REPORT TO CONGRESS

Ocean Dumping of Chlorinated Hydrocarbons under the

Marine Protection, Research and Sanctuaries Act of 1972

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In support of Whistleblower Complaints:

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Contents

APPENDICES

STATEMENT OF THE SITUATION

The author's Whistleblower Complaint to the Department of Interior is in regard to unsafe drilling practices in the offshore Gulf of Mexico. Specifically, the Department of Interior is allowing drilling within a drum disposal site containing wastes produced from the manufacture of fungicides and herbicides, which is interpreted by the author to include dioxin-contaminated still bottoms resulting from the manufacture of Agent Orange prior to and during the Vietnam War.

The drum dumpsite was permitted by the Environmental Protection Agency (EPA) between 1973 and 1977 under the Marine Protection, Research and Sanctuaries Act of 1972. The EPA never regulated the site after permitting, and the Department of Interior has allowed use of a Barrel Avoidance and Release Response Plan to regulate drilling within the drum site.

It is the author's opinion that the Barrel Avoidance and Release Response Plan is without any regulatory authority and is in violation of the Outer Continental Shelf Lands Act and the Clean Water Act.

Many of the drums are known to have released their contents, and the current drilling practices are interpreted by the author to disturb sediments and suspend contaminants in the water column where they are bioavailable to the marine food chain.

It is the author's opinion that the site is a major source of persistent organic pollutants that is endangering the Gulf of Mexico seafood supply.

The author respectfully submits that Congress should address the critical issue of invalidating the Barrel Avoidance and Release Response Plan at the earliest possible date.

INTRODUCTION

This Report to Congress has been prepared in support of complaints submitted to the U.S. Department of Interior and U.S. Environmental Protection Agency made under the Whistleblower Protection Act by the author in 2018. The complaints are attached in Appendix A. This Report provides additional supporting data and a new timeline researched and compiled by the author to explain how the conditions came to be that resulted in these complaints. This timeline is based on public information and includes revelations by the author of government efforts to keep the drum

site secret from the public. The revelations that led to development of this timeline stem from the release of EPA ocean dumping permits pursuant to the Marine Protection, Research and Sanctuaries Act of 1972 that were obtained by the author via a Freedom of Information Act request.

DISCOVERY OF THE CONDITIONS

Marine Protection, Research and Sanctuaries Act

One of the new pieces of legislation enacted by the Nixon administration was the Marine Protection, Research and Sanctuaries Act of 1972 (MPRSA). The MPRSA was the United States' embodiment of the London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, an international agreement to stop uncontrolled ocean dumping. The United States ratified the London Convention on April 29, 1974, and the London Convention entered into force on August 30, 1975 (EPA, 2018).

Section 102 of the MPRSA provided that permits may be issued by the EPA for dumping of certain types of waste if it would not endanger human health or the marine environment. Section 102 of the MPRSA specifically prohibited the dumping of chemical and biological warfare agents. The EPA Administrator was required to determine that such dumping would not unreasonably degrade or endanger human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities.

The MPRSA provided all the protections that the scientific community had requested at the time. The Act ensured only certain types of waste would be dumped in the oceans, it would provide for scientific research of dumped materials, and it would establish marine sanctuaries.

National Academy of Sciences Research Program

Related to the new Marine Protection Research and Sanctuaries Act, in July 1972, The National Academy of Sciences (NAS) organized a study panel and workshop with over 50 scientists from educational institutions, National Science Foundation, National Cancer Institute, Navy, Coast Guard, Atomic Energy Commission, Dow Chemical and Monsanto. The purpose of the workshop was to discuss contaminants of interest and perform exposure assessments of these ocean-dumped chemicals.

The NAS study identified synthetic organic chemicals as the highest priority for attention, specifically those that are persistent and toxic, persistent and bioaccumulated, or persistent and released in large volumes. The high molecular weight chlorinated hydrocarbons, such as PCB, DDT, and Dieldrin, were described as having bioaccumulation factors 100 to 1000 times those of low molecular weight chlorinated hydrocarbons, and therefore not suitable for ocean dumping.

A component of the NAS research program was to use summer research associates to collect information from various sources. NAS research associates visited EPA in the Summer of 1973 to summarize the first few months of the MPRSA Section 102 permit program. The program produced nearly 1200 copies of public records, and resulted in a report entitled, "Assessing Potential Ocean Pollutants," (NAS, 1975).

The NAS report was referenced in a public document submitted to the U.S. Bureau of Ocean Energy Management by Shell Exploration and Production. The document, "Waste Barrel Avoidance and Release Response in the Mississippi Canyon" (Shell, 2010), hereinafter referred to as the Barrel Avoidance Plan, was reviewed by the author as part of his official duties, and was the starting point of this investigation.

The NAS report identified seven permits issued by EPA Region 6 in Dallas, Texas, for ocean disposal of industrial chemicals in the first few months of the MPRSA Section 102 program (#730D002, #730D004, #730D005, #730D006, #730D007, #730D008, and #730D009). Permit #730D008, issued by EPA to Shell Chemical Company in Deer Park, Texas, allowed dumping of chlorinated hydrocarbons in drums.

Review of the NAS report and knowledge of the MPRSA Section 102 program led to three revelations by the author:

- Permit #730D004 was the first to be issued with an effective date of May 1, 1973, the day after William Ruckelshaus was moved from EPA to become Acting Director of the FBI.

- Permit #730D008, issued to Shell Chemical Company in Deer Park, Texas, allowed dumping of chlorinated hydrocarbons which did not appear to meet the provisions of Section 102 due to the waste properties of toxicity and persistence. This permit was authorized for Site A, but was ambiguous because it included both contained and uncontained waste.

- A Report to Congress on Hazardous Waste Disposal (EPA, 1973) does not mention the MPRSA Section 102 program, even though dumping was taking place on the day the report was delivered to Congress.

Freedom of Information Act Request

As a result of the revelations from the NAS report, the MPRSA Section 102 permits for the period of 1973 to 1977 were requested by the author from EPA Region 6 through a Freedom of Information Act (FOIA) request. In May 2016, EPA provided copies of permits issued to E.I. DuPont de Nemours & Company (#7300D002, #730D004, #730D005, and #730D006), GAF Corporation (#730D007), Shell Chemical Company (#730D008), and Ethyl Corporation (#730D009) in response to the FOIA request (EPA, 2016). Two of the permits are pertinent to this report, #730D008 and #730D009, which became effective on June 13, 1973 and May 25, 1973, respectively, and are further discussed below.

Preliminary Analysis of Permits

EPA had approved two industrial chemical disposal sites in the Gulf of Mexico. Site A, designated for direct discharge of uncontained waste, is located about 125 miles southeast of Galveston, Texas, and Site B, designated for waste in barrels (also known as drums), is located about 60 miles south of the mouth of the Mississippi River.

Permit #730D009, issued to Ethyl Corporation, allowed disposal of approximately 20,800 drums of metallic sodium, a byproduct of extracting chlorine from salt. These drums were barged down the Mississippi River from Baton Rouge, Louisiana, and dumped at Site B.

Permits #730D008A and #730D008B, issued to Shell Chemical Company, allowed disposal of three waste streams at Site A: chlorinated hydrocarbons (55,000 drums); digested sludge (87,500 drums); and spent caustic (62,500 drums). The dumping of drums at Site A is considered to be an inconsistency because that site is designated for uncontained wastes. This inconsistency was apparently corrected after Permit #730D008B. Permits #730D008C, #730D008D, and #730D008F specified disposal of uncontained wastes at Site A. Then in Shell's barging report dated November 30, 1973, the quantity of waste disposed under Permits #730D008A and #730D008B was converted from barrels to pounds of waste, another inconsistency.

	BARRELS	TOTAL POUNDS
ORGANICS:	55,000 x 1.30 x 42 x 8.33	25,000,000
SLUDGE:	87,500 x 1.04 x 42 x 8.33	31,800,000
CAUSTIC:	62,500 x 1.11 x 42 x 8.33	24,300,000
		81,100,000

Conversion from number of barrels to pounds of waste (# barrels x specific gravity of waste relative to water x 42 gallons per barrel x 8.33 specific gravity of water).

Also, an incorrect conversion factor of 42 gallons per barrel (an oil industry unit of measure) was used instead of 55 gallons per drum (a standard waste drum capacity), another inconsistency.

Digested sludge and spent caustic are unlikely waste streams for ocean disposal due to excessive cost compared to other more environmentally-friendly disposal options. Digested sludge (with no hazardous characteristics) is normally a municipal waste from wastewater treatment plants. Spent caustic is a common waste that is typically neutralized or recycled.

First Indications of Violation

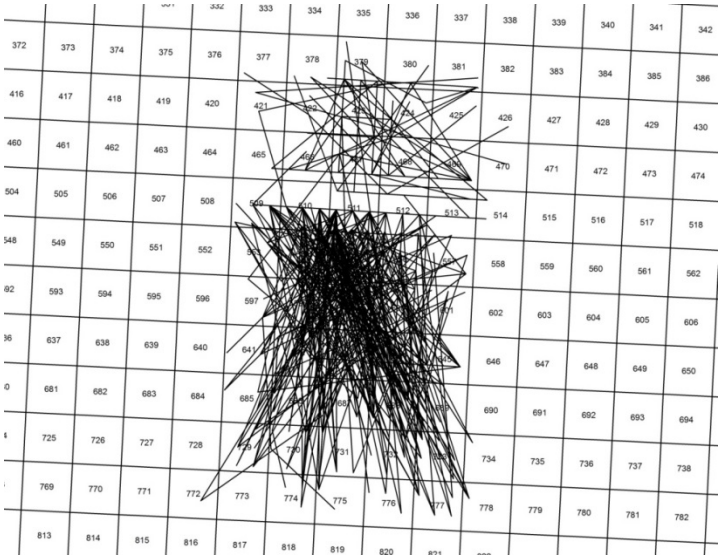
The inconsistencies described above indicated that EPA violated the terms of the MPRSA by allowing ocean disposal of chlorinated hydrocarbons. There were indications that the waste types were misrepresented and that the permits and barging reports were falsified.

Plotting of Barging Tracks

Barging reports were submitted to EPA by the permittee to show when and where waste was dumped, and these barging reports were included with the permits that were responsive to the FOIA request. Coordinates were given in degrees and minutes latitude and longitude. The example below was extracted from the Shell Chemical Company barging report dated September 10, 1975.

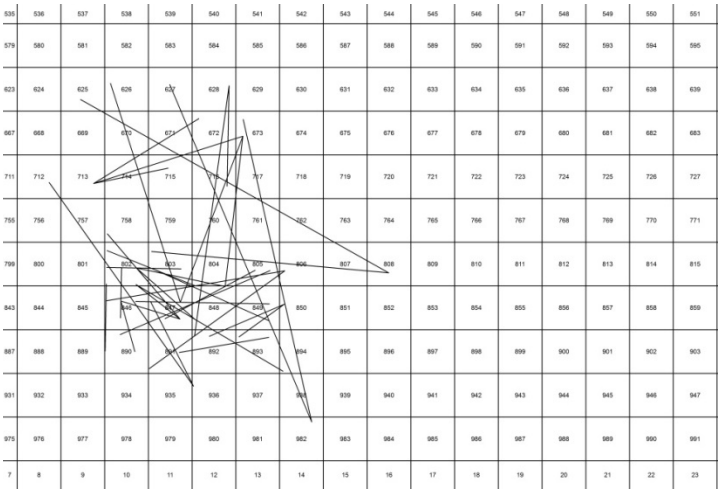
Barge Number		Date	CDT	Latitude	Longitude	Fathoms
1-D	Departed	2/22/75	1700	Shell Oil Docks		
	Commenced	2/27/75	0845	27° 28N	94° 38W	480
	Midpoint	2/27/75	1245	27° 14N	94° 38W	720
	Stopped	2/27/75	1630	27° 26N	94° 37W	570
	Returned	2/28/75	1715	Shell Oil Docks		

Coordinates from Permit #730D008 (Shell Chemical Company) and #730D009 (Ethyl Corporation) were plotted to show where the waste was dumped. The lines on these plots signify the track of the barge as waste was discharged. The numbered blocks on the plots are used by the Department of Interior for leasing seafloor to the oil and gas industry and are shown as a location reference. Similar to the offshore surveying industry, the barging tracks for a given permit area often shared points or lines with adjacent permit areas. In the case of Permit #730D008 below, multiple barging tracks connect to a single control line extending from East Breaks Block 509 to 514.



