Dioxins in Northern Gulf of Mexico Coastal Waters

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INTRODUCTION

This article is tiered from and referenced to the following previous documents: Ocean Dumping of Chlorinated Hydrocarbons under the Marine Protection, Research, & Sanctuaries Act (MPRSA) (McCreery, 2019a), EPA Region 6 MPRSA Ocean Dumping Permits (McCreery, 2019b), Ocean Dumping of Toxics, a Newly-Recognized Potential Source of Human Carcinogens (McCreery, 2022), and Polychlorinated Biphenyls (PCBs) in New England Coastal Waters (McCreery, 2023a).

SUMMARY OF PREVIOUS FINDINGS

In McCreery (2023a), I discussed fish consumption advisories in New England coastal waters relative to ongoing Superfund cleanup at the General Electric (GE) Co. site located on the Housatonic River in western Massachusetts. Waste PCB compounds were released to the river from the GE plant in Pittsfield, Massachusetts since before the creation of the Environmental Protection Agency (EPA) in December 1970. I make the distinction between virgin PCB product and waste PCBs, which were heat-damaged by transformer fires, converting a small percentage of the virgin PCBs to dioxin.

When the GE site was evaluated by ATSDR in 2008, PCBs and dioxin in river sediments were considered Contaminants of Concern (COCs). Subsequent evaluations by EPA omitted consideration of dioxin as a COC in site assessments and human risk characterizations. When I asked in public comments why dioxin was omitted, EPA Region 1 responded that dioxin is not a listed hazardous waste under the Resource Conservation and Recovery Act (RCRA), therefore, dioxin is considered non-hazardous by EPA (eCFR, 2023).

I identified six pre-1970 offshore industrial waste sites in EPA Region 1 waters, as well as several PCB-related Superfund sites and tainted rivers that may serve as sources for contaminants in coastal waters. Several lines of evidence connected the GE/Housatonic site to New Bedford Harbor and offshore Massachusetts Industrial Waste Site #1, located just outside Stellwagen Bank National Marine Sanctuary.

Fish consumption advisories in New England coastal waters indicate the presence of PCBs and dioxin in area bluefish and striped bass, matching the COCs at the GE/Housatonic site. The Maine CDC advisory indicates safe consumption of these fish should not exceed four palm-sized meals per year.

PRE-1970 INDUSTRIAL WASTE SITES

Sixteen offshore industrial waste sites were identified in the Gulf of Mexico in EPA (1971). The largest concentration of offshore industrial waste sites is located off Galveston Bay near Houston. In 1953, Shell Chemical Company, with collaboration from Champion Paper, engaged in disposal of chlorinated hydrocarbons from the Shell Deer Park facility, located in the Houston Ship Channel at the top of Galveston Bay. Under jurisdiction of the Army Corps of Engineers (EPA, 1976a), the wastes were pumped from a specially designed barge in an area located about 110 miles south of Galveston (Hood et. al., 1958). Beginning in 1958, Shell Chemical Company ran 30 to 35 barges per year, each containing 7,000 barrels of waste of which 40% was chlorinated hydrocarbons (Hann et. al., 1976). Shell Chemical Company manufactured commercial chlorinated pesticides like aldrin, dieldrin, endrin, DDT, and malathion. Shell Chemical Company also developed military-grade tactical herbicides (i.e. Agent Orange) at Deer Park, TX. The Mississippi Canyon Drum Disposal Site is shown for reference below.

GALVESTON BAY AREA SITES

The most notorious of Superfund sites along the Gulf coast is the San Jacinto River Waste Pits, located in Channelview, TX. The northern pit contains dioxin-contaminated waste that EPA alleges are pulp and paper mill wastes. The Potentially Responsible Parties (PRPs) for the site are now International Paper

and McGinnes Industrial Maintenance Corporation. EPA mentions nothing about the former tactical herbicide plant at Shell/Deer Park. Petrochemical companies are likely to have contributed to the waste pits but are not mentioned in the public record. However, the Shell Chemical Company facility in Deer Park, TX is located only 6.5 miles from the waste pits, and is known to have generated large volumes of dioxin-contaminated waste for which disposal was a problem (EPA, 1976a).

