Intercontinental Terminals Company Fire Response 2019

Texas Commission on Environmental Quality

AFTER ACTION REVIEW REPORT

January 7, 2020

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1.0 Introduction

Organizational learning requires that agencies continuously assess their performance to identify and learn from successes and failures. The After Action Review (AAR) is an effective approach for capturing the knowledge gained from disaster response events. Conducting an AAR at the end of a large disaster response, like the Intercontinental Terminals Company (ITC) Fire, provides a valuable opportunity for capturing those lessons learned for what went well, so those actions can be applied forward. The AAR also allows the agency to identify those actions that did not go well, so they can be improved and not repeated in the future. Furthermore, sharing the results from an AAR can help staff responding to future disasters learn from past successful strategies and avoid pitfalls that have already been overcome.

As improvement actions are identified and addressed, any relevant plans, policies, and procedures will be are updated accordingly.

2.0 Incident Overview

On March 17, 2019, at approximately 10:00 AM, an aboveground storage tank containing naphtha caught fire within the 2nd 80's Tank Farm at the ITC facility in Deer Park, Texas. The affected ITC tank farm consisted of fifteen 80,000-barrel capacity aboveground storage tanks containing petro-chemicals including: naphtha, xylene, toluene, pyrolosis gas (pygas), gasoline blendstock, and base oil (2 of the 15 tanks were empty). All 15 tanks in the 2nd 80's Tank Farm were impacted by the fire and ten of the tanks collapsed, or partially collapsed. Water runoff from fighting the tank farm fire and the partial failure of the secondary containment wall surrounding the tank farm discharged tens of thousands of barrels (bbls) of material into Tucker Bayou, which empties into the Houston Ship Channel (HSC). This also resulted in the release of contaminants into the atmosphere and the discharge of some of the tank contents to drainage pathways that led to the HSC.

3.0 Emergency Response Summary

ITC, Harris County Pollution Control Services (HCPCS), the Texas Commission on Environmental Quality (TCEQ), and the U.S. Environmental Protection Agency (EPA) immediately responded to the fire.

ITC, with assistance from Channel Industries Mutual Aid (CIMA) and US Fire Pump, was able to fully extinguish the fire by 3:03 AM on March 20, 2019.

Several brief re-ignitions occurred but were quickly extinguished by on-site fire crew personnel.

On March 22, 2019, when the secondary containment wall for the tank farm partially collapsed and contaminated firefighting water and petro-chemicals flowed into the HSC, the U.S. Coast Guard (USCG) closed a portion of the HSC between Tucker Bayou and the San Jacinto Monument to Crystal Bay and deployed booms to capture released

material. Also, shortly after the collapse of the containment wall, the tank farm fire re-ignited causing a secondary fire to ignite in the Tidal Road drainage ditch. The secondary fire spread all the way down the ditch to the confluence with Tucker Bayou, threatening other petro-chemical storage tanks in the area before being extinguished.

Additionally, the TCEQ activated its emergency response contractor, SWS, to bring in professional industrial firefighting experts to evaluate the firefighting efforts and provide guidance to firefighters on the ground.

3.1 ITC Fire Timeline

Sunday, March 17, 2019 At approximately 10:00 AM, ITC Deer Park experienced a fire at their 2nd 80's Tank Farm in tank No. 80-08 that reportedly held naphtha. ITC evacuated facility personnel and a shelter-in-place was issued by the City of Deer Park for the north end of the city. The Lynchburg Ferry and parts of State Highway (SH) 225 near the facility were closed.

Monday, March 18, 2019 At 1:30 AM, ITC reported that the fire had spread to five additional adjacent tanks, for a total of seven tanks involved. By 5:00 AM, at least eight tanks containing gasoline blends, toluene, naphtha, xylenes, pyrolysis gasoline, and blended oils were involved in the fire. The shelter-in-place for the City of Deer Park remained in effect. SH 225 continued to be closed in both directions in the vicinity of the facility.

Tuesday, March 19, 2019 At 2:30 AM, ITC reported that two additional tanks, 80-14 and 80-15, both containing pyrolysis gasoline, were confirmed to be on fire bringing the total to 10 tanks burning.

Wednesday, March 20, 2019 At 4:00 AM, ITC issued a press statement indicating all tank fires were extinguished and that crews continued to spray foam and water to facilitate cooling to prevent reignition of the remaining material and suppress vapors. At approximately 5:00 PM, a flash fire occurred in one of the tanks and was extinguished within approximately five minutes. ITC applied foam at the impacted tanks to prevent additional flare ups.

Thursday, March 21, 2019 Detection of elevated levels of benzene >1 part per million (ppm) in the community, prompted a shelter-in-place. The Unified Command (UC) set up a comprehensive air monitoring program.

Friday, March 22, 2019 At approximately 12:15 PM, the containment wall surrounding the tank farm breaches, releasing tens of thousands of barrels of firefighting water and petro-chemicals into Tucker Bayou and the HSC. Booms were deployed, and the U.S. Coast Guard closed a portion of the HSC between Tucker Bayou and the San Jacinto Monument to Crystal Bay.

At approximately 3:45 PM the tank farm fire re-ignited causing a secondary fire to ignite in the Tidal Road drainage ditch, extending down to the ditch to the confluence with Tucker Bayou, and threatening other petro-chemical storage tanks in the area. At this time TCEQ requested the agency's emergency response contractor to bring in

professional firefighters in an advisory role to assist TCEQ and EPA with the technical aspects of the fire and to provide guidance for the local firefighting efforts.

Although both of the fires on March 22, 2019 were extinguished within a couple of hours, ITC maintained an active firefighting presence at the 2nd 80's Tank Farm throughout the cleaning and deconstruction of all 15 tanks in the tank farm due to the danger of a fire re-ignition. On July 29, 2019 ITC reported that the cleaning and deconstruction of all fifteen tanks in the 2nd 80's Tank Farm was complete.

3.2 Unified Command Structure

EPA established a UC as the Federal On-Scene Coordinator (FOSC) providing oversight.

- EPA activated the USCG Strike Team and the National Oceanic and Atmospheric Administration (NOAA) to provide EPA support with the emergency response.

The UC included Incident Commanders from EPA, TCEQ, Harris County and ITC.

- TCEQ joined Unified Command as the State On-Scene Coordinator (SOSC).
- Due to their control of the HSC, USCG joined UC.
- Additional agencies and entities were brought on-board to support the response in varying capacities including among others, representatives from the Texas General Land Office (TGLO); the Texas Department of State Health Services (DSHS); the Texas National Guard, 6th Civil Support Team; City of Houston, City of Deer Park, Houston Port Authority, Harris County Hazmat (HC Hazmat), Harris County Fire Marshal and HCPCS.

As a Unified Command, EPA, TCEQ, Harris County, and ITC worked together to secure the incident and conduct the emergency response actions to extinguish the fire, contain and clean up the spill, and conduct environmental monitoring.