Permit #730D008 as plotted at Site A in the East Breaks area.

In the case of Permit #730D009 below, one barging track extends significantly outside the permit area to Mississippi Canyon Block 808, as if to connect to another permit area.



Permit #730D009 as plotted at Site B in the Mississippi Canyon area.

Indications of Coordinate Encoding

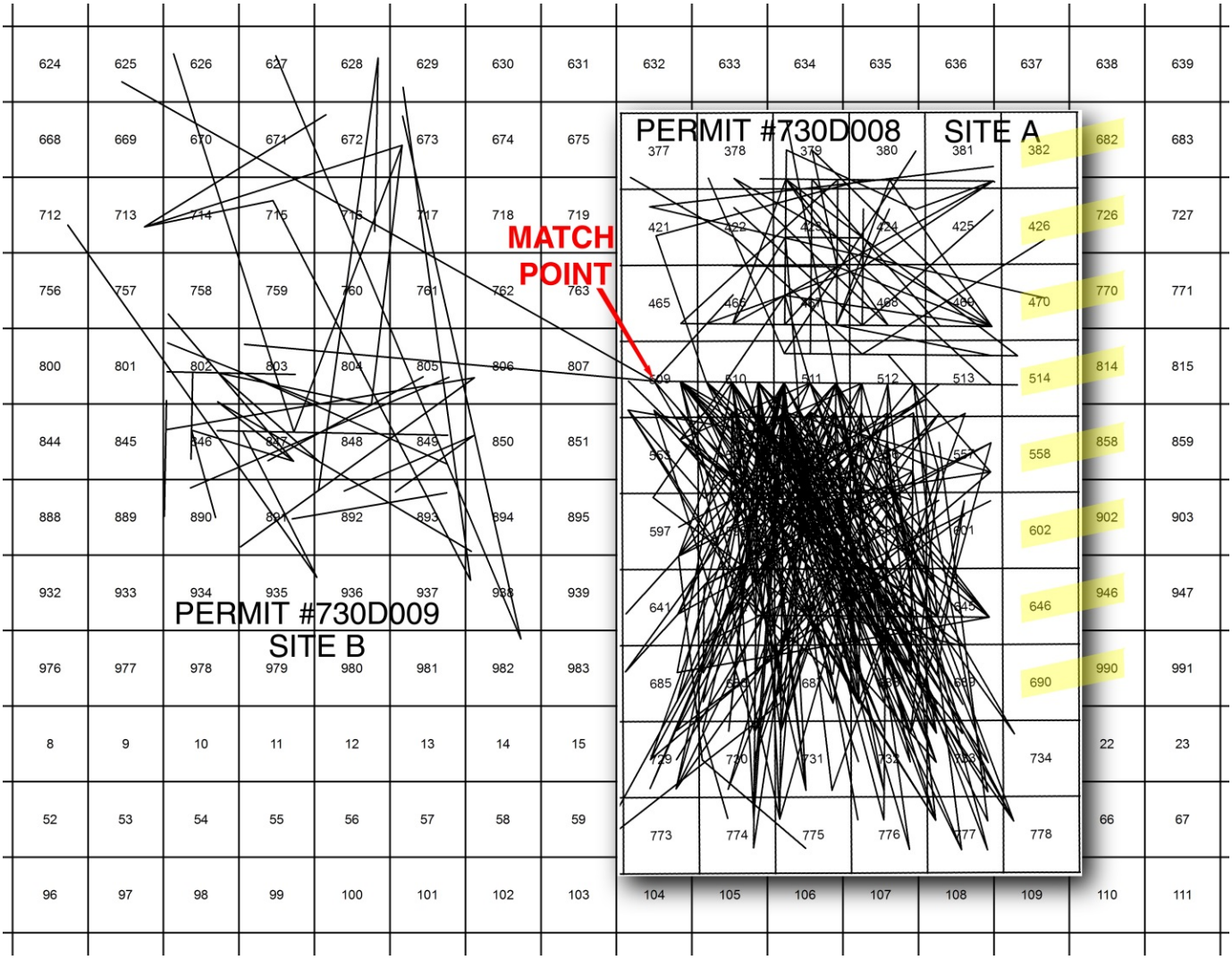
As previously noted, Permit #730D008 was ambiguous with respect to whether the waste was contained or uncontained, which may dictate if dumping occurred at Site A or Site B. Based on modern high-resolution sonar data, it is now known that there are no drums located at Site A, but there are many tens of thousands of drums at Site B. Site B is described in a Bureau of Ocean Energy Management Notice to Lessees for Oil and Gas Lease Sale 231 (BOEM, 2014).

> (n) Commercial Waste Disposal Areas. Bidders are advised that an inactive commercial waste disposal site exists on all or portions of blocks in the Mississippi Canyon Area. This site is more particularly described as being 28°00'00"N to 28°10'00"N by 89°15'00"W to 89°30'00"W, as depicted on the map "Stipulations and Deferred Blocks" included in the Final NOS Package. It was established in the 1970s to facilitate the USEPA's permitting for the seafloor deposition of thousands of steel barrels containing chemical wastes. According to limited USEPA documentation, the chemical wastes consist mostly of chlorinated hydrocarbons and liquid metal salts. The exact location of the waste material is unknown because the geospatial data was not collected when the barrels were jettisoned. Hazards surveys are required before bottom-disturbing activities are approved in plans and permits. Hundreds of barrels have been detected during hazards surveys conducted on blocks over 10 miles away from the designated disposal site boundaries, making the actual disposal site area much larger than the USEPA-permitted site shown on the map. Therefore, lessees are advised that the blocks associated with the disposal site and adjacent blocks associated with the disposal site that are included in the sale should be considered potentially hazardous. Drilling and platform/pipeline placement may require precautions, such as avoidance upon identification and any other appropriate precautions.

Coordinates shown on barging reports associated with Permit #730D008 were apparently shifted to show disposal at Site A when they were really dumped at Site B. This must have required calculation of "encoded" coordinates and retyping of the barging reports, resulting in unusually neat reports.

To test this coordinate encoding theory, the author plotted and cut out the barging tracks for Permit #730D008 at Site A, and overlaid them on Site B to look for a match point with Permit #730D009. In doing so, the author assumed there should be a match point between the two sets of tracks to maintain a location reference for survey integrity purposes, a common technique used in collection of seismic data.

A potential match point was found on Mississippi Canyon Block 808. Upon making the match, the author noticed a mathematical oddity, that blocks on the right side of the piece from Site A had the same last two digits as in the adjacent Site B blocks, with the difference in block numbers being exactly 300. For example, Block 382 from Site A was now adjacent to Block 682 from Site B, 426 was next to 726, 470 was next to 770, etc.



Permit #730D008 (from Site A) superimposed on Site B showing a match point with Permit #730D009 on Mississippi Canyon Block 808.

The author took this mathematical oddity as confirmation that the coordinates had been decoded properly. The required shift in coordinates from Site A to Site B was 5 degrees 33 minutes to the east, and 41 minutes to the north. The author concluded that the mathematical oddity sufficiently raised confidence in the match point where he could presume certainty and present the chart as his interpretation of the permits. They had apparently linked sodium back to chlorine on the seafloor.

The author considered the purpose of encoding the coordinates and concluded this was likely done to disguise the true port of origin of the waste. But, if it didn't come from the Shell Chemical Company in Deer Park, Texas, where would it have come from? The coordinates had been encoded, but perhaps they did not change the transit times from the dock to the dumping location.

- The author found that the transit time from Deer Park, Texas to Site A was very similar to the transit time from the Naval Construction Battalion Center in Gulfport, Mississippi to Site B.

- The MPRSA Section 102 permits and barging reports were apparently falsified by a yet-unknown entity. The permitted waste types of biological sludge and caustic were likely code names for other more toxic types of waste.

- Concealment of the actual waste types and the port of origin indicate government efforts to keep the drum site secret from the public.

NAVAL CONSTRUCTION BATTALION CENTER, GULFPORT, MS

The Naval Construction Battalion Center (NCBC) is a Navy Seabee base located in Gulfport, Mississippi, and is associated with a deepwater port facility known as the Outport, located about two miles from the base. Young (2009) mentioned that the Outport was an embarkation port for shipping Agent Orange to Vietnam. Both NCBC and the Outport are served by rail to facilitate shipments.

Aerial photograph of the Outport facility in Gulfport, Mississippi. Image courtesy of U.S. Geological Survey. Google Earth, dated October 1989.

In 1968, approximately 15,400 55-gallon drums reported to contain Agent Orange arrived at the NCBC base and were stored in an area known as Site 8. The soil in the outdoor storage area of NCBC had been treated in the 1940s with cement and compacted. Creosote-treated lumber was laid on the hard surface, and drums were stacked horizontally in double rows, three high, in pyramidal fashion (Young, 2009). As a result of spills and leaks that occurred during storage at Site 8, dioxin migrated through a network of on-site ditches to off-site swampland (ATSDR, 2005) and personal accounts of health effects from being near the storage area or in the neighborhood north of NCBC that was contaminated by dioxin.

An online news article contains stories from dock workers and residents who lived north of the NCBC base who suffered from cancer and other health effects (Deceleration News, 2013):

> "That whole neighborhood is dying over there, and it's not a quick, painless death," said 33-year-old Stephanie Ragar, who grew up playing at her grandparents' house two blocks from the base. "I watched my mother throw up her liver in a trash can." "There's a lot of heart problems, liver problems, but especially kidney problems." Suzanne Collum said, "We have 13 retardations in a five-block radius."
>
> Former dockworkers who unloaded railroad cars of Agent Orange weekly at the Port of Gulfport to be shipped off to Vietnam from 1967 to 1969 have their own stories. "We poured out more stuff on the docks down there than we did in Vietnam," said Frank Ladner, who retired from the port in 1985. "Nobody's saying anything about that. . . All those boys that worked with me are damn near dead." Ladner talks about forklifts punching holes in the drums and of black fluid spraying out, or barrels dropping from pallets being hoisted by crane onto waiting vessels. "I've had this stuff in my eyes. I've had it all over," Ladner said. Not familiar with the toxic nature of the liquid, workers would spray spills off into the water. "We didn't know what we were working with," Ladner said. "So help me God, we didn't know."

Others commented on the story:

> Edward Skomurski: "I was stationed at Gulfport from 73-77 with MCB133. Had prostate cancer and I now have heart disease. Have been fighting with the VA for about 4 years. The Agent Orange was stored in rusting leaking barrels right across the street from our barracks."
>
> Melvin Gibson stated, "I was stationed with (NCBC) from 1976-1979 at Gulfport. During this time we held company training next to the area that held Agent Orange (Site 8). We dug fighting positions and did truck convoys with ambushes on the dirt road that ran along the train tracks that was used to move the Agent Orange to the port in the Summer of 1977" (Deceleration News, 2013).

