedures related to flood, hurricane, loss of power, and emergency operations, and shutdown.

RESPONSE:

Please refer to the Safety Data Sheets for the organic peroxides at the Crosby facility that require refrigerated storage, Emergency Response Plan, Hurricane Preparedness Plan, Risk Management Plan, and Process Hazard Analysis for Organic Peroxide Storage that were submitted with Arkema's initial response on September 18. The following additional information is submitted with this second response:

Please see the enclosed Crosby Plant Products Storage Directory, Storage Building Limits and Safety Guidelines procedure, and Nitrogen Transfer Procedure.

This response may be supplemented at a later date.

3. What are the names and Chemical Abstract Service (CAS) Numbers of the organic peroxides moved to the refrigerated trailers?
 - a. How and where are organic peroxides normally stored at the facility?
 - b. How much organic peroxides are stored at the facility at any one time?
 - c. What layers of protection or other release prevention measures are in place for the storage of organic peroxides on site?
 - d. Under what conditions are organic peroxides moved to refrigerated trailers? Prior to the incident, when and for how long did you store materials, including organic peroxides, in refrigerated trailers?
 - e. Are organic peroxides ever moved off site for safe storage? If so, where are they moved, and what conditions trigger such movement?

RESPONSE:

Please refer to the Safety Data Sheets for the organic peroxides at the Crosby facility that require refrigerated storage, 2016 Tier II Report, and On-Site Inventories of raw and finished material for August 28-29, 2017 that were submitted with Arkema's initial response on September 18. The

following additional information responsive to Question 3(c) is submitted with this second response:

1. The primary refrigeration system (main power supplied from third party electric company) is used to keep the low temperature Organic Peroxides (OP) at their designated storage temperature. To keep the OPs at their designated storage temperature, the following engineering and administrative controls are employed:
 - a. A backup or redundant compressor is provided for each building in case of compressor failure on the refrigeration system.
 - b. A Temperature Alarm is also installed within each refrigerator building to notify an operator if the temperature inside begins to rise above the set point for the building. An alarm triggers operator response to identify the source of the temperature deviation.
 - c. In addition to the above, operators make rounds in the storage area every two (2) hours to visually check temperature/status of each refrigerator building.
2. If the primary source of power fails, each Refrigerator building is equipped with a diesel powered backup generator to power the refrigeration system.
3. If the refrigeration system on a single refrigerated building has been compromised (due to loss of primary and backup power), the product for that building can be moved to either a building which still has power or to a Reefer Storage Trailer.
4. A Nitrogen Cooling system is also available to cool a building which has lost power/refrigeration.

This response will be supplemented at a later date.

4. What backup power and safety systems were in place prior to the flooding?
 - a. What "Recognized And Generally Accepted Good Engineering Practices" are followed by Arkema for the design, installation, operation, maintenance, and reliability of the backup power and safety system?
 - b. What were the engineering and administrative controls for the safety and power systems, and what were their known consequences of failure, and what additional safety measures were in place in event of such failure?

RESPONSE:

Please refer to the Process Hazard Analysis for Organic Peroxide Storage that was submitted with Arkema's initial response on September 18. The following additional information is submitted with this second response:

Please see the responses to Questions 1 and 3 above.

This response will be supplemented at a later date.

5. What measures did Arkema take in response to the flooding to minimize consequences of an accidental release or fire/explosion involving either RMP-regulated substances or other hazardous chemicals held at the site, including organic peroxides?

RESPONSE:

Please refer to the timeline included in the response to Question 1 that was submitted with Arkema's initial response on September 18. The following additional information is submitted with this second response:

Please see the information provided above in response to Question 1 in this second response.

There was no accidental release of any RMP-regulated substance at the site during the flooding incident. Arkema took a number of actions in concert with Unified Command to prevent an accidental release of RMP-regulated substances, and these were successful.

There was an overflow of some hazardous materials from the site's open-topped wastewater storage tanks. The plant personnel took a number of actions prior to and during the storm (prior to power becoming unavailable and the secondary containment becoming overtopped by rising flood water), such as pumping water to the site's UIC system, reducing freeboard within the secondary containment, and the like. Rising flood waters coupled with power being unavailable eventually overcame all

efforts to prevent the accidental release of this material. A copy of Arkema's STEERS report on this accidental release was included with the initial response to the Information Request.

This response may be supplemented at a later date.

Second Response to EPA Information Request Pursuant to the Clean Air Act
Section 114(a), for the Arkema Crosby Plant, received Sept. 7, 2017

List of Attachments

Attachments that are Not Confidential Business Information

Enhanced Timeline – Hurricane Harvey Event

Appendix 2 – Ride Out Crew Log

Appendix 3 – Arkema Community Air Monitoring Results

Appendix 4 – Analytical Results for Ash Samples

Appendix 5 – ERM Sampling and Analysis Plan

Materials Provided to EPA and Unified Command (non-CBI)

Attachments that are Confidential Business Information

Materials Provided to EPA and Unified Command (CBI)

Appendix 1 (to Enhanced Timeline – Hurricane Harvey Event)
– Storage Building Limits and Safety Guidelines

Operating Procedures for Storage of Organic Peroxides