The CIMA organization also participated in the response. This private industry group combines fire-fighting, rescue, hazardous material handling and emergency medical capabilities of the refining and petrochemical industry in the HSC area, and provides cooperative assistance and expertise for emergency responses.

3.3 Environmental Monitoring

3.3.1 Air Quality Monitoring

Starting on March 17, 2019, multiple local, state and federal agencies began conducting initial air monitoring activities to collect data to determine the potential health impact of the ITC incident. The initial air monitoring activities included: ITC contractors, TCEQ, EPA, and Harris County staff utilizing handheld equipment (Toxic Vapor Analyzers (TVAs), MultiRAEs and UltraRAEs; stationary air monitoring data from the TCEQ Continuous Ambient Monitoring Stations (CAMS) in southeast Harris County and air monitoring data from the Houston Regional Monitoring Corporation (HRM) in

southeast Harris County; EPA's Airborne Spectral Photometric Environmental Collection Technology (ASPECT) plane; and, TCEQ air monitoring vans.

Working under a UC with EPA, TCEQ, Harris County, USCG, and other agencies, ITC was directed to conduct air monitoring. ITC deployed its contractor, Center for Toxicology & Environmental Health (CTEH), to conduct handheld, real-time air monitoring in accordance with two distinct sampling plans: 1) community; and, 2) industrial area.

- ITC placed community air monitoring data and information on ITC's 2nd 80's Fire Response webpage. Community and industrial area air monitoring data was provided in real-time to the primary on-scene response partners (the UC group), including local governments responsible for making decisions related to public safety, such as to shelter-in-place.
- CTEH collected over 90,000 community air readings. In addition, ITC employed the Emission Monitoring Service, Inc. mobile monitoring van to take additional readings in the community.
- During the early morning hours of March 21, 2019, there were multiple detections of benzene above 1 ppm in a northern portion of the Deer Park community, during which time the affected area was sheltered-in-place.
    - There were no other detections of benzene above 1 ppm reported in the community during the response.
    - The only other detections of benzene above 1 ppm occurred on-site and in industrial areas.
    - In on-site and industrial areas, and on the water, there was a joint response integrated air monitoring program in place to protect first responders, industrial neighbors, and water response personnel from exposure to air contaminant levels of concern.
- On August 12, 2019, with concurrence from TCEQ, ITC concluded air monitoring in the surrounding vicinity. ITC's air monitoring results were evaluated and posted on TCEQ's website at https://www.tceq.texas.gov/response/itc-monitoring-air-quality/.

TCEQ

On March 17, 2019, the TCEQ Houston Region Emergency Response Coordinator (ERC) was dispatched at approximately 12:45 PM and arrived on scene at approximately 1:45 PM to ensure that ITC was conducting air monitoring actions. The TCEQ ERC noted that ITC contractors and HCPCS were already on-site conducting air monitoring.

At approximately 4:00 PM, the TCEQ began evaluating the air monitoring data from the TCEQ Deer Park CAMS near the fire event, which at the time was directly downwind of the facility. The monitoring data included volatile organic compounds (VOCs), particulate matter ($PM_{2.5}$) and nitrogen oxides (NOx). This monitor collected ambient data throughout the day.

At approximately 9:00 PM, TCEQ began air monitoring in Deer Park utilizing handheld equipment (two TVAs to detect VOCs and four MultiRAEs to detect lower explosive limits (LEL), VOCs, hydrogen sulfide (H2S), and carbon monoxide (CO)).

At TCEQ's request, EPA conducted an aerial screening level assessment with the use of the ASPECT aircraft to evaluate the unreported or undetected releases of hazardous materials or contaminants in the vicinity and downwind of the incident.

On March 18, 2019, between 9:30 AM and 10:30 AM, TCEQ deployed two additional air monitoring stations (monitoring vans) with automated gas chromatography (autoGC) placed strategically in coordination with the UC in the surrounding communities (data included H2S, sulfur dioxide (SO2), and 17 VOCs at parts per billion (ppb) levels).

The TCEQ also requested the EPA to deploy their Trace Atmospheric Gas Analyzer (TAGA) vehicle to assist with air monitoring.

On March 19, 2019, the TCEQ began deploying a multi-pronged 24-hour air monitoring strategy to supplement the air quality monitoring already being conducted by ITC and local government. This included deploying multiple staff and contractors with handheld air monitoring units, using air monitoring vans, and assessing data from CAMS. Any elevated measurements identified were compared against TCEQ's short-term Air Monitoring Comparisons Values (AMCVs).

In addition, two air monitoring strike teams (1 for land and 1 for surface water operations) were created by EPA, TCEQ, and ITC to conduct 24-hour air monitoring and provide a quick response, as needed, in areas where elevated levels were detected near or above action levels.

- During the ITC Tank Farm fire - monitoring assets focused on assessing areas in the path of the resulting black plume.
    - TCEQ regional investigators, ER contractors, and air monitoring vans were deployed to the west side of Houston for continuous community assessments of potential plume impacts.
- After initial fire was extinguished - monitoring assets shifted to assessing ambient levels of VOCs, specifically benzene, in downwind communities.
    - TCEQ monitoring vans or the EPA TAGA vehicle were directed to locations to assess elevated measurements identified with TCEQ handheld monitors. The TAGA vehicle conducted in-transit, mobile monitoring throughout downwind communities. TCEQ's monitoring vans were positioned to fill gaps in monitoring coverage in downwind communities.
    - As changing wind conditions dictated, all air monitoring assets were coordinated to investigate reports of elevated concentrations, odors, or health impacts.
    - Downwind air monitoring stations equipped with autoGCs were reviewed to assess ambient concentrations of benzene and other air contaminants farther from the ITC facility.

- ASPECT overflights provided overall situational analysis to UC by collecting airborne infrared images and screening level assessments for releases of hazardous materials or contaminants from the ITC facility.
- All data were shared with UC, the local city/county emergency operation centers (EOCs) and the public. The EOCs are responsible for evaluating the information received from the UC and for ensuring timely and appropriate measures are taken to protect public health (i.e. issuing a community shelter-in-place notice).

o Handheld Air Monitoring Equipment - Starting on the afternoon of March 17, 2019, TCEQ began conducting air monitoring in the Deer Park, Texas area. Beginning on March 19, 2019, TCEQ initiated 24-hour air quality monitoring across the area utilizing TCEQ staff and contractors equipped with handheld monitors.

Handheld monitoring with MultiRAE and UltraRAE instruments provided instantaneous measurements.

- MultiRAEs with various sensors were used for all survey activities. This instrument provides instantaneous readings for various compounds that include the LEL, VOCs, H2S, CO, SO2, radiation (Gamma), chlorine (CL2), ammonia (NH3), and oxygen levels (O2).
- UltraRAEs were used to monitor for benzene.

TVAs were also used, when appropriate. This instrument measures most organic and inorganic gases and provides instantaneous readings for non-speciated ppm level VOCs.