By Summer of 1977, all excess Agent Orange had been shipped to Johnston Island in the Pacific for incineration, with the final shipment leaving NCBC on June 9, 1977. However, the last barge under Permit #730D008F completed its trip on August 8, 1977. Therefore, the rail transport that Mr. Gibson describes was likely not Agent Orange, but the last of the dioxin-contaminated still bottoms that were shipped by rail to NCBC.

ROCKY MOUNTAIN ARSENAL

In 1942 at the height of World War II, the U.S. Army Chemical Corps acquired 17,000 acres of land in Commerce City, Colorado, on which to manufacture chemical weapons such as mustard gas, white phosphorus, and napalm. The Rocky Mountain Arsenal (RMA) is located approximately 10 miles northeast of Denver. The facility contains a central test range surrounded by manufacturing facilities. The South Plants area of Rocky Mountain Arsenal was a complete chemical manufacturing complex designed, built, and used by the U.S. Army for the production of chemical weapons and conventional munitions for World War II.

Beginning in 1946, portions of the South Plants were leased to private companies reportedly for the manufacture of commercial chemical products. Under the lease program, Julius Hyman and Company began producing “high potency insecticides” in 1946 (Global Security, 2018).

In 1951, further research was started by the U.S. Army Chemical Corps, which tested various formulations of tactical herbicides, code-named orange, white, blue, purple, pink and green (known collectively as the “Rainbow Herbicides”), and assigned “Military Specifications” by the U.S. Army Chemical Corps (Young, 2009). Of the tactical formulations, it was Agent Orange that was selected for use in Vietnam.

We now know that Shell Chemical Company was working with the U.S. Army Chemical Corps to produce military quantities of Agent Orange at RMA. Evidence for this conclusion is given in a determination of service connection by the Veteran’s Administration (VA, 2015). The Veteran in question served on active duty in the U.S. Army from November 1950 to November 1953 with the Decontamination Section of the 216th Chemical Service Company at RMA. He was responsible for cleaning and decontamination of chemical leaks and accidental spills, and incurred exposure to numerous chemical agents, including Agent Orange. The Veteran indicated that his company was called in to the Shell Chemical Company plant to aid in the cleaning of a spill of Agent Orange, testifying that the company had to "flush the whole building out," despite the lack protective

clothing. The Veteran was granted a service connection for prostate cancer (Veteran's Administration, 2015).

RMA was apparently the test application range for various formulations of tactical herbicides. The Arsenal test area was mapped out, and herbicides were applied in patches at varying proportions of 2,4,5-T to 2,4-D, varying cooking temperature which controlled concentration and waste generation, and application strength to determine the final military specifications for Agent Orange.

Beginning in 1947, Tanks 464A and 464B at the RMA South Tank Farm were used to store still bottoms from the production of chlorinated pesticides and herbicides. When the tanks were full, the still bottoms, mixed with fuel oil, were pumped onto the ground to separate the solid from liquid fractions, and the residual solids were contained. The liquids would percolate down to the groundwater. Holding ponds were installed to intercept the groundwater to allow evaporation of the dissolved chemicals (RMA Archives, Chemical Agent Program History, 1996).

- These were the site conditions investigated by Rachel Carson as discussed in Chapter 4 of her book, *Silent Spring* (Carson, 1962).

Julius Hyman and Company was purchased by Shell Chemical Company in 1952, which became the principal lessee at RMA (RMA Archives, Chemical Agent Program History, 1996). In 1960, the U.S. Army Chemical Corps at RMA notified local authorities that it intended to install a deep injection well to dispose of process waste. The disposal well was drilled through the flat-lying sedimentary rocks into the underlying older crystalline rocks more than 12,000 feet deep. The injection well began operation in 1962. Injection rates varied from 2 million gallons per month to as much as 5.5 million gallons per month. The northeast Denver area experienced an earthquake one month later. About 1,500 earthquakes up to M 4.8 occurred in the area over the next five years as the result of injecting nearly 165 million gallons of waste. In 1966, the injection well was ordered shut down because it was triggering earthquakes. The earthquakes continued after the well was reportedly shut down. In August 1967, Denver experienced 82 quakes in 31 days (Hersh, 1968).

- The injected process waste described in the RMA Archives is interpreted by the author as dioxin-contaminated still bottoms. Fuel oil was added to the still bottoms to make the material flow. The high viscosity of the injected material and the hard, crystalline nature of the bedrock probably caused the earthquakes.

The Army was running out of options for disposal of dioxin-contaminated waste. After the injection well was shut down, in 1966, residue from a mixture of fuel oil and still bottoms was buried at the South Tank Farm. In 1967, a mixture of still bottoms and fuel oil was stockpiled, and later drummed and shipped offsite (RMA Archives, Chemical Agent Program History, 1996).

- The 15,400 drums stored at Site 8 at NCBC described above likely contained dioxin-contaminated still bottoms mixed with fuel oil that had been stockpiled at RMA in 1967, pending ocean disposal. This conclusion is based on the timing of drums leaving RMA and arriving at NCBC and the fact that soils in the Site 8 storage area were contaminated with dioxin (ATSDR, 2005)

The Commercial Manufacturing Sites

In 1962, the U.S. Army Chemical Corps hosted a First Defoliation Conference at Fort Detrick prior to issuing contracts for commercial manufacturing of tactical herbicides for the Army. Young (2009) identifies commercial manufacturers of tactical herbicides as Dow Chemical Company, Monsanto Company, Hercules Inc., Thompson-Hayward Chemical Company, Diamond Alkali/Shamrock Company, US Rubber Company (Uniroyal, Inc.), Thompson Chemicals Corporation, Agrisect Company, Hoffman-Taft, Inc., and Ansul Chemical Company. The commercial companies were instructed to produce various formulations in accordance with military specifications.

The production process left dioxin contamination at several of the manufacturing facilities, many of which are now EPA Superfund cleanup sites. Some of these contaminated sites include Dow Chemical Company, Midland, Michigan; Monsanto Company, Nitro, West Virginia; Hercules, Inc., Jacksonville, Arkansas; Diamond Alkali/Shamrock Company, Newark, New Jersey; Thompson-Hayward, New Orleans, Louisiana and Kansas City, Kansas; Thompson Chemical, St. Louis, Missouri; and Hoffman-Taft, Inc., Verona, Missouri (Agent Orange Record, 2010) and (Truthout, 2018). Apparently the military specifications did not include instructions for proper disposal of the dioxin-contaminated still bottoms, because there were no safe legal options.

- The Shell Chemical Company facility at RMA could have manufactured all the tactical herbicides that were needed for the Vietnam War. There was no real need for the commercial manufacturing facilities except to provide cover for the secret operations at RMA. But in the end, it was the commercial facilities that showed us there was a dioxin-contaminated waste product from making tactical herbicides, which never degrades and leaves a permanent mark upon the land, betraying any effort to keep the operation secret. Without this evidence from the commercial sites, there may have been no reason to suspect the existence of a similar waste stream from RMA.

Byproducts of Making Pesticides and Herbicides

The byproducts of making chlorinated pesticides such as DDT have been seldom discussed due to the chemical properties of the waste and the culture of secrecy in the military and petrochemical industry.

The chemical name for common salt is sodium chloride, which has the formula NaCl. In its natural (inorganic) form, salt is harmless and is an essential part of our diet. However, when sodium and chloride are disassociated and then concentrated, they both become hazardous. The residuals from this process become metallic sodium, which is water-reactive and potentially explosive, and chlorine which becomes a highly toxic gas.

Metallic sodium is a waste product from the dechlorination of salt and presents a disposal risk because of its water-reactive properties. A demonstration of the 1947 disposal of metallic sodium in Lake Lenore, Washington, can be viewed at YouTube (2018). The video implies the metallic sodium is a surplus chemical product that is being destroyed due to transportation risk, however, we now know it was generated as a waste byproduct of salt dechlorination. Chlorine is converted from inorganic to organic form when combined with hydrocarbons, and becomes "bioavailable" as it will easily bind to animal fats as a toxin.

After the war, chemists began experimenting with even stronger formulations of chlorinated pesticides and herbicides. Tactical herbicides were generally a mixture of equal parts of two chlorinated herbicides, 2,4,5-T and 2,4-D. 2,4,5-T is an herbicide that kills plants by artificially overstimulating the growth hormone. The combination of these two herbicides produces a product that is up to 50 times more effective than would be produced by adding the effects of the two together, a synergy called "potentiation." The unwanted byproducts of manufacturing chlorinated herbicides were TCDD and furans (dioxin-like compounds), discussed collectively here as "dioxin".

The production process called for reacting the herbicides 2,4,5-T and 2,4-D in the presence of heat. Dioxin was formed as an unwanted byproduct of the manufacturing process if the mixture was heated above 160 degrees Celsius. The compound TCDD would begin to precipitate out of the solution at this temperature and accumulate at the bottom of the reaction vessels (known as "still bottoms"). Careful monitoring of slow heating would minimize dioxin generation, and overheating would generate more. This became a balance of production speed versus waste generation. This process likely generated a significant amount of still bottoms. The finished tactical herbicide product was decanted from the top of the vessel, which was contaminated by dioxin but did not contain dioxin still bottoms.

Contamination Control Program at RMA

In 1974, the Army established a Contamination Control Program at Rocky Mountain Arsenal (RMA). Beginning in 1975, the Army and Shell implemented early Interim Response Actions (IRAs) at the most highly contaminated areas. IRAs were taken in advance of the official cleanup to remove the source contaminants and stop the spread of contamination (EPA, 1997). These actions would have included removal of any dioxin-contaminated still bottoms remaining on the site. However, disposal of waste generated during the IRAs was not documented. It is interpreted by the author that this waste was disposed under Permits #730D008D and F.