The Northern Pit is now partially submerged in the middle of the San Jacinto River, Channelview, TX (Google Earth).

In addition to the San Jacinto River Waste Pits, up to 32 waste sludge impoundments with earthen levees are located in Hitchcock County, TX along the west side of Galveston Bay, adjacent to the Intracoastal Waterway (FOX26, 2018). Analytical results obtained from state records by FOX 26 revealed dioxin toxicity in the Hitchcock County sludge impoundments at levels greater than those at the San Jacinto River Waste Pits. The Hitchcock County sludge impoundments are not designated Superfund sites.

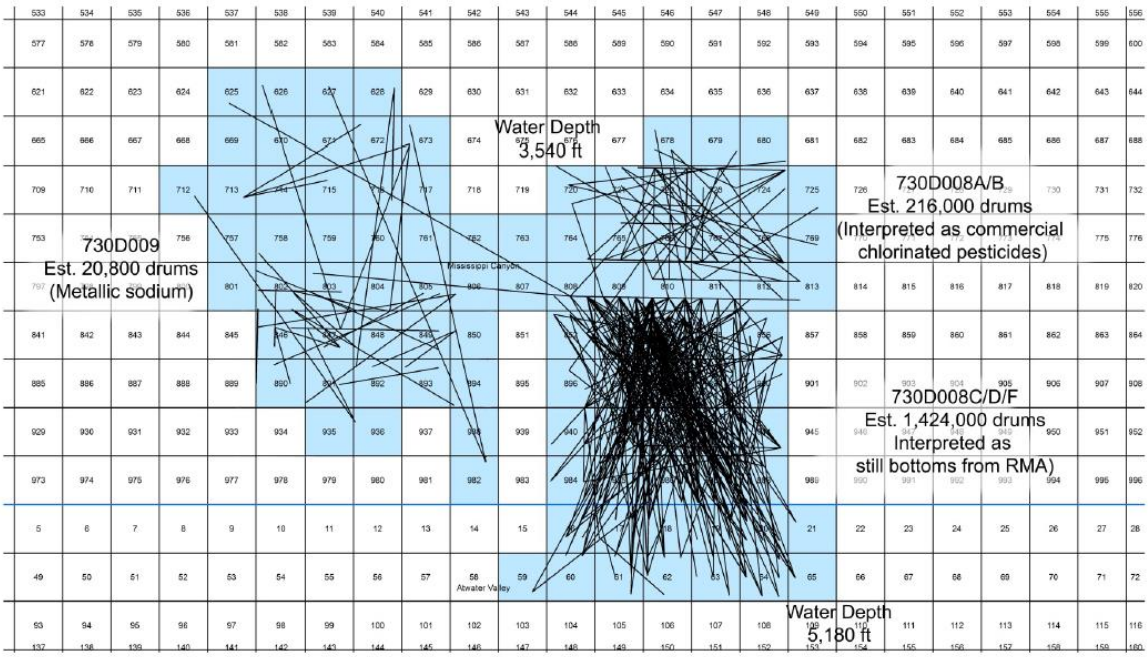
Hitchcock County sludge impoundments adjacent to the Intracoastal Waterway (Google Earth).

With the knowledge that Shell Chemical Company became the largest Department of Defense (DoD) manufacturer of Agent Orange for the Vietnam War, more so than any other commercial manufacturer, it is my interpretation that the San Jacinto River Waste Pits and the Hitchcock County sludge impoundments served as off-site storage for waste generated by Shell Chemical Company in Deer Park, TX. The 12 offshore waste sites south of Galveston are also attributed to Shell Chemical Company, as the largest quantity generator of chemical waste in the Galveston Bay area.

Reiterating from McCreery (2019a), Shell's manufacturing process involved reacting two primary components (2,4,5-T and 2,4-D), and distilling the mixture while heating. Finished Agent Orange product was decanted off the top of the reaction vessel, and precipitate settled to the bottom of the vessel where it burned, creating dioxin-enriched "still bottoms." The dioxin concentrations in the still bottoms far exceeded the dioxin concentration in the finished Agent Orange. It was the dioxin-enriched still bottoms that became Shell's primary waste stream at Deer Park, TX.