From March 17, 2019 to June 11, 2019, over 12,500 air quality readings were collected by TCEQ and its contractors across the area.

o Air Monitoring Vans – Beginning March 18, 2019, stationary monitors were supplemented by deployed TCEQ's two air monitoring vans equipped with various instruments including autoGCs, to survey the communities surrounding the ITC site for VOCs, H2S, and SO2 on a 24-hour basis at ppb levels.

- These vans are only capable of collecting data while stationary and require a time-consuming process to deploy, park and calibrate at each monitoring location.

o Continuous Ambient Monitoring Station - Multiple fixed air monitoring stations were used to assess ambient concentrations of VOCs (specifically benzene) and $PM_{2.5}$ in areas north, west, and south of ITC.

Stationary Air Monitors:

Location	Equipment
Baytown	continuous $PM_{2.5}$
Cesar Chavez	autoGC[1]
Channelview	autoGC[1]
Clinton Drive	autoGC[1], continuous $PM_{2.5}$
Deer Park #2	autoGC[1], continuous $PM_{2.5}$
Galena Park	autoGC[1]
Houston East	continuous $PM_{2.5}$
HRM Haden Road	autoGC[1]
Lynchburg	autoGC[1]
Milby Park	autoGC[1]
Park Place	continuous $PM_{2.5}$

Data from TCEQ's continuous air monitoring stations are available 24-hours a day online through the GeoTAM viewer. Air quality data from these stations were available throughout the ITC fire incident with the exception of the autoGC at Deer Park #2[2]. The autoGC at this monitor station was taken offline from 6:00 AM to 12:00 PM on March 18, 2019, to perform a multipoint calibration required following a repair that was completed two days earlier. This calibration was conducted in accordance with the TCEQ standard operating procedure at the time for autoGC operations and was necessary to ensure the collection of valid VOC data for the remainder of the response to the ITC fire.

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[1] AutoGC target list includes: ethane, ethylene, propane, propylene, isobutane, n-butane, acetylene, t-2-butene, 1-butene, c-2-butene, cyclopentane, isopentane, n-pentane, 1,3-butadiene, t-2-pentene, 1-pentene, c-2-pentene, 2,2-dimethylbutane, isoprene, n-hexane, methylcyclopentane, 2,4-dimethylpentane, benzene, cyclohexane, 2-methylhexane, 2,3-dimethylpentane, 3-methylhexane, 2,2,4-trimethylpentane, n-heptane, methylcyclohexane, 2,3,4-trimethylpentane, toluene, 2-methylheptane, 3-methylheptane, n-octane, ethyl benzene, p-xylene + m-xylene, styrene, o-xylene, n-nonane, isopropyl benzene – cumene, n-propylbenzene, 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene, n-decane, 1,2,4-trimethylbenzene

[2] Letter from Jon Niermann, TCEQ Chairman, to the Honorable Adrian Garcia, Harris County Commissioner, Precinct No. 2, dated March 28, 2019 (see link below).
https://www.tceq.texas.gov/assets/public/response/smoke/correspondence/response-from-Niermann-to-Adrian-Garcia.pdf

The multipoint check was completed, and valid ambient data collection from the autoGC was resumed as of 1:00 PM, Monday, March 18, 2019.

The ambient data collected from Saturday, March 16, 2019 through early Monday, March 18, 2019 were reviewed and found to be within required quality standards.

Important Note: Although the autoGC at Deer Park #2 was taken down for a short duration due to a necessary calibration, the gathering of $PM_{2.5}$ data continued without interruption (including during the tank fires). $PM_{2.5}$ was a pollutant of concern while the fire was burning and generating the thick cloud of black smoke.

- Since the time of the ITC fire incident, TCEQ has revised current protocols to ensure that appropriate communications take place prior to scheduling quality control operations that will result in instrument downtime (This item is discussed further as an Action Taken under Section 5.6 "Air Monitoring Station Temporary Outage Planning", see p.22).

Data from the TCEQ autoGC stationary monitors can be found on TCEQ's website: https://www.tceq.texas.gov/cgi-bin/compliance/monops/agc_daily_summary.pl?user_site=48_201_0069.

On May 24, 2019, the TCEQ completed monitoring activities with the agency's two (2) air monitoring vans.

On June 11, 2019, the TCEQ concluded daily handheld air monitoring of the area around the tank fire at ITC. However, ITC continued to conduct handheld air monitoring in the surrounding vicinity.

EPA

On March 17, 2019, EPA began monitored the air quality in the vicinity of the site, the downwind community, and the plume area overhead utilizing handheld equipment and with the ASPECT aircraft.

- EPA deployed contractors to conduct air monitoring using handheld equipment that provided real-time concentrations of selected gases including VOCs, H2S, CO, and O2, VOCs and LEL. EPA's contractor collected over 3,600 air quality readings in communities downwind from the facility, in adjoining industrial areas, along the HSC, and around the tank farm.
- ASPECT flew daily missions (27 missions in all) throughout the response with the only exceptions being inclement weather or when maintenance on the aircraft was necessary.

On March 18, 2019, EPA activated TAGA at the request of TCEQ to support the incident response.

- TAGA is a self-contained mobile monitoring laboratory (bus) that collects millions of air sampling results in three second increments during operation.

On March 21, 2019, TAGA arrived at the incident and begin air monitoring in communities downwind of the facility.

On April 19, 2019, ASPECT completed its mission and was demobilized from the site.

On May 20, 2019, TAGA concluded air monitoring activities and was demobilized from the site.

On May 21, 2019, EPA concluded handheld instrument air monitoring activities at the site.

More information regarding air monitoring activities and data is available on the TCEQ, EPA, and ITC webpages (see webpage links below).

TCEQ's webpage: https://www.tceq.texas.gov/response/itc-monitoring-air-quality/

EPA's webpage: https://epa.maps.arcgis.com/apps/Cascade/index.html?appid=f5eca85b79484cd69ea3a68cec886797

ITC's webpage: https://itcresponse.com/

For a detailed review and discussion of ambient air monitoring conducted during the ITC fire response, please see the [3]TCEQ 2019 Report – ITC Air and Water Monitoring Report.

3.3.2 Surface Water Quality Monitoring

On March 18, 2019, at TCEQ's request, ITC began collecting hourly water samples to assess impacts of fire suppression water runoff to Tucker Bayou downstream of the plant. On March 20, 2019, ITC adjusted the sampling to every two hours. On or about April 18, 2019, ITC adjusted the sampling to twice per day. All the ITC water sample data was assessed by the TCEQ.

Starting on March 19, 2019, state and local agencies began collecting surface water samples in order determine the potential health impact of the ITC incident.

As of April 23, 2019, no chemicals associated with the incident were detected above the known health PCLs for surface water in the samples collected in the HSC, Galveston Bay, or the Gulf.

Surface water monitoring results from the lower portions of the HSC through Galveston Bay and downstream to the Gulf of Mexico showed no chemicals associated with the incident have been detected above the known health PCLs for surface water in the samples collected in the main part of the HSC, Galveston Bay, or the Gulf.