TYPE AND ORIGINS OF THE WASTE MATERIALS

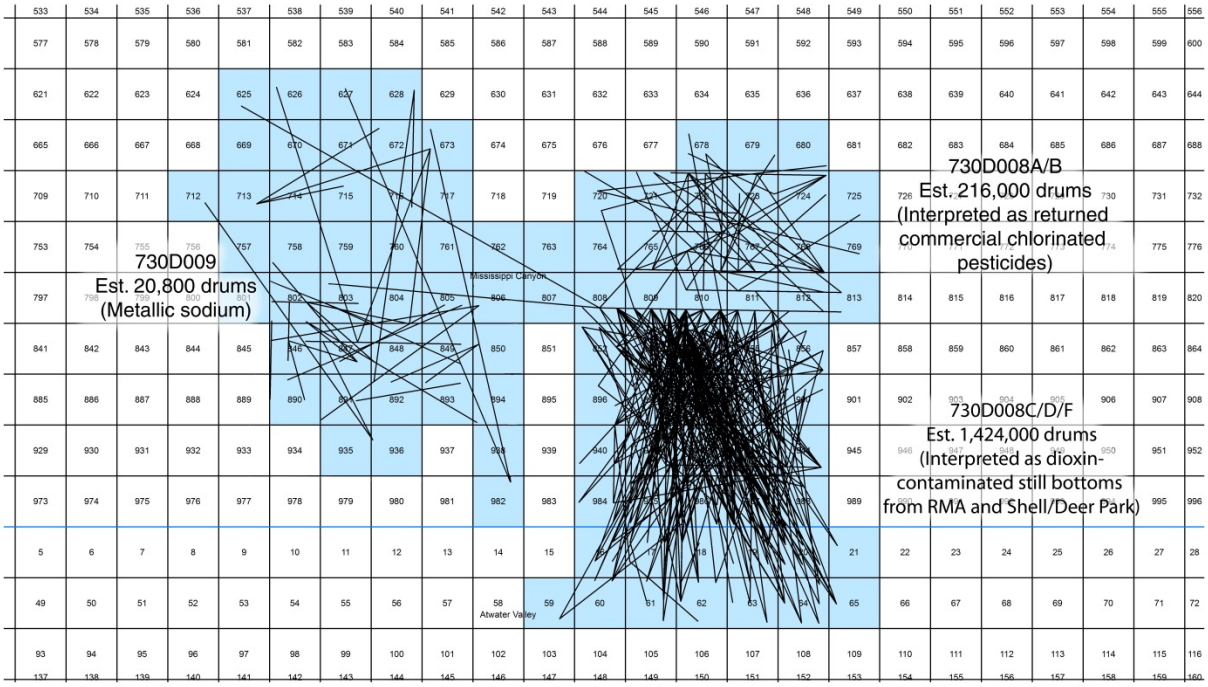
Plotting of Permits #730D008A and B shows these wastes were segregated from Permits #730D008C, D, and F. This is normally done to keep different waste types separate. Also, the quantities of wastes dumped under Permits #730D008A and B were considerably less than Permits #730D008C, D, and F. Permits #730D008A and B, rather than allowing disposal of biological sludge and caustic, were interpreted by the author as returned post-ban commercial chlorinated pesticides (e.g. Aldrin, Dieldrin, Endrin, and DDT), products that Shell Chemical Company was known to produce during the 1960s.

As of September 1974, Shell Chemical Company had accumulated more than 19,000 tons of chlorinated hydrocarbon waste stored in aboveground tanks at its Deer Park, Texas facility (Kamlet, 1981), and was continuing to generate the material at the rate of approximately 1,900 tons per month, (Wastler et. al., 1975). It is interpreted by the author that this waste was dioxin-contaminated still bottoms disposed under Permit #730D008C originating from the Shell Chemical Company facility in Deer Park, Texas.

- The quantities of wastes dumped under Permits #730D008D and F were considerably larger than Permits #730D008A, B, and C, and may be characterized as “military quantities.” It is interpreted by the author that this this waste was dioxin-contaminated still bottoms originating from initial IRAs at RMA.

The number of drums disposed under each permit was estimated based on the number of barge trips and the permitted number of 8,000 drums per trip. The following figure shows the author’s interpretation of the barging tracks and waste descriptions for Permits #730D008 and #730D009. The author estimated that 216,000 drums were disposed under Permits #730D008A and

#730D008B, and 1,424,000 drums were disposed under Permits #730D008C, #730D008D, and #730D008F.



Interpreted barge tracks and drum contents for Permits #730D008 and #730D009. Blue blocks show the extent of Site B.

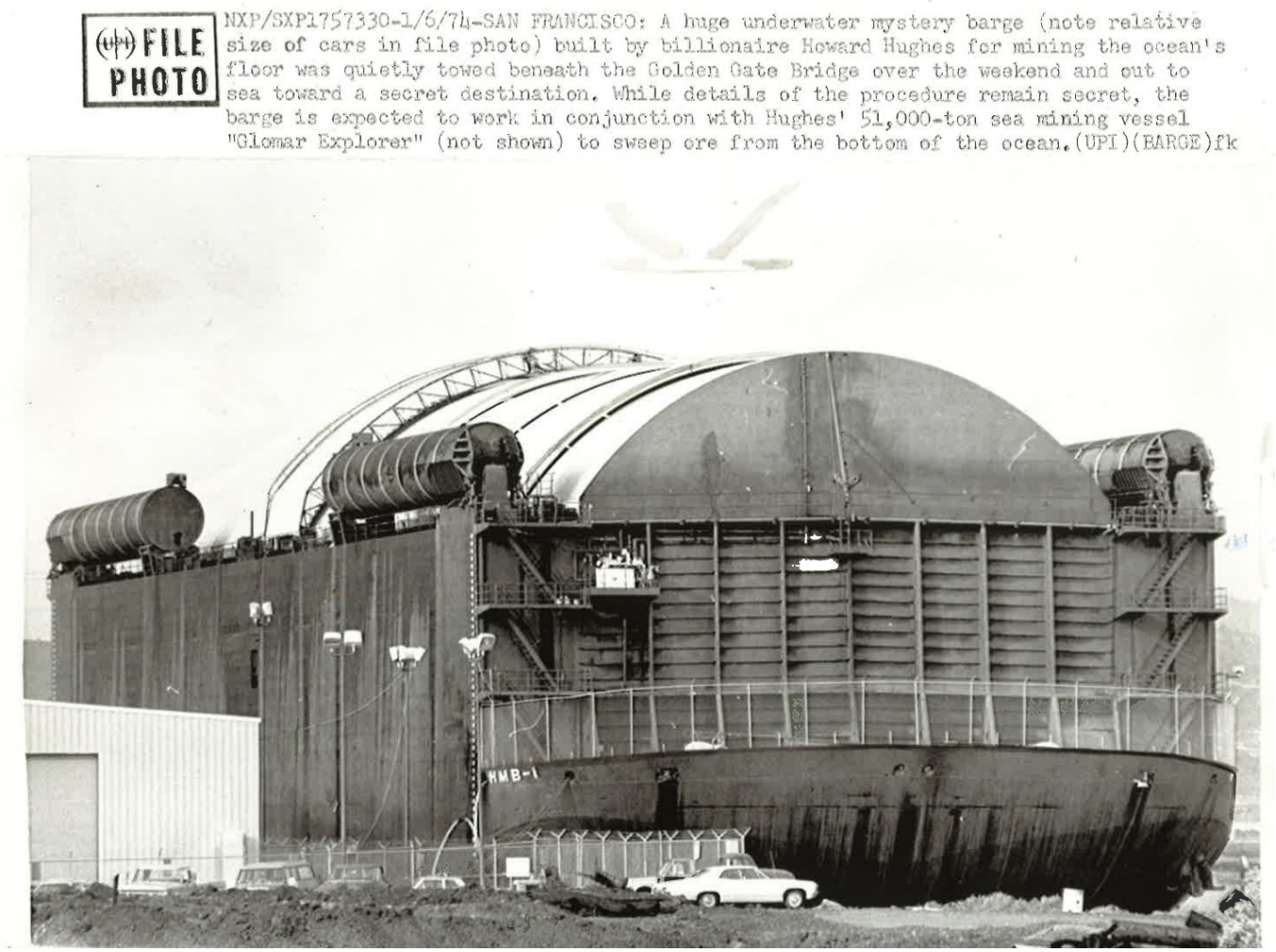
HUGHES MINING BARGE HMB-1

Project Azorian

The ocean disposal program continued until August 1977, in violation of the London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter. This international agreement to stop uncontrolled ocean dumping came into force on August 30, 1975, and the United States was a signatory party.

How did the dumping occur after the August 30, 1975 effective date of the London Convention? By 1975, satellite reconnaissance could easily have observed the dumping action. The answer to this question lies with a covert operation conducted by the CIA between June 1974 and February 1975, named Project Azorian.

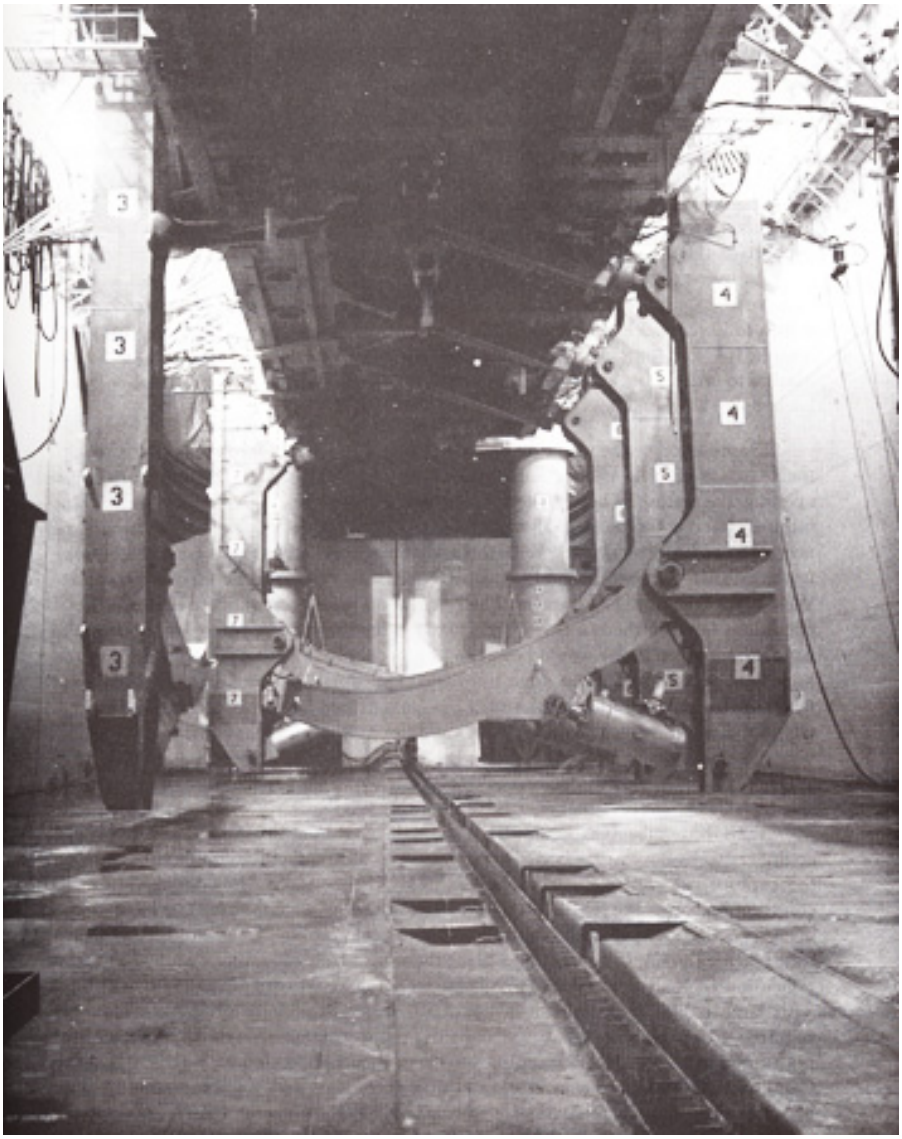
Project Azorian was disclosed in the book, "*The Jennifer Project*," by Clyde Burleson (1997). Now more widely known as Project Azorian, the real mission objective was the secret recovery of the sunken Soviet submarine K-129 from the seafloor 16,000 feet deep 1,560 nautical miles northwest of Hawaii. However, the elaborate cover story told of Howard Hughes using the Glomar Explorer and the Hughes Mining Barge (HMB-1) to mine manganese nodules from the seafloor.



The Hughes Mining Barge (HMB-1) prior to Project Azorian, with the caption giving the cover story. January 6, 1974.