In 1942, the Army acquired 17,000 acres of land in Commerce City, CO for development of chemical weapons at Rocky Mountain Arsenal (RMA). By 1952, Shell Chemical Company was established at RMA manufacturing military-grade tactical herbicides including Agent Orange. McCreery (2019a) describes waste handling procedures and attempts to dispose Shell's waste stream in deep injection wells, which was ultimately unsuccessful due to earthquakes. The waste was then stored at RMA pending ocean disposal.

During the time that the MPRSA ocean dumping program was implemented in 1973-1977, drummed waste was shipped by rail to the Naval Construction Battalion Center (NCBC) deepwater port in Gulfport, MS, and was then barged to the Mississippi Canyon Drum Disposal Site. The figure below is my interpretation of dumping tracks within the dumpsite, based on MPRSA permits. The number of barge trips and drums per trip yielded an estimate of 1.4 million drums of dioxin-enriched still bottoms that were dumped at Mississippi Canyon. The blue area of the site shown below encompasses about 250 square miles of seafloor.



Interpreted barge tracks and drum contents for Permits #730D008 and #730D009 in the Mississippi Canyon Drum Disposal Site. Figure by C. McCreery.

LEGACY ISSUES VS. CURRENT ISSUES

So far I have discussed legacy issues in the northern Gulf of Mexico that could affect water quality. If legacy issues were the only threats to water quality, I would likely not have gone down this road. It is the current issues that pose the greatest risks.

SUPERFUND

As part of my research, I reviewed the GHD (2022) report, Pre-Final 90% Remedial Design for the Northern Impoundment of the San Jacinto River Waste Pits. Section 3.3.4 of the report gives waste characterization conclusions for the planned remediation. Similar to the GE/Housatonic site discussed in McCreery (2023a), EPA took the position that the dioxin-contaminated waste at the San Jacinto River Waste Pits is not hazardous, because dioxin is not a listed hazardous waste under RCRA regulations. EPA

further claims that the dioxin-contaminated material in the San Jacinto River Waste Pits does not exhibit toxicity. EPA's conclusion appears dependent on the interpretation the material originated from pulp and paper mill waste. EPA takes the position that the material does not meet conditions of F or K hazardous waste codes, which apply to dioxin-bearing wastes, chlorinated aliphatic hydrocarbons, and organic chemicals manufacturing (EPA, 2023).

EPA's policy of deregulating dioxin (not listing it in RCRA, declaring it non-hazardous, failing to include dioxin in human health risk characterizations, hiding dioxin from PCB cleanups, and withholding dioxin analyses from the public), is consistent across the US. It is my conclusion that this approach only benefits the petrochemical industry, and is very detrimental to the public. At the GE/Housatonic site, lawsuits are beginning to fly. GE and Monsanto claim "the weight of the scientific evidence does not support an association between exposure to PCBs and the cancers alleged in these cases" (Berkshire Edge, 2023). They are ignoring the potential health effects of dioxin present in heat-damaged PCBs. This raises environmental justice issues for the surrounding residents.

The effects of Agent Orange in Vietnam (containing only dilute concentrations of dioxin) are well-known: cancer (lymphoma, leukemia, and prostate cancer), birth defects (cleft palate and spine bifida), neurological disorders (Parkinson's disease and peripheral neuropathy), immune system disorders, reproductive system disorders (infertility and spontaneous abortion), and perhaps most concerning, these effects are passed to future generations (Hill and Ponton, 2023).

The non-hazardous designation EPA gives to dioxin also seems to justify ocean dumping of this waste. It is my conclusion that the dioxin-contaminated waste at the San Jacinto Waste Pits is really destined for the Mississippi Canyon Drum Disposal Site, not at an "out of state licensed disposal facility" as EPA alleges. Based on analysis of the San Jacinto Waste Pits and the GE/Housatonic site where COCs match the fish consumption advisories, I conclude that most chlorinated hydrocarbon waste (PCB, DDT, and dioxin) from Superfund sites has been dumped at the offshore industrial waste sites since 1973.