As of June 18, 2019, TCEQ completed all surface water sampling activities and transitioned all remaining surface water sampling activities to ITC.

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[3] Intercontinental Terminals Company (ITC) Deer Park Facility Fire Ambient Air and Water Monitoring, Deer Park, Harris County, TX", dated 2019 – Draft Deliberative.

TCEQ

On March 19, 2019, TCEQ began conducting surface water sampling in four locations from Tucker Bayou and the HSC. This sampling eventually expanded to 21 locations which included other areas in the HSC, Galveston Bay and on the Gulf side of Galveston Island and Crystal Beach on the Bolivar Peninsula. The TCEQ samples were analyzed for metals, polychlorinated biphenyls, total petroleum hydrocarbons, semi-volatile organic compounds (SVOCs), and VOCs.

- On March 23, 2019, a daily comprehensive surface water quality sampling plan was initiated by TCEQ staff. This plan included multiple sampling locations within the HSC and Galveston Bay and on the Gulf side of Galveston Island and Crystal Beach on the Bolivar Peninsula.
- On June 18, 2019, TCEQ completed all surface water sampling activities with a total of 619 water samples collected by TCEQ and its contractors at 21 locations, spanning from the HSC to Galveston Bay and into the Gulf of Mexico.
- Beginning June 19, 2019, all remaining surface water sampling activities were transitioned to ITC. The remaining surface water sample locations were focused on Tucker Bayou and on the confluence of Tucker Bayou and the HSC.
- TCEQ used these samples to evaluate any impacts to aquatic life and human health.
- As surface water sample results became available, the analytical data was reviewed and assessed by the TCEQ Water Quality Planning Division. The final sample analyses results, along with the TCEQ data review identifying any exceedances of the Texas Risk Reduction Program health protective concentration levels (PCLs) in surface water were posted on the TCEQ website https://www.tceq.texas.gov/response/itc-monitoring-water-quality/.
- No public drinking water system draws its source water from the HSC.

EPA

EPA conducted surface water sampling for SVOCs, VOCs, chemical oxygen demand, oil and grease, and polyfluoralkyl substances. EPA collected 458 surface water samples from multiple locations along the HSC as well as from the ditches in the immediate area of the tank farm. EPA sampling was conducted from March 20, 2019 to May 3, 2019.

NOAA

NOAA completed the discharge trajectories that petro-chemicals would follow into the HSC based upon the weather, wind, and tidal cycles. NOAA also provided consultation on NOAA Protected Species and Habitat.

USCG

The USCG Captain of the Port was the primary entity responsible for making determinations regarding closure of the HSC and restricting access to waterways impacted by the ITC tank farm petro-chemical release. Additionally, USCG personnel

were directly involved in the oversight and management of on-water recovery and remediation efforts of contracted Oil Spill Response Organizations (OSROs). The USCG established the OSRO classification in response to regulatory requirements of the Oil Pollution Act of 1990 (OPA90). OSRO is a voluntary program and was developed to assist oil handling facilities and vessels in preparing spill response plans.

- During the response and cleanup period, the USCG was responsible for making decisions about which waterways to close, and when those waterways would re-open. A complete closure of portions of the HSC was in place between March 22, 2019 and March 24, 2019. The HSC was re-opened with restrictions at 4:40 PM on March 24, 2019, with the release of the Marine Safety Information Broadcast 06-19. Waterway restrictions in the HSC and adjacent commercial waterways remained in place until April 22, 2019.
- The UC and its contracted OSROs recovered 223,882 bbls of oily-water petro-chemicals from waterways surrounding the ITC tank farm and HSC.

More information regarding air monitoring activities and data is available on the TCEQ and EPA webpages (see webpage links below).

TCEQ's webpage: https://www.tceq.texas.gov/response/itc-monitoring-water-quality/

EPA's webpage: https://epa.maps.arcgis.com/apps/Cascade/index.html?appid=f5eca85b79484cd69ea3a68cec886797

For a detailed review and discussion of surface water monitoring conducted during the ITC fire response, please see the [4]TCEQ 2019 Report – ITC Air and Water Monitoring Report.

3.4 Joint Emergency Response Cleanup

On March 23, 2019, a large-scale cleanup effort was initiated to recapture chemicals that spilled into various waterways when the containment wall on the north side of the tank farm was partly breached. The tank contents, as well as mixtures of fire foam, fire water and petrochemicals removed from the site (including all runoff from fire response activities), the cleanup of Tucker Bayou, and the HSC were collected in barges and in onsite tanks unimpacted by the fire.

Additionally, ITC has captured or removed solid waste materials consisting of contaminated soils, used personal protective equipment, absorbent pads, and surface water booms, which are being stored on-site in drums and roll-off boxes.

All collected waste materials are being stored on-site by ITC until they can be properly characterized and disposed.

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[4] Intercontinental Terminals Company (ITC) Deer Park Facility Fire Ambient Air and Water Monitoring, Deer Park, Harris County, TX", dated 2019 – Draft Deliberative.

3.4.1 ITC Tank Farm Facility

On March 21, 2019, ITC initiated the transfer of the contents from ITC's impacted tanks in the 2nd 80's Tank Farm to unimpacted storage tanks on-site. As of June 18, 2019, a total of 656,457 bbls of material were collected from the tank farm operations.

On April 26, 2019, ITC reported that all the tanks had been cleaned, to the best extent possible. However, since many of the tanks were severely damaged, ITC indicated that it was impossible to completely clean and remove all residual contents from the tanks without first demolishing them.

On April 29, 2019, ITC reported that all piping in the tank farm system has been cleaned and flushed.

On May 13, 2019, ITC began the deconstruction of the first five of the 15 impacted tanks began (tanks 80-7, 80-10, 80-13, 80-14 and 80-15). The deconstruction of the first five tanks was completed on June 8, 2019.

On July 29, 2019, ITC reported that the deconstruction and cleaning of all fifteen tanks in the 2nd 80's Tank Farm was complete.

On August 27, 2019, ITC reported that all tank floors had been removed from the tank farm facility.

The metal from the deconstructed tanks in the 2nd 80's Tank Farm was decontaminated prior to being transported off-site as recyclable metal.

TCEQ

TCEQ continued to be engaged with UC since March 18, 2019, to monitor and oversee ITC progress on the response, including environmental monitoring, cleanup and disposal activities. The TCEQ reviewed/approved the multiple plans under the agency's regulatory jurisdiction. These plans included the following: Emergency Response Plan/Facility Response Plan; Waste Management Plan; Wastewater Discharge Plan; Stormwater Management Plan; Water/Foam Sampling Plan; Land Decontamination Plan; Vessel Decontamination Plan; Demolition Plan; and, Hard Boom Sampling Plan. TCEQ also required ITC to maintain records to track and report the status/volume of all collected and disposed waste materials handled as part of the response and cleanup effort.