Project Azorian employed Howard Hughes as a subcontractor to the CIA to design and build a deep-sea drillship, the Glomar Explorer, and a companion submersible barge, the HMB-1. Once on position, the HMB-1 would submerge and lock to the underside of the Glomar Explorer. The retractable roof would be opened on the HMB-1, exposing the "Clementine" claw inside that was designed to retrieve the submarine. The ship's drill pipe was lowered through the 200-foot long by 70-foot wide "moon pool" in the Glomar Explorer, into the HMB-1, and picked up Clementine. The flap doors in the floor of the HMB-1 would open, and Clementine could be lowered to the

seafloor to retrieve the submarine. Upon recovery, the submarine would be lifted into the HMB-1, and the flap doors would close. The drill pipe would be disconnected from Clementine, the HMB-1 would close its retractable roof, separate from the Global Explorer, and rise to the surface. The submarine would then be taken to a safe location free of the prying eyes of Soviet satellites.



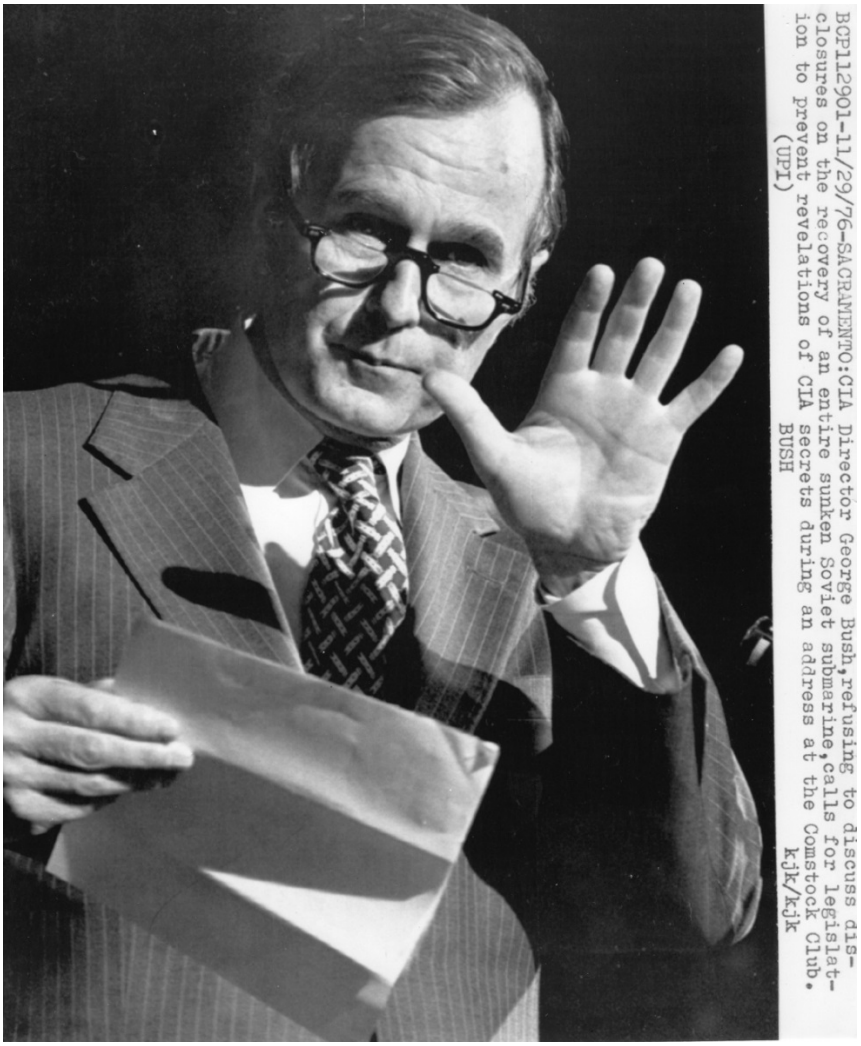
"Clementine" inside the HMB-1, showing the flap doors in the floor that would open to allow the claw to be lowered to the seafloor.
https://maritime.org/tour/seashadow/index.php

In February 1975, the recovery mission had been completed and the media were given closure with respect to Howard Hughes and the Glomar Explorer. The story was told that operation details had been stolen from Hughes' office in June 1974 and released to the media in February

1975. The cover story was blown. The Glomar Explorer lost any possible future covert use, and media focus moved on from the project.

Ocean Dumping and the HMB-1

With the Azorian Project complete, the relatively unknown submersible barge HMB-1 quietly disappeared from San Francisco and continued covert activities after May 1975. On page 177 of *The Jennifer Project*, Burleson states without attribution that, "during the 1970s, the vessel was transferred to the Environmental Protection Agency for experimental work."



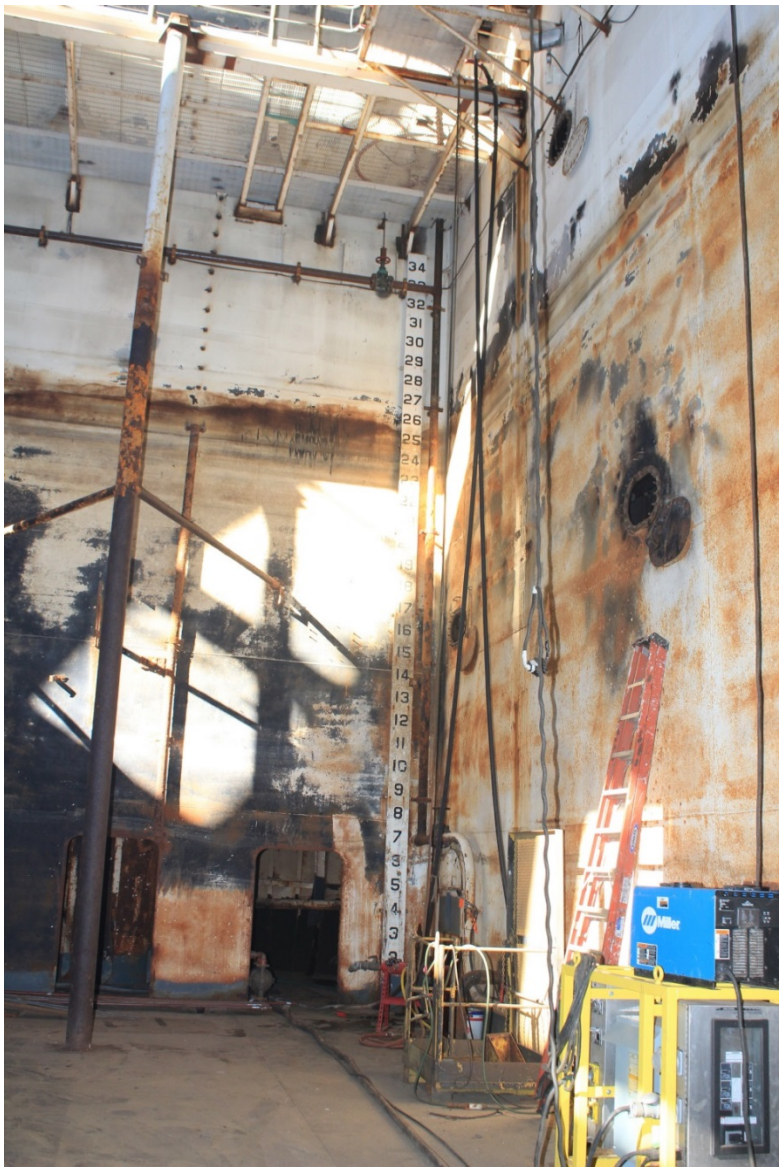
George H.W. Bush, then CIA Director, refusing to discuss the Azorian Project to prevent revelations of CIA secrets. November 29, 1976.

Use of the HMB-1 for "experimental work" suggests it was used for the MPRSA ocean disposal program for "research." As shown in the press photo above, then-CIA Director George H.W. Bush had apparently declined to take questions about Project Azorian at the risk of disclosing the current status of the HMB-1. This conclusion leads to another revelation:

- The entity that falsified permits and barging reports was likely CIA with agents embedded at EPA Region 6 in Dallas. This would explain the elaborate manipulation of Permit #730D008 by using code names for waste types and encoding the dumping coordinates.

With its ability to submerge, the flap doors in the floor and retractable roof, the barge was designed as a covert dumping vessel. No other legitimate use of the HMB-1 is known between the Azorian Project in 1975 and 1982 when it was used as a drydock for the stealth ship, "Sea Shadow."

It is interpreted by the author that the HMB-1 would be loaded with drums of dioxin-contaminated still bottoms from RMA that had been transported by rail to the NCBC Outport. Approximately 8,000 drums per load could be carefully placed in three layers on the floor of the barge in an orderly fashion, oriented with their long dimension parallel with the flap doors. After loading at the NCBC Outport, the HMB-1 would be submerged to a depth of about 25 feet above the floor, where the drums were underwater but the catwalk was still above water so the flap doors could be controlled hydraulically by someone inside. The barge would remain partially submerged while making the transit to the dumpsite to "keep a low profile." The barge would be pushed by tug from the Outport, between Cat lsland and Ship Island, along the east side of the Chandeleur Islands, and out to Site B without passing populated areas. To the casual observer, HMB-1 would appear to be a low covered grain barge.



Interior of the HMB-1, showing an oily water line at about 25 feet above the floor, indicating it spent substantial time at that submergence depth. http://onclippercove.com/tag/bay-ship-and-yacht/

Once at the dumpsite, the flap doors would be slowly opened underwater, and the drums would roll out in an orderly slow motion fashion because they were already submerged. This "bombs away" dumping method along north-south tracks would have resulted in strategic placement of the drums in a fairly compact pile as indicated by the dumping tracks for Permits #730D008D and F.

- This method of dumping may have imparted a “spin” on the drums that could help retain their orientation, allowing them to land on their side and roll to the east or west into low gullies, preventing them from rolling into deeper water.

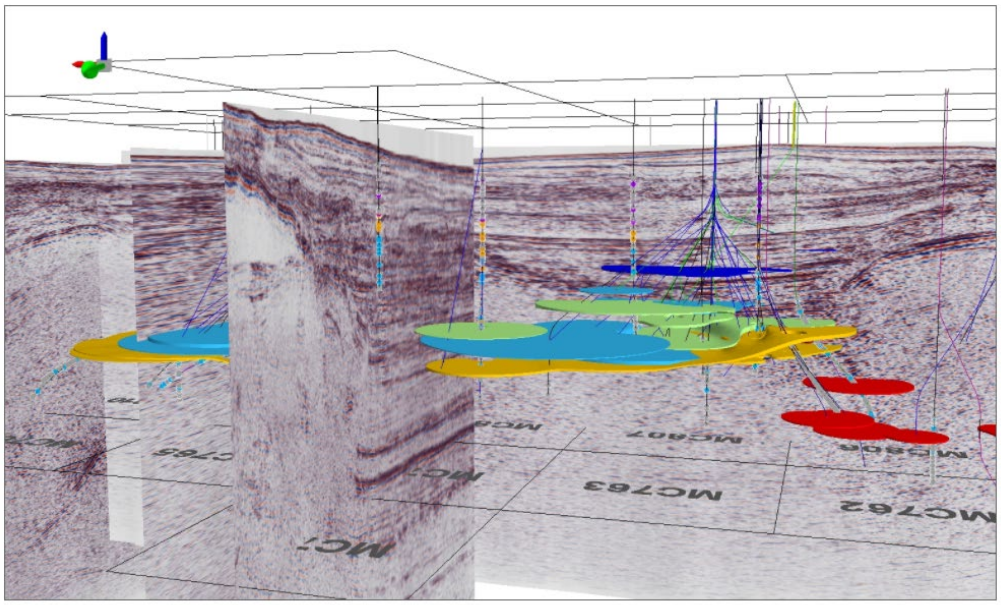
OFFSHORE OIL INDUSTRY

Shell Exploration and Production within the Drum Site

The drum dumpsite laid dormant from 1977 to 1989, and the EPA, CIA, and the Shell Chemical Company appeared to have succeeded with the covert dumping activity.