In 2017, EPA Administrator Scott Pruitt said he intended to put Superfund cleanups "at the center of the agency's core mission" (NBC News, 2020). It is my conclusion that Superfund cleanups have always been at the center of EPA's core mission, including offshore disposal of PCB, DDT and dioxin wastes.

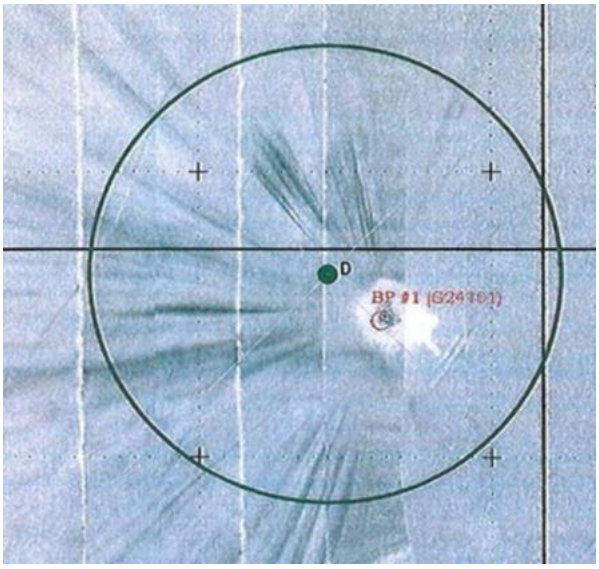
MISSISSIPPI CANYON DRUM DISPOSAL SITE - SPACE-USE CONFLICT

When Shell Chemical Company waste was shipped from NCBC, Shell made the very poor decision to dump the drums on top of the most valuable oil reservoir in the northern Gulf of Mexico. I conclude this was done both to hide the drums and to stake a mineral claim on the reservoir. However, now the drums litter the area of Shell Oil's petroleum development installation, shown below.

Shell Oil facilities within the Mississippi Canyon Drum Disposal Site.

THE WHISTLEBLOWER COMPLAINTS

This space-use conflict was the subject of my complaints to EPA and the DOI Bureau of Safety and Environmental Enforcement (BSEE) in 2017. My primary concern was that open-hole (riserless) drilling involves jetting out the shallow interval of a new well, similar to pushing a garden hose into the ground, which ejects surface muds in a "splay." A splay area on the seafloor exceeds a 2,000-foot radius. However, Shell allows itself only a 30-foot clearance from drums on the seafloor, and BSEE is allowing this practice by default.



A “splay” pattern on the seafloor from riserless drilling.

At this point I introduce research being conducted by David Valentine of the University of California/Santa Barbara, who has been researching the DDT barrel field between Catalina Island and Long Beach, CA. That barrel field, reportedly the size of Manhattan, has been partially mapped, and sediment samples have been recovered for analysis. Valentine found a layer of pure, undegraded DDT at a sediment depth of 6 centimeters, indicating uncontained dumping of DDT has occurred in addition to drums of DDT (LA Times, 2023).

I have found several lines of evidence that the DDT barrel field is also an MPRSA dumping site, likely with DDT Superfund waste poured on top. I consider the DDT barrel field to be an analog for the Mississippi Canyon Drum Disposal Site, and conclude it is very plausible that uncontained dioxin-enriched Superfund waste has been poured on top of the drum site.

The revelation that uncontained dumping may have occurred renders Shell’s 30-foot clearance from drums meaningless. They are likely jetting through pure dioxin-enriched still bottoms generated by Shell Chemical Company’s Agent Orange manufacturing operations.

To wrap this section, none of my Whistleblower complaints from 2017 were ever recognized by EPA or DOI, and Shell continues the practice of riserless drilling within the drum site, ejecting dioxin up into the water column where it becomes bioavailable. There is now no question that Shell Oil, EPA and BSEE are aware of the risks of contamination to Gulf fish stocks. This article continues my Whistleblower efforts.