TPWD

Texas Parks and Wildlife Department (TPWD) protected wildlife areas of resources at risk and priority protection areas, including marsh habitats, bird island rookeries, state and federal property as well as other important habitat and cultural sites. TPWD also coordinated with the DSHS for seafood safety and potential fishing and oyster harvesting closures.

EPA

EPA responded as the federal lead entity responsible for protecting public health and the environment from releases of hazardous substances and oil discharges to navigable waters of the Unities States. Due to the incident being on land, the FOSC

jurisdiction to oversee the response was EPA. Had the incident occurred in the HSC, the USCG would have had the FOSC jurisdiction to conduct oversight. EPA activated NOAA to provide Scientific Support Corp support during the incident. EPA also activated the USCG Strike Team to provide EPA direct support and provide a federal presence overseeing ITC contractors during water recovery operations implemented by UC. EPA lead UC during the emergency response cleanup and worked closely with TCEQ, Harris County, ITC, and USCG Sector Houston-Galveston to mitigate and recover the spill in an expeditious and safe manner, protective of public health and the environment.

3.4.2 Houston Ship Channel

The USCG and ITC's contractors captured and removed the petro-chemicals and contaminated runoff released during the ITC incident through Tucker Bayou and into the HSC.

As of April 30, 2019, a total of 233,882 bbls of liquid waste material were collected by on-water marine operations.

Additionally, the total volume of contaminated solids (personal protective equipment, absorbent pads, and boom) reportedly collected was 3,400 cubic yards.

TCEQ and EPA

TCEQ and EPA continued to be engaged with UC to monitor and oversee ITC progress on the response, including environmental monitoring, cleanup and disposal activities.

- ITC, working with EPA, TCEQ, Harris County, the USCG, and other agencies, deployed over 2,000 contractors in over 250 vessels to remove the spilled petro-chemicals.
- ITC was required to clean the shoreline of Tucker Bayou and concurrently perform flushing and skimming operations along the bayou.

TPWD

TPWD conducted rapid shoreline cleanup assessment to determine potential locations of petro-chemicals. In addition, TPWD assisted:

- Wildlife Response Services, LLC in wildlife reconnaissance and recovery to rescue and document any wildlife impacts; and,
- Environmental Institute of Houston for Marina Mammal Surveys in coordinating with ITC to provide them with valuable information regarding dolphin and other marine mammal populations, their movements and potential impacts related to the spill.

On May 8, 2019, TPWD re-opened the Battleship Texas and the San Jacinto Battleground State Historic Site to the public. All public areas were screened and cleared, and ITC performed air sampling inside the Battleship Texas to assure the area would be safe for overnight stays.

USCG

The USCG was the primary entity responsible for opening and closing the HSC and providing support to EPA and UC.

- USCG Sector Houston-Galveston assigned 169 personnel, including 30 National Strike Force members, to provide operational command and control, on-scene assessment, waterway cleanup and management, and vessel decontamination.
- The efforts of these personnel led to the successful recovery of over 9.4 million gallons of oily-water petro-chemicals from the HSC and adjacent commercial waterways, as well as the decontamination of 224 vessels.
- 214 response vessels, 142 skimmers, 50 vacuum trucks, and the placement of nearly 168,000 feet of boom were utilized to mitigate the substantial threat to the environment and nationally significant economic waterway.
- During the cleanup period, the USCG was responsible for making decisions about which waterways to close and when those waterways could be reopened. The HSC was closed between March 22, 2019 and March 27, 2019. The HSC was opened to 24/7 inbound and outbound traffic on April 11, 2019.
- On May 8, 2019, the USCG demobilized personnel from the USCG National Strike Force and transferred operational command and control of waterway activities back to the USCG Houston-Galveston Sector.

NOAA

NOAA completed the discharge trajectories that petro-chemicals would follow into the HSC based upon the weather, wind, and tidal cycles. NOAA also provided consultation on NOAA Protected Species and Habitat.

Joint Emergency Response Cleanup Summary

A joint effort between ITC, USCG, TCEQ, and TPWD conducted Shoreline Cleanup and Assessment Techniques (SCAT) surveys in order to determine the progress of cleanup along segments of 87 miles of affected shoreline. The SCAT survey team provided recommendations to the UC regarding the signoff of affected shoreline or the need for additional active cleanup, passive cleanup, and/or monitoring. As of May 20, 2019, the Unified Command had signed out all shoreline segments except Tucker Bayou (0.87 miles), which will require additional remediation. Unified Command partners agreed on June 19, 2019 that Tucker Bayou would be transitioned and addressed under a long-term remediation phase and not as part of the emergency response phase.

3.5 Long-Term Remediation

On June 19, 2019, the EPA FOSC transitioned this incident from the emergency response phase to the long-term remediation phase.

As of October 18, 2019, ITC has disposed of approximately 223,886 bbls of liquid waste at Delta and Clean harbor disposal facilities by tanker truck transfer and 163,103 bbls of liquid waste at Texas Molecular by pipeline transfer. ITC has also processed approximately 51,721 bbls of fire related wastewater on-site through ITC's wastewater plant.

TCEQ

The TCEQ SOSC and Remediation Division is providing responsible party oversight for all remaining remediation activities of ITC-impacted areas to ensure proper characterization and disposal of all waste materials.

- ITC is required to perform an affected property assessment to fully assess all affected media (sediment, soil, surface water, and groundwater as applicable).
- ITC is also required to provide a schedule and supporting workplans of post ER-related interim actions; and the assessment and delineation of soil, groundwater, sediment and surface water impacted by the releases.
- Upon completion of the assessment and approval from TCEQ, ITC will be required to develop and implement any necessary remedial actions in accordance with state rules and standards.
- ITC will continue sampling and monitoring activities associated with these remediation efforts.
- ITC will complete weekly documentation noting the observations from the impacted area as well as special areas designated under the monitoring and maintenance plan.
- Any new areas of material or sheen observed will be reported to the National Response Center at (800) 424-8802 indicating that it is associated with the ITC Fire Incident (NRC# 1240304).

The Natural Resource Damage Assessment Trustees from the TCEQ, TPWD and TGLO will participate in the long-term documentation of damages to state resources, wildlife and wildlife habitat during the remediation process.

USCG

Although the USCG is not involved with long-term remediation, the Houston-Galveston Sector will provide assistance as needed to the TCEQ by monitoring the waterways in the impacted area during normal patrol activities and report any findings to ITC and the SOSC.

4.0 After Action Review Comments

On August 15, 2019, an internal AAR was conducted to discuss TCEQ's response to the ITC Fire. TCEQ staff that were in attendance represented the Executive Director's Office, (to include the External Relations Division and the Toxicology Division), the Office of Compliance and Enforcement (OCE) (to include Critical Infrastructure Division

(CID), Monitoring Division, and Regional offices), the Office of Water (OW), the Office of Waste (OOW), and the Office of Air (OA).