By 1987, technology had advanced to allow three-dimensional seismic surveys, which dramatically improved visualizations of subsurface structure and bright spots to allow precise design for exploratory wells (BOEM, 2018). Remotely-operated vehicles (ROVs) assisted in positioning the wells on the seafloor in deep water and could open and close valves on subsea equipment.

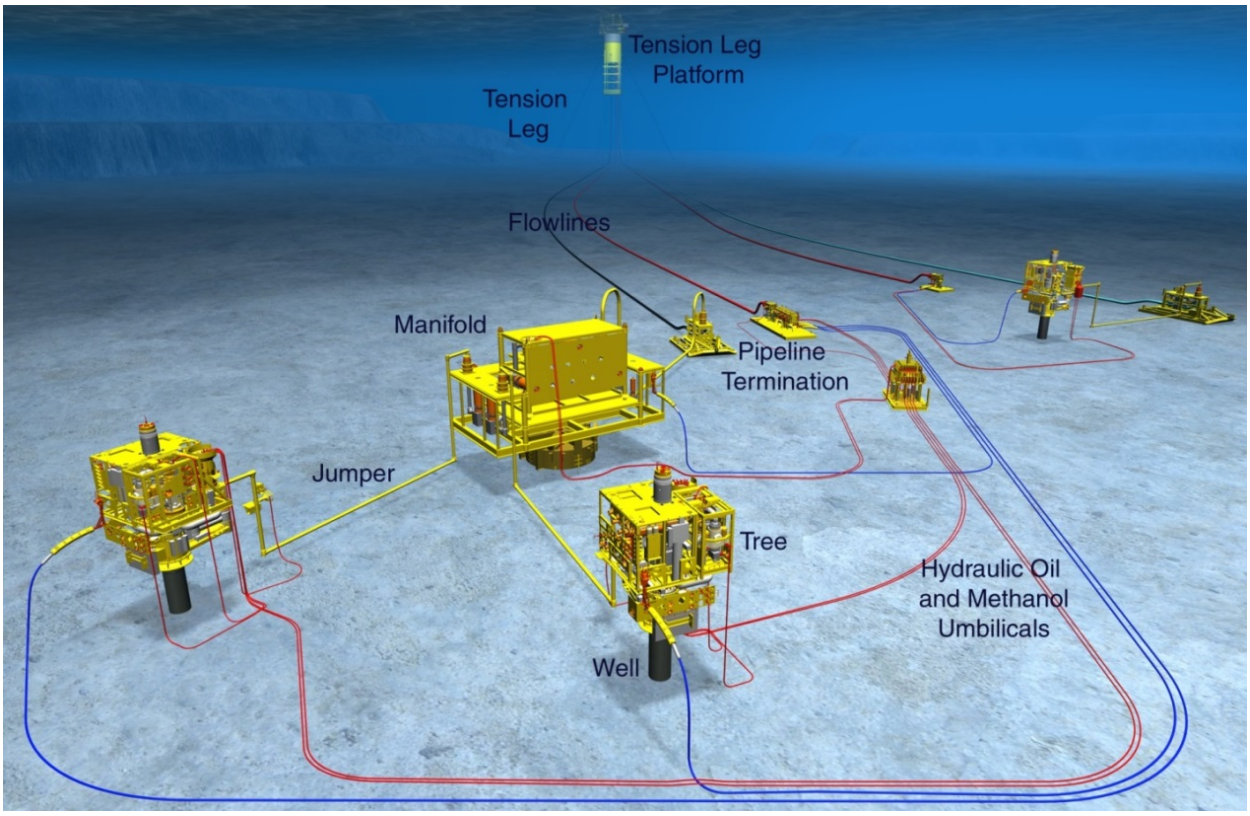
Discovery wells at the Mars prospect within the drum dumpsite were drilled in 3,000 feet of water by Shell Exploration & Production Company, Inc. in 1989 during the George H.W. Bush administration. The wells, which would not be developed for some years, confirmed the prospect was a monster (Master Investor, 2012).



Mars-Ursa complex: seismic, wells and reservoirs, legended by pressure gradient (0.58-0.83 psi/ft, blue to red)

Seismic data over the Shell Mars-Ursa complex, with superimposed oil and gas reservoirs. http://www.earthsci.com/seismic.php

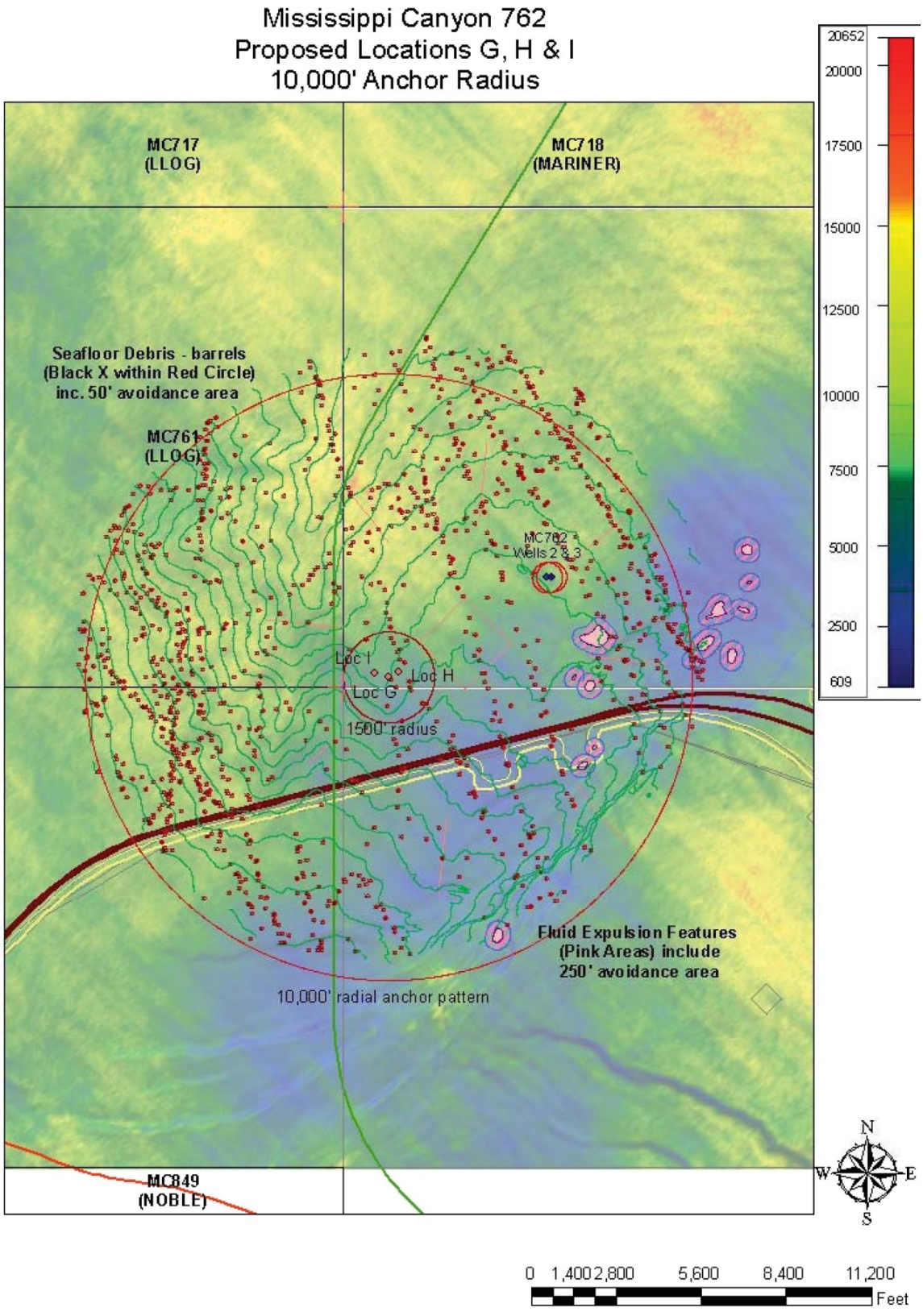
Exploratory drilling within the drum dumpsite by Shell continued into the 1990s. Discovery wells at the Ursa prospect were drilled in 4,000 feet of water in 1991. The Crosby Pink subsea field was discovered in 4,072 feet of water in 1999.



A typical subsea field similar to Crosby Pink, consisting of three subsea wells, manifolds, control umbilicals, and the tension leg platform host facility in the background. Modified from http://www.drillingcontractor.org/?s=SSFMC20KField.png.

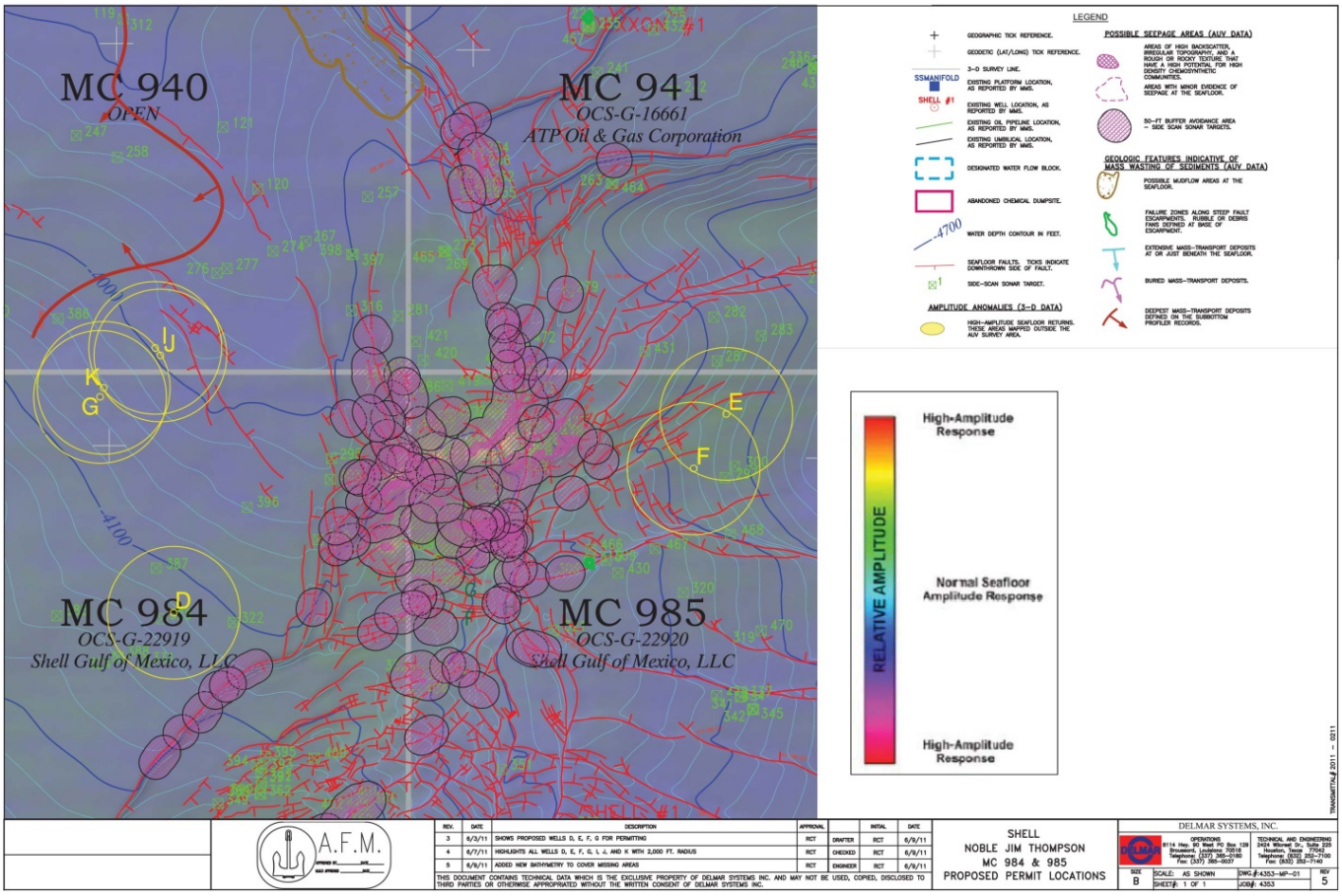
Shell Exploration & Production continued its discovery campaign into the 2000s. The Princess Field, located adjacent to Ursa, was discovered in 3,600 feet of water in 2000 (FMC Technologies, 2018). The Deimos Field, located near Mars, was discovered in 3,000 feet of water in 2002. The West Boreas Field was discovered in 2004, and Vito was discovered in 2009.