FISH CONSUMPTION ADVISORIES

I reviewed available fish consumption advisories for chlorinated hydrocarbon contaminants in Gulf coastal marine species. Most of the advisories are for localized areas of inland waters, and not for offshore larger game fish. In Florida, I found fish consumption advisories for PCBs only in Escambia County 22 miles offshore from Pensacola at Oriskany Reef, where the USS Oriskany aircraft carrier was scuttled as an artificial reef (FLDOH, 2023).

Alabama updated its fish consumption advisories in July 2023. Most advisories involving chlorinated hydrocarbons in Alabama are for inland, fresh water source locations (ALDPH, 2023).

In Mississippi, advisories for the chlorinated compounds toxaphene and DDT exist at inland freshwater source locations (MDWFP, 2021). No advisories were found for the NCBC deepwater port at Gulfport, where Agent Orange product was embarked to Vietnam, and dioxin-enriched still bottoms were embarked to the Mississippi Canyon Drum Disposal Site.

In Louisiana, a specific advisory was posted in 2016 for Bayou d'Inde and portions of the Calcasieu Ship Channel for PCBs, dioxins and furans. The advisory limits crab fat/fish/shellfish consumption, swimming, water sports, and contact with bottom sediments (LDH, 2016).

Based on the level of contamination, the type of contaminants, and because the Calcasieu Ship Channel provides access to the Gulf of Mexico via the Lake Charles deepwater port, I consider it likely that Upper Calcasieu Estuary was an embarkation location for chlorinated hydrocarbon waste destined for offshore dumping.

In Texas, the Houston Ship Channel, all of Galveston Bay, the San Jacinto River downstream of the Lake Houston dam, and Clear Creek on the west side of Galveston Bay, have fish consumption advisories for PCBs and dioxins (TDSHS, 2023).

As previously stated, the Houston Ship Channel was used by Shell Chemical Company as an embarkation location for ocean dumping of dioxin-enriched still bottoms. Sabine Lake, with access to the Gulf of Mexico via Sabine Pass deepwater port, has fish consumption advisories for PCBs. Sabine Lake is another potential embarkation location for waste destined for offshore dumping.

From this evaluation, it is clear that fish consumption advisories for chlorinated hydrocarbon compounds are mostly in Louisiana and Texas inland waters. None of the advisories address migratory species or larger fish in open waters. Based on the number of source areas, the history of ocean dumping along the Gulf coast, the time duration that the space-use conflict has existed at the Mississippi Canyon Drum Disposal Site (since 1989), and analogous impacts in New England, it can be surmised that chlorinated hydrocarbons are now throughout the offshore food chain.

THE FOOD CHAIN

I evaluated the marine food chain in the Gulf of Mexico to see where the potential risks are to the US food supply. The potential exposure to local residents depends on how much seafood is consumed, its species, oil content, and how it is prepared. Indigenous populations and other subsistence fishermen appear to be at elevated potential risk because they eat seafood regularly, which raises environmental justice issues. Local tourists appear to be at a lower potential risk because of the limited time they consume affected seafood.

I see the highest potential risk from commercial operations that produce high volumes of oily fish for national distribution. The largest commercial fishery in Louisiana is menhaden, a small oily fish. About 610 million pounds of menhaden were caught off of Louisiana in 2020 (NOLA.com, 2022).

Menhaden primarily eat zooplankton (e.g. copepods). Copepods are known to migrate vertically on a daily cycle (up at night and down during the day) and are able to reach the drum site at a water depth of about one mile. Copepods are known to eat marine snow, organic matter that slowly sinks through the water column. Turbidity (suspended sediment and contaminants) overlying riserless drilling looks just like food for the copepods, and oil sacks in their bodies store the lipophilic contaminants.

Menhaden are fished primarily to be reduced into fish meal and fish oil. The fish are caught in seine nets, capturing up to 900,000 fish in one haul. The fishery crushes the fish whole to extract fish oil for human consumption. One fishery in Louisiana treats the fish oil using activated carbon to remove PCBs and dioxin. However, there is no mention of how the residual fish meal is treated. There could be up to 900,000 small livers in that mash, where contaminants are concentrated.