4.1 Areas of Strength

Staff Support

TCEQ staff maintained professionalism in a high stress environment including responsiveness to media questions. TCEQ's Houston Regional Office responded within 24 hours in fully mobilizing to the disaster and were a significant contribution to the successes of the response, despite the limited personnel available relative to the magnitude of the response. Additional TCEQ staff outside of the Houston Region were eager to volunteer to assist in the response and greatly contributed to the successful response. Staff from different offices and regions integrated well into various teams and cooperated effectively. Monitoring Division field staff were approachable by the public and maintained good contact with regional staff and local partners. The Toxicology Division contributed important scientific expertise on potential public health issues. Executive Management was proactive in taking part in the agency's daily briefings, and in turn, disseminating the information to state legislative officials, aiding in the distribution of accurate information to the public. Cross media communications within the agency allowed for faster and more efficient decision making.

Data Management

For this disaster response, public information releases were highly data driven. Technical staff were required to collect, analyze, perform quality control reviews and release the data at a rapid pace. Staff did a good job managing, reviewing, and summarizing high volumes of data for distribution to the media and public in very short, often 24-hour, timeframes. The sampling efforts and air monitoring activities (with the contractor support) allowed data publishing to occur as quickly as possible.

Communications & Media

Transparency in how TCEQ's response operations were conducted and data was being collected was of vital importance. Communications and outreach to the public was made available on the TCEQ website in less than 24 hours. Staff worked hard in ensuring this transparency was achieved by providing data-driven media content with visuals so the public could understand what was happening in their community. Staff worked with media outlets to prepare and distribute press releases early in the day so that current information could be distributed to the public in a timely manner. The TCEQ's use of social media to provide information on how the agency was responding and supporting local government was well received and helped get accurate information out to the public.

TCEQ effectively utilized its HS Notify email system to keep staff in the loop on the latest response information. In addition, TCEQ held daily internal conference calls to ensure that all staff involved in the response were provided current updates and were

given an opportunity to work through any issues where coordination with other parts of the agency or with agency leadership was necessary.

Partnerships with external agencies

The success of any disaster response is often contingent on having strong relationships with local, state and federal agencies. The Incident Command System (ICS) structure was well integrated with response staff from all levels and agencies. Proactive requests for assistance from federal government partners were successful. The hiring of an industrial fire contractor was particularly critical in the ultimate success of the response.

4.2 Areas for Improvement

Staff Support

Due to the need for a large-scale response, there was a steep learning curve for some of the new emergency response personnel who were tasked with duties not related to their normal positions. The disaster events were very frenzied, dynamic and multi-faceted which required knowledge of how to respond to a multiple event scenario. Additionally, there were other emergency response incidents occurring in the same region at the same time. Because of the scale of these events, it would be helpful to have more dedicated staff with ICS training.

Data Management

This disaster response was particularly data intensive with the air monitoring that was necessary along with the surface water quality analyses. Getting access to the data and ensuring the data was sent to the right people in a clear and useable format was challenging. Managing document version control across programs needed a centralized format to speed up data analysis and release. A secure FTP site, or comparable system, should be established to upload data into an appropriate format instead of relying on transmitting through email and potentially slowing the down the servers. Managing expectations about the time it takes to analyze high volumes of data, ensure it is accurate, and release it quickly was difficult. Utilizing outside sources of data also presented challenges due to inconsistent or missing reference points and sampling duration information.

Additional air monitoring resources would be helpful in the regions to include real-time, mobile air monitoring. The two air monitoring vans currently in TCEQ's inventory are equipped with instruments only capable of collecting data while stationary and require a time-consuming process to deploy and calibrate at each monitoring location.

An air monitoring station was taken offline for necessary calibration during the response that resulted in data gaps. Current protocols should be reassessed to ensure that appropriate communications take place prior to scheduling routine quality control operations that will result in instrument downtime.

Processing the volume of data was a challenge and resulted in 12-hour lag times while other agencies were releasing their data faster. Hand held monitors used by TCEQ staff

were limited in their ability to produce data digitally and required manual data handing. For example, TCEQ staff were manually recording readings that later had to be transcribed into a digital format for upload and review prior to being released to the public. This process was time and labor intensive, and inefficient to convert data into correct formats. The standard operating procedure/protocol for data management and analysis could be reviewed for improvements.

For this incident, staff recommended using Response Manager live mapping for air monitoring results, notes for odors and health effects, and orphan containers modes for air monitoring capabilities. Utilizing ICS mapping for stations where monitoring is taking place would ensure that there is one format for data being used and that the agency is better prepared for the volume of data readings.

Integrating internal and external data sources was a challenge, particularly in naming conventions for sampling sites and identifying the data source. Some staff requested more clarity on air monitoring activities as part of the responder health and safety planning.

Communications & Media

The public was active in seeking out information on the fire through social media very soon after the fire broke out. Although all emergency response activities are managed at the local level, the agency could improve its support to local governments by having a more active role on social media. Many suggestions and ideas were offered on how to improve the content that was shared on social media, such as more video clips of the response efforts and how to counter incorrect information being shared on social media, particularly when it goes viral. The TCEQ could also benefit from having a Public Information Officer (PIO) manage the media requests for on-camera interviews. Providing advanced media relations training for regional staff like the SOSCs would be of great benefit.

While there was effort put into releasing data summaries that were accessible to the public, further efforts could be made to make the information more understandable to a non-scientific audience. The agency could also improve public access to information to be more user friendly. The agency should prioritize issuing press releases early in the morning and afternoon to match the media's news cycles. Consideration should be given for implementing a feature such as Storybook to better document the TCEQ's activities in a more user-friendly format. Presenting more data in graphs would be beneficial, however, staff acknowledged that some data is not intended to be used for real-time decision-making but rather for conducting long-term trend analyses. Some social media formats, such as Twitter, are not ideal for disseminating highly technical information to the public. Overall, there was a struggle with how to balance getting appropriate information out quickly, but ensuring it was accurate before it was released. Having pre-established publishing protocols would be helpful for the future.

Partnerships with external agencies

Partnerships with local, state and federal agencies and community programs are critical to the success of a disaster response. TCEQ should continue to strengthen its relationships with the local communities and officials so it can better integrate its efforts into their disaster response protocols. Some coordination challenges existed with UC at the beginning of the response. These issues were quickly resolved. Industry partners could benefit from additional training on the ICS structure and having joint exercises with local and state agencies to be better prepared to participate in ICS in future disaster response efforts. Consideration should be given to have contractors participate in joint exercises, as well. Having additional staff to report to the Emergency Operations Center would be helpful, especially for large scale, multi-disaster situations.

5.0 Improvement Actions

Below are some of the larger AAR improvement items that have been implemented or are currently planned for implementation:

5.1 Relationships with Local Government Emergency Managers

The TCEQ coordinates with local government emergency managers. For "routine" emergency events and in areas where local entities have the capability to respond to hazardous materials and other types of incidents, TCEQ participates in the ICS structure. The roles of the TCEQ representative include: providing advice and compliance assistance; setting objectives, setting directives, and evaluating response efforts.