Sonar targets representative of the drums are seen on shallow hazard surveys from public information copies of Exploration Plans S-7273 (Shell, 2008) and related plans N-9570 (Shell, 2011a), S-7480 (Shell, 2011b), and S-7499 (Shell, 2011c). These plans were submitted by Shell Offshore, Inc., which has extensive operations in the disposal site area. These shallow hazard surveys indicate different styles of dumping. The surveys from Plan S-7273, N-9570, and S-7499 show the drums were dumped in straight lines at fairly regular intervals. These drums were pushed off a barge at a given speed and time interval.



Shallow hazard survey from Shell Plan S-7273 (Shell, 2008).

In contrast, the survey from Plan S-7480, in the area believed to hold drums of dioxin-contaminated still bottoms, indicates accumulations of drums in low valleys on the seafloor, suggesting they may have rolled to their final resting spot after hitting the bottom. These drums were discharged in a large volume over a small area, with no regard for spacing of the drums.



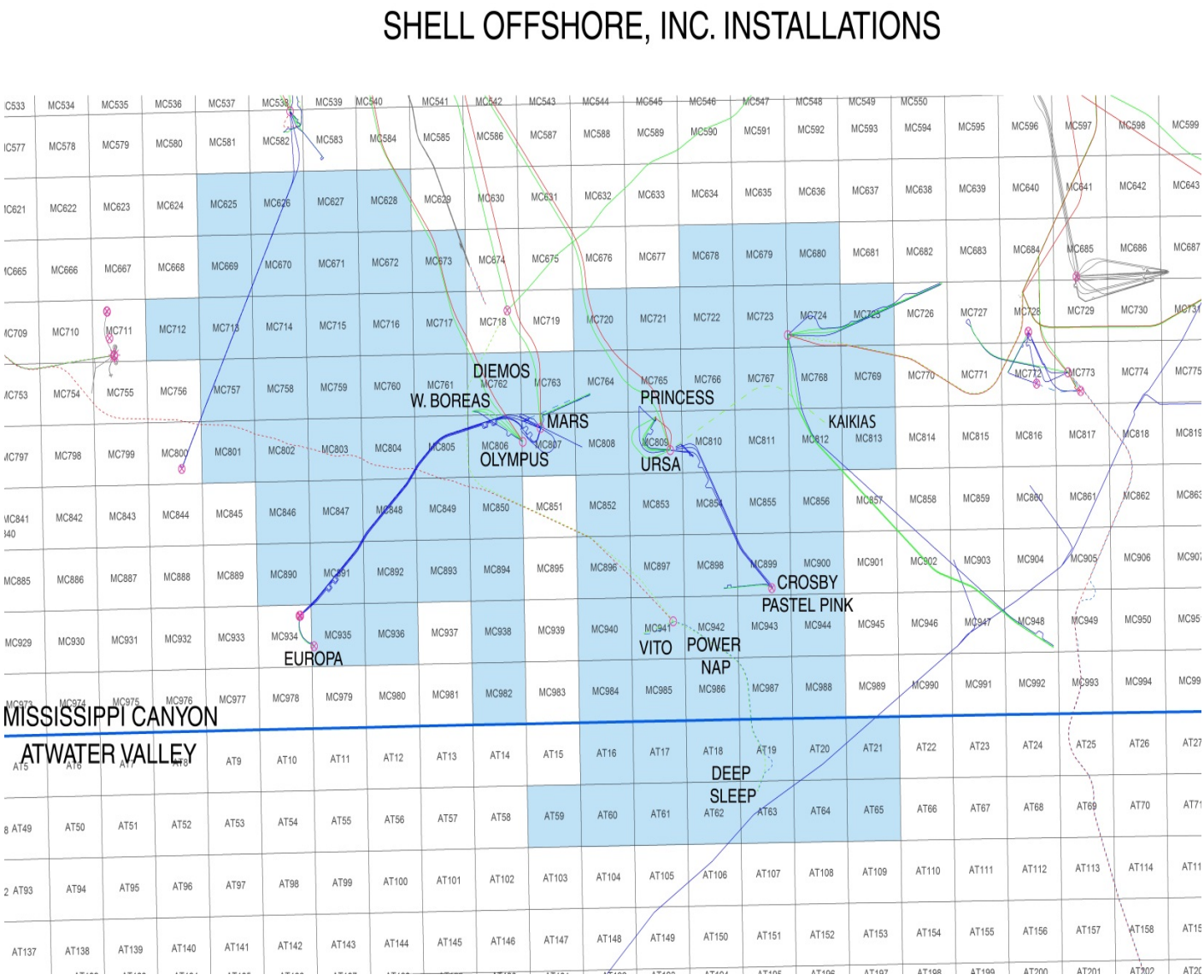
Shallow hazard survey from Shell Plan S-7480 (Shell, 2011b).

In 2010, Shell Offshore, Inc. had discussions with the Mineral Management Service (MMS) in New Orleans regarding the drum dumpsite. Shell decided it was best to acknowledge the presence of the dumpsite without talking about its history. With the approval of Minerals Management Service (MMS), in 2010 Shell developed a Barrel Avoidance and Release Response Plan, which is now used for all Shell operations in the dumpsite area (examples include BOEM Plan S-7876, Shell, 2017). The Plan provides for response measures in the event that subsea operations might impact a drum.

- The Barrel Avoidance Plan states that many drums may have released their contents, and identifies the barrel contents as wastes produced from the manufacture of fungicides and herbicides.

Shell Offshore, Inc. used the Barrel Avoidance Plan to drill discoveries at Kaikias and Power Nap in 2014, and Deep Sleep in 2015. The aforementioned fields are now operated in various partnerships between Shell Offshore, Inc. and other companies.

The figure below developed by the author shows Shell Offshore, Inc. host facilities and subsea fields within the drum dumpsite.



Lease block locations and pipeline locations from BOEM (2019). Shell host facilities and subsea field locations from various public sources.

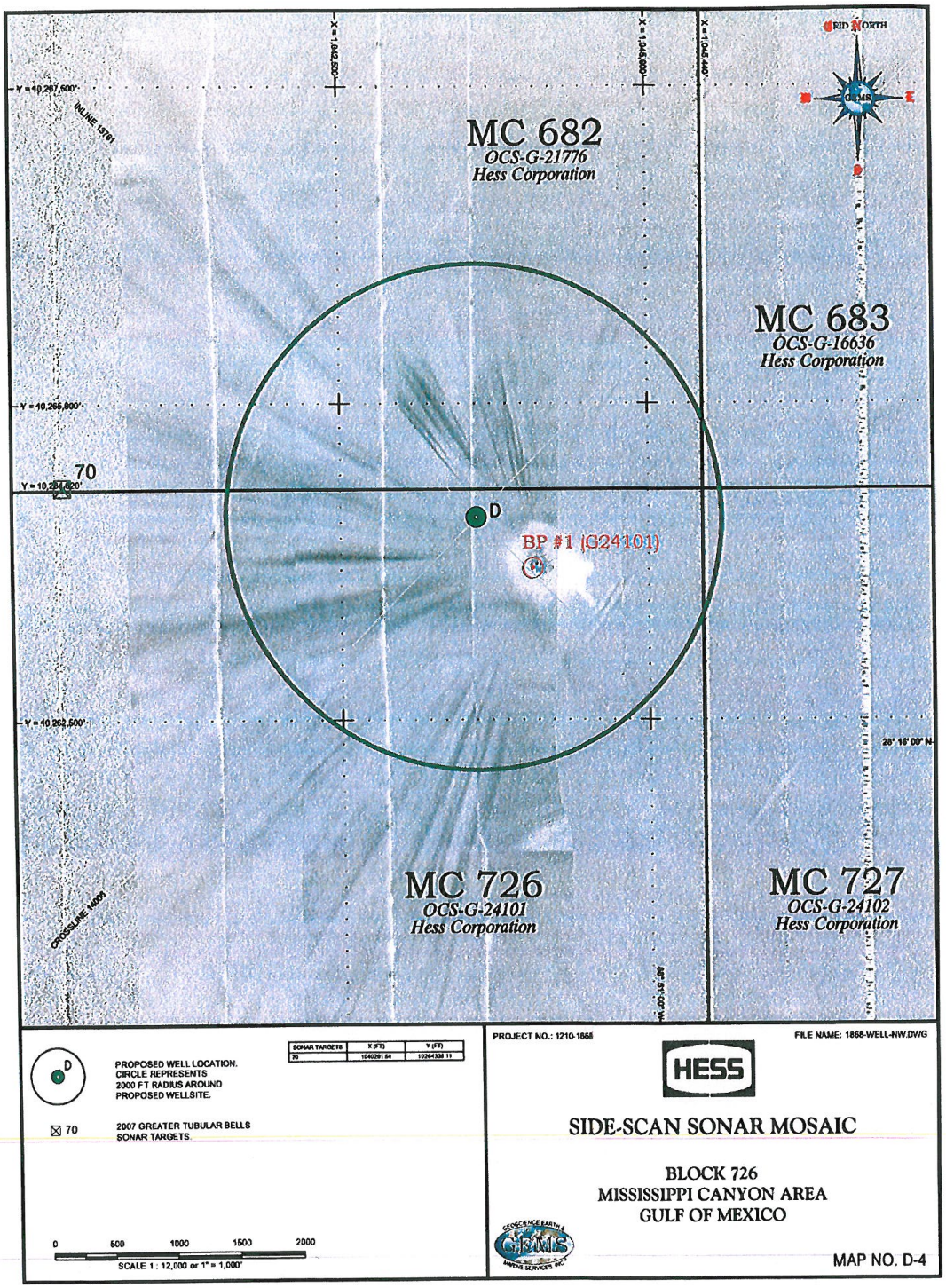
- The drums appear to have been strategically placed over the Mars prospect, the largest oil reservoir in the Gulf of Mexico based on the early seismic data. This was apparently done to protect the reservoir for later development by Shell Offshore, Inc., the only oil company authorized by the Department of Interior to use a Barrel Avoidance Plan within the dumpsite area.

By 2016, Shell Offshore, Inc. was the largest oil producer in the Gulf of Mexico. As of 2012, Mars had produced more than 700 million barrels of oil with daily production of between 120,000 and 240,000 barrels a day (Master Investor, 2012). Much of that production is coming from within the drum dumpsite, currently the most prolific area of the Gulf of Mexico.