Finished fish meal is sold in bulk to fish farms, poultry farms and hog farms, and is used as fertilizer. Bioaccumulation of PCBs and dioxin could be expected in farmed fish, poultry and hogs if the fish meal is contaminated. In 2008, PCB and dioxin contamination of animal feed in Ireland resulted in a recall of all pork and some milk (NY Times, 2008). In that case it was due to accidental contamination of the feed, but at least someone was monitoring, and the problem was rectified.

I have been unable to find any authority that oversees fish meal production in the U.S., and monitors levels of PCBs and dioxin in the product. This task may slip through the cracks because the meal is not intended for human consumption, it may be technically infeasible or uneconomical to remove contaminants from the fish meal, and EPA is likely reluctant to inform the fisheries of Shell Oil's drilling activities since it may imperil either business. I consider the potential contamination of animal feed to be of greatest concern, and needs to be evaluated immediately.

CONCLUSIONS

The northern Gulf of Mexico has a long history of ocean dumping of chlorinated hydrocarbon waste. Specifically, Shell Chemical Company's development and production of tactical herbicides (Agent Orange) at Deer Park, TX and RMA in Commerce City, CO generated huge amounts of dioxin-enriched still bottoms that were dumped in the northern Gulf of Mexico.

Legacy dumping from the MPRSA program and Superfund has resulted in multiple source locations where oil-soluble chlorinated hydrocarbons may enter the food chain. In addition, drilling within the Mississippi Canyon Drum Disposal Site is suspending contaminants, making them bioavailable to the food chain.

Based on my research, I found the greatest potential risk to the food supply is posed by fish meal production, a situation that could pose an existential risk to the U.S. population. Shell Oil, BSEE and EPA have been non-responsive to warnings of potential impacts to the food supply resulting from drilling activities.

EPA has deregulated dioxin (not listing it in RCRA, declaring it non-hazardous, failing to include dioxin in human health risk characterizations, hiding dioxin from PCB cleanups, and withholding dioxin analyses from the public). These actions by EPA are interpreted to allow ocean dumping of chlorinated hydrocarbon Superfund waste and "hide" dioxin from Superfund cleanups, enabling PRPs to deny a linkage between cancer clusters and health affects for virgin PCBs. These actions only benefit the petrochemical industry, and are very detrimental to the public. The fact that EPA is aligned with the petrochemical industry and working against the public poses yet another existential risk to the US public.

I invite readers to review McCreery (2019a), which presents a timeline suggesting conspiracy between Shell Chemical Company and EPA to make all of this happen.

In President Dwight D. Eisenhower's words:

> In the councils of government, we must guard against the acquisition of unwarranted influence, whether sought or unsought, by the military-industrial complex. The potential for the disastrous rise of misplaced power exists and will persist (Farewell Address, January 17, 1961).

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Mr. McCreery has a Bachelor of Science degree in geology and a Master of Science degree in geological oceanography from the University of Rhode Island. His work toward his MS degree, including training in marine geophysics and geotechnical engineering, was funded by the US Department of Energy Low Level Waste Ocean Disposal Program. After graduate school, he worked as a geologist and geophysicist for Gulf Oil and Chevron in New Orleans for several years. He returned to New England in 1989 where he became licensed to direct subsurface environmental assessment of hazardous waste sites.

In 2013, he was called back to New Orleans to work for the US Department of Interior Bureau of Ocean Energy Management (BOEM). His role at BOEM was to conduct environmental research of the northern Gulf of Mexico following the Deepwater Horizon accident. He worked in a multi-disciplinary team to write National Environmental Policy Act (NEPA) documents for public disclosure of offshore drilling activities. It was there he began public research into ocean dumping practices as a cumulative impact on water quality. His research on ocean dumping has continued to the present. Mr. McCreery has never held a secret clearance which could restrict his ability to disclose his public research. His preliminary report, "Ocean Dumping of Chlorinated Hydrocarbons under the Marine Protection, Research & Sanctuaries Act of 1972," can be found on Amazon.

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