> Action – To maintain and enhance TCEQ's coordination with local government emergency managers, TCEQ regional offices will continue to train and exercise as frequently as possible with their local government response partners and participate in regularly scheduled planning and coordination meetings held by local Emergency Management Coordinators (EMCs) and Local Emergency Planning Committees (LEPCs).

5.2 Public Information Officer

The TCEQ could benefit from having a Public Information Officer manage the media requests for on-camera interviews during high profile emergency management events such as the ITC Fire.

> Action – On November 1, 2019, External Relations Division posted a position for a Public Information Officer. A PIO will be on staff before the end of the year.

5.3 Social Media Presence

Disinformation was widespread on social media during the response. TCEQ should provide response updates on social media to help get accurate information out to the public.

> Action - TCEQ has increased its social media presence online and implemented new streamlined procedures for providing timely updates for response activities.
>
> Action – TCEQ will timestamp all social media posts related to emergency response to ensure the latest information is being shared through social media. This will help eliminate old or misinformation from being spread.
>
> Action – TCEQ will engage with partnering agencies to multiply social media presence during a response.

5.4 Local Industry Incident Command System Structure

While most of the industry representatives have all completed the ICS training, the vast majority have not been involved with a large complex incident that requires forming an ICS group or Unified Command.

> Action - TCEQ coordinated with the Texas Division of Emergency Management (TDEM) to bring advanced-level ICS incident management training to the Houston area. TDEM sponsored Intermediate Incident Command System for Expanding Incidents (ICS -300) and Advanced Incident Command System, Command and General Staff (ICS-400) training and exercise events in Houston during the weeks of August 1st and August 6th, in 2019, respectively.

5.5 Additional Air Monitoring Resources

TCEQ could benefit from real-time, mobile air monitoring resources. Currently, the agency has two air monitoring vans equipped with instruments only capable of collecting data while stationary and that require a time-consuming process to deploy and calibrate at each monitoring location.

> Action - The 86th Texas Legislature appropriated specific funding and authority for the agency to equip up to three vehicles with real-time, mobile air monitoring technology.
>
> While still in the planning and development stage, the TCEQ's Fiscal Year (FY) 2020 budget includes $947,500 in new funding for mobile monitoring equipment. The funds will be used to upgrade two existing vans with mass spectrometers that can sample in real-time for a broad target pollutant list, expandable to more than 1,000 compounds, including benzene. In addition, funding will provide for the purchase of a third vehicle with complementary technology that focuses on a narrower pollutant list that will also include benzene.

Between the three vans, sampling times will vary based on the number of compounds being analyzed but can be as quick as one to four seconds per compound, making them suitable for in-transit monitoring. The new vans will provide the ability for rapid survey assessments, allowing the agency to quickly sample pollutant hot spots, map air concentrations in an area, and identify locations for sampling over longer durations.

Action – TCEQ is using savings from the agency's FY 2019 budget to install three new autoGC air monitoring stations in areas along the HSC.

Additionally, using FY 2019 budget savings, TCEQ has purchased 15 new handheld air monitors capable of assessing cumulative VOCs and providing benzene-specific readings down to 10 parts per billion. The handheld air monitors, called UltraRAEs, have been distributed to TCEQ's Amarillo, Dallas/Fort Worth, Tyler, El Paso, Midland, Beaumont, Houston, San Antonio, Corpus Christi, Harlingen, and Laredo regional offices, as well as to TCEQ's Monitoring Division in Austin.

5.6 Air Monitoring Station Temporary Outage Planning

During the ITC Fire event, the autoGC at the Deer Park #2 air monitoring station was unable to collect ambient data for a 6-hour period on March 18, 2019, due to a contractor performing a required calibration following a critical instrument repair.

The need for the critical instrument repair was necessary after the monitoring station experienced operational issues with the autoGC sampler, indicated by quality control (QC) failures on March 11, 2019. Therefore, data were invalidated back to the previous passing daily QC check which was March 10, 2019. Only the autoGC was affected; other samplers at this monitoring station continued to operate normally.

The TCEQ contractor performed the necessary repair on March 13-16, 2019. Following this repair, the contractor must run a 1-point QC check, followed by a multi-point check typically completed within a few days. The instrument passed the 1-point QC check at 8:00 AM on Saturday, March 16, 2019. The instrument resumed ambient data collection at 11:00 AM on Saturday, March 16, 2019 the day before the fire.

The instrument continued to collect ambient data throughout the day on Sunday, March 17, 2019 and into Monday, March 18, 2019 until 5:00 AM. The contractor began the multipoint check at 6:00 AM on Monday, March 18, 2019; this QC check is required in the days following a repair.

The multipoint check was completed, and valid ambient data collection from the autoGC was resumed as of 1:00 PM, Monday, March 18, 2019.

The ambient data collected from Saturday, March 16, 2019 through early Monday, March 18, 2019 were reviewed and found to be within required quality standards.

Important Note: Although the autoGC at Deer Park #2 was taken down for a short duration due to a necessary calibration, the gathering of $PM_{2.5}$ data continued without

interruption (including during the tank fires). $PM_{2.5}$ was a pollutant of concern while the fire was burning and generating the thick cloud of black smoke.

Action - While quality control activities are required to protect the integrity of the data collected, the TCEQ has revised current protocols to ensure that appropriate communications take place prior to scheduling QC operations that will result in instrument downtime, whether planned or unforeseen. These communications will allow the TCEQ to take appropriate action, including scheduling these activities during times of minimal risk for data loss, making decisions about deploying additional monitoring assets, and/or notifying the public during the anticipated outage.

5.7 Area Coordination for Air Monitoring Plan

During large complex emergency response events involving hazardous materials, like the ITC Tank Fire, one of the most difficult tasks the local emergency management officials face is obtaining quick, reliable information that is needed to make timely decisions on public health and safety. One of the most important parts of making public health decisions is having reliable air monitoring data, toxicity information on the chemicals of concern (with recommended actions levels), and weather data to show the potential movement of a chemical plume.

Action - Members of the Central Texas Coastal Area Committee (CTCAC), led by the USCG, established a new workgroup to review all applicable requirements of local, state and federal agencies regarding air monitoring and key public health decisions to include, but not limited to, shelter-in-place orders, establishing evacuation, and safety zones. The CTCAC is comprised of various federal, state, and local government agency representatives as members and representatives from the marine transportation system as advisors. The CTCAC was created pursuant to OPA90 which established Area Committees to serve as spill preparedness planning bodies responsible for developing strategies for coordinated responses to the discharge, or threat of discharge, of oil or hazardous substances, in pre-designated Inland and Coastal zones. This Area Committee was established to cover the navigable waters of the Captain of the Port Houston-Galveston area of responsibility. The new workgroup created by CTCAC is comprised of federal, state, and county health officials, TCEQ, USCG, EPA, NOAA, local emergency management representatives and air monitoring service providers. The goal of this workgroup is to develop an Air Monitoring Plan that can be included in the existing Area Contingency Plan.