Barrel Avoidance Plan Regulatory Authority

The Barrel Avoidance Plan was intended to show that the dumpsite is adequately-regulated when, in fact, the Department of Interior had no regulatory authority to allow work within the hazardous waste site. EPA never regulated the dumpsite after it was permitted, and EPA never transferred any regulatory authority to the Department of Interior. The primary body of regulations governing offshore oil and gas development is the Outer Continental Shelf Lands Act (OCSLA). These regulations require that geological and geophysical explorations "not be unduly harmful to aquatic life in the area, result in pollution, create hazardous or unsafe conditions, unreasonably interfere with other uses of the area, or disturb any site, structure, or object of historical or archaeological significance."

The Barrel Avoidance Plan developed by Shell Offshore, Inc. specifies a safe standoff distance of 33 feet from any drum. However, the act of "spudding" a well disturbs a much larger area. Spudding a well is similar to pushing a garden hose into the ground under great water pressure to penetrate soft seafloor sediments. The disturbance pattern, known as a "splay," may extend thousands of feet from the spudding well, as shown on the sonar image below. This process also ejects sediments vertically upward into the water column where it may become more bioavailable. Nevertheless, the Department of Interior has allowed the use of the Barrel Avoidance Plan by Shell.


MC 682
OCS-G-21776
Hess Corporation
MC 683
OCS-G-16636
Hess Corporation
MC 726
OCS-G-24101
Hess Corporation
MC 727
OCS-G-24102
Hess Corporation
BP #1 (G24101)
70
PROPOSED WELL LOCATION.
CIRCLE REPRESENTS
2000 FT RADIUS AROUND
PROPOSED WELLSITE.
2007 GREATER TUBULAR BELLS
SONAR TARGETS.
SCALE 1 : 12,000 or 1" = 1,000'
PROJECT NO.: 1210-1868
FILE NAME: 1868-WELL-NW.DWG
HESS
SIDE-SCAN SONAR MOSAIC
BLOCK 726
MISSISSIPPI CANYON AREA
GULF OF MEXICO
MAP NO. D-4

Hess (2015).

As of June 2018, Shell Offshore, Inc. was planning to install a new production platform at the Vito field (Regulations.gov: search term "N10018PublicPlan"). The platform will be tied into multiple pipelines to existing and new subsea fields (Offshore, 2018). The semi-submersible platform will be held in place by 12 moorings (Shell Offshore, Inc., 2018), with their anchor cables draped across the drum field. The moorings will be placed on mud mats, presumably to reduce contamination on the moorings when they are retrieved.

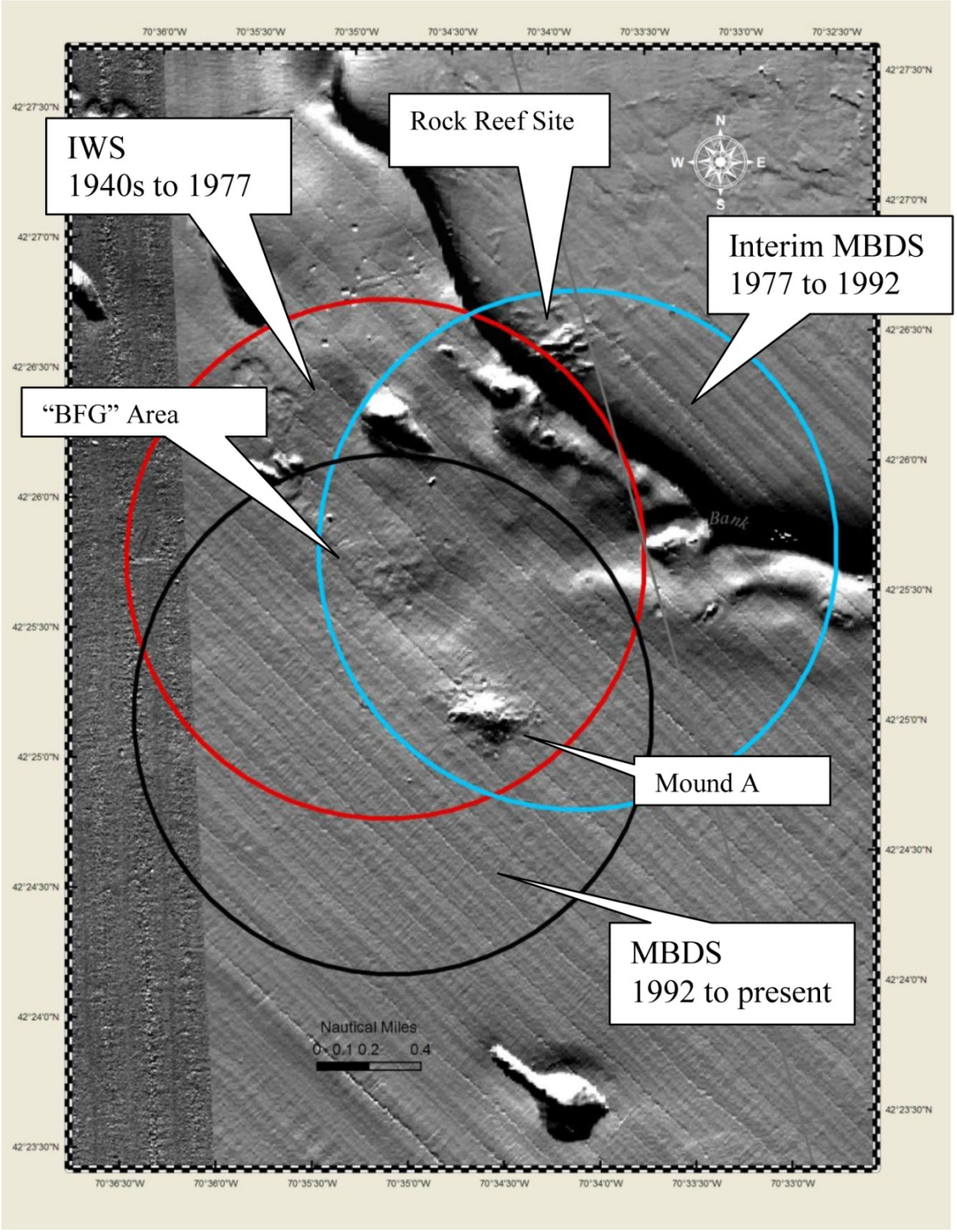
OTHER MPRSA SECTION 102 SITES

The analysis of the MPRSA Section 102 ocean dumping program at EPA Region 6 led to the author's following revelation:

- The MPRSA Section 102 permits between the dates of 1973 and 1977 were issued by EPA for covert disposal of chlorinated hydrocarbons at ocean dumpsites.

Another of these MPRSA Section 102 dumpsites, permitted by EPA Region 1 in Boston, is located at the Stellwagen Bank National Marine Sanctuary, and is believed by the author to be associated with New Bedford and Gloucester Harbors, which are contaminated with polychlorinated biphenyls (PCBs). Section 3.2.3.2 of EPA (2017) indicates pesticides and PCBs were detected in tomalley from lobsters in the area of the site. Table 4 of Section III (B)(2) in Appendix A of EPA (2017) has been redacted to conceal concentrations of PCB and DDT concentrations in sediment, which are also mentioned in the table caption. Appendix C of EPA (2017) includes an estimate that 10,000 to 20,000 barrels are scattered on the seafloor, centered near the northern edge of the former Industrial Waste Site. EPA has confirmed that the MPRSA dump site at Stellwagen Bank was emplaced between 1973 and 1977 (Appendix B: Correspondence, January 16, 2018). There is no evidence that the MPRSA dumpsite at Stellwagen Bank is adequately-regulated by the EPA.

- Based on observations of the Mississippi Canyon Drum Disposal Site and the site at Stellwagen Bank, MPRSA Section 102 dumpsites were emplaced in Federal waters close to, but not at, pre-1970 industrial chemical waste sites, likely so unknowing investigators would assume the barrels were part of the historic dumpsite. The MPRSA sites were never regulated by EPA after permitting. EPA is still withholding permits and barging reports for all MPRSA Section 102 dumpsites except for the EPA Region 6 permits released by the author's FOIA request.



Sonar image showing the Industrial Waste Site (IWS, 1940s to 1977) and the Rock Reef Site, potential areas of the MPRSA Section 102 dumpsite "near the northern edge of the former Industrial Waste Site" (EPA, 2017).

SAN JACINTO RIVER WASTE PITS

Prior to 1953, process wastes from the Shell Chemical Company facility in Deer Park, Texas, were incinerated, which resulted in air pollution problems. In 1953, Shell Chemical Company, with collaboration from Champion Paper and Fibre Company, engaged in ocean disposal of chlorinated hydrocarbons from the Shell Deer Park facility. Under jurisdiction of the Army Corps of Engineers (EPA, 1976), the wastes were pumped from a specially designed barge in an area located about 110 miles south of Galveston, Texas (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).

It has been suggested that Shell and other petrochemical companies also dumped their wastes into the Houston Ship Channel until 1972 (Sarasota Tribune, 1974). A waste management company known as McGinnes Industrial Maintenance Corporation accepted dioxin-contaminated wastes from local industry in the 1960s, and placed this material into an impoundment now known as the San Jacinto River Waste Pits in Channelview, Texas. Champion Paper and Fibre Company is known to have contributed to the impoundment (Texas Monthly, 2015). 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, Texas, 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, 1976).

This history led to another revelation by the author:

- Due to the demonstrated history of the Shell Chemical Company, it is likely that the company contributed to the San Jacinto River Waste Pits, and that this information has been withheld by EPA.

FOOD SAFETY CONCERNS

The Mississippi Canyon Drum Disposal Site is believed by the author to be a major source of synthetic persistent organic pollutants (POPs) that are ubiquitous in marine fauna of the Gulf of Mexico. POPs have been detected in the world's oceans in marine mammals (Green, A. and S. Larson, 2016), fish (Sascha C.T, et. al., 2017), eels (Bonnineau, C., et. al., 2016), oysters (Sericano, T.L. et. al., 1991), birds (Vallarino et. al., 2017), and even the plankton (West, J.E., et. al., 2011).

POPs do not break down or get excreted. Concentrations of POPs bioaccumulate up the food chain, with apex predators (including humans) receiving the highest body burdens. POPs are carcinogenic, and are a major concern for the World Health Organization (WHO, 2010). The breadth of these scientific studies leads to the reasonable conclusion that the seafood supply from the Gulf of Mexico is likely contaminated by dioxin from the drum dumpsite. The author was unable to find any recent governmental screening data of the Gulf of Mexico seafood supply for dioxin.

RECOMMENDATIONS

1. The author respectfully submits that Congress should address the critical issue of invalidating Shell's Barrel Avoidance Plan at the earliest possible date. The Plan is without any regulatory authority and is in violation of the Outer Continental Shelf Lands Act and the Clean Water Act. This will in effect end drilling operations and disturbance within the drum site.

2. Space-use conflicts, such as drilling within the Mississippi Canyon Drum Disposal Site, should be resolved by leaving the oil industry access to reservoirs from outside the drum site via horizontal drilling.

3. Now that these legacy disposal sites have been discovered, the EPA should release all MPRSA permits and barging reports so the sites can be properly regulated and allow the process of risk assessment to begin.

4. Engineered containment caps should be installed over all of the MPRSA dumpsites in an effort to prevent contaminant exposure to the food supply. The capping process should be designed to prevent further damage to drums that could