- The first CTCAC workgroup meeting occurred on October 24, 2019.

As an agency, the TCEQ is a member of many area committees with our state and federal partners. The USCG explained that this area committee was tasked to have an air monitoring section that would be reviewed by USCG for the potential of all area committees having the same air monitoring plans.

5.8 Data Analysis and Communication

Action – TCEQ purchased 15 UltraRAE handheld air monitors including hardware and software that will provide investigators the ability to report data directly from the field through real-time uploading. This new technology represents a substantial upgrade in equipment, especially for use in future emergency response activities.

Action – TCEQ is planning to purchase 40 software licenses for ESRI's Collector for ArcGIS, a mobile data collection app allowing the user to capture and edit data in the field using mobile devices such as iPads and iPhones. In addition, field staff will be able to use web maps for plotting sample collection locations and upload data while in the field. Collector for ArcGIS also works when disconnected from the Internet and can integrate data into most GIS platforms.

6.0 Improvement Recommendations

Below are AAR improvement recommendations that are intended to strengthen the agency's disaster preparedness and response capabilities:

6.1 State On-Scene Coordinators Academy

During large emergency response events and disaster situations the TCEQ staff responding may be designated as the SOSC. During these responses, SOSCs may face complex, stressful, and high-profile media situations. In addition, the SOSCs rotate in and out depending on the length of the incident. To ensure consistency between SOSCs and staff readiness to handle the stressful task of the SOSC role, TCEQ senior Emergency Response (ER) staff that will hold the position of SOSC could benefit from having advanced training and experience qualifications.

Recommendation – The TCEQ should create an SOSC Academy with advanced training to help ensure that all SOSCs have the knowledge needed to perform the required job duties, no matter the type or magnitude of response. Providing a minimum number of hours of on the job training would ensure that qualified SOSCs possess the knowledge base, skills, and experience needed to be successful in these types of situations. The SOSC qualifications will merge with or supersede the Senior Disaster Response Strike Team (DRST) Performance Development Plan (PDP), with some additions. A TCEQ SOSC Academy could be developed by the Emergency Management Support Team (EMST) and the OCE Area Directors to be the cornerstone training for the SOSC PDP. The senior ER staff who are pursuing a SOSC qualification would attend the SOSC Academy. This training event would be offered every other year and would include instructors from various TCEQ programs, other governmental agencies and private industry. Training topics would include media relations, intergovernmental relations, advance hazmat and oil spill response techniques, problem solving, advance ICS, case studies and would conclude with an exercise.

This intense training session would help prepare the SOSCs for complex, multijurisdictional responses.

6.2 Incident Command System Training for Management Staff

While all TCEQ ER staff are required through their PDP to have ICS training, management level staff could benefit from similar entry level training.

Recommendation - All Area Directors, Directors, Regional Management, and senior level decision makers should work to complete the following online courses:

- ICS-42 - Social Media in Emergency Management
- ICS-100.c - Basic Incident Command
- ICS-230.d - Fundamentals in Emergency Management
- ICS-775 - EOC Management and Operations
- ICS-908 - Emergency Management for Senior Officials

These courses are no-cost online training options that can be completed at any time at https://training.fema.gov/is/.

Recommendation - All Area Directors, Regional Directors, and Regional Management should work to complete the following classroom courses:

- ICS-300 - Intermediate Incident Command System for Expanding Incidents
- ICS-400 - Advanced Incident Command System, Command and General Staff

Information and schedules for these classes can be found at https://www.preparingtexas.org/.

6.3 Unmanned Aircraft Systems Technology for Emergency Management

The use of Unmanned Aircraft Systems (UASs) by state and local government agencies continues to grow at a rapid pace. The use of a UAS can provide agency staff with information during responses and investigations that could not be obtained without compromising the safety of the staff.

The use of remote imaging can give staff the capability of assessing a situation and planning a response while remaining at a safe distance from the event. Utilizing a UAS with remote imaging can also allow staff to survey large areas in a short amount of time. Remote imaging can also be conducted by thermal cameras and optical gas imaging cameras, which have numerous applications that could benefit the agency.

Air monitors have now been developed specifically for UAS use. These monitors are multi-gas monitors designed to affix to certain UASs. Utilizing this technology would

allow staff to obtain air monitoring data from a safe distance; therefore, keeping the staff member out of potential harm.

> Recommendation – The agency should investigate the feasibility of developing a UAS program, that would include purchasing UAS technology and obtaining approved UAS pilot training for staff.

Legend of Acronyms

AAR	After Action Review
AMCV	Air Monitoring Comparisons Values
ASPECT	Airborne Spectral Photometric Environmental Collection Technology
AutoGC	Auto Gas Chromatography
BBLS	Barrels
CAMS	Continuous Ambient Monitoring Station
CID	Critical Infrastructure Division
CL2	Chlorine
CIMA	Channel Industries Mutual Aid
CO	Carbon Monoxide
CTCAC	Central Texas Coastal Area Committee
CTEH	Center for Toxicology & Environmental Health
DRST	Disaster Response Strike Team
DSHS	Department of State Health Services
EMC	Emergency Management Coordinator (County)
EMST	Emergency Management Support Team
EOC	Emergency Operations Center
EPA	Environmental Protection Agency
ERC	Emergency Response Coordinator (TCEQ)
FOSC	Federal On-Scene Coordinator
GIS	Graphic Information Systems
HCPCS	Harris County Pollution Control Services
HRM	Houston Regional Monitoring Corporation
H2S	Hydrogen Sulfide
HSC	Houston Ship Channel
ICS	Incident Command System
ITC	Intercontinental Terminal Company
LEL	Lower Explosive Limit
LEPC	Local Emergency Planning Committee
NH3	Ammonia
NOAA	National Oceanic and Atmospheric Administration
NOx	Nitrogen Oxide
O2	Oxygen
OA	Office of Air
OCE	Office of Compliance and Enforcement
OOW	Office of Waste
OPA90	Oil Pollution Act of 1990
OSRO	Oil Spill Response Organizations
OW	Office of Water
PCL	Protective Concentration Level
PDP	Performance Development Plan
PIO	Public Information Officer
PM 2.5	Particulate Mater 2.5

PPB	Parts Per Billion
PPM	Parts Per Million
SCAT	Shoreline Cleanup and Assessment Techniques
SO2	Sulfur Dioxide
SOSC	State On-Scene Coordinator
SVOC	Semi-Volatile Organic Compound
TAGA	Trace Atmospheric Gas Analyzer
TCEQ	Texas Commission on Environmental Quality
TDEM	Texas Division of Emergency Management
TGLO	Texas General Land Office
TPWD	Texas Parks and Wildlife Division
TVA	Toxic Vapor Analyzer
QC	Quality Control
UAS	Unmanned Aircraft System
UC	Unified Command
USCG	United States Coast Guard
VOC	Volatile Organic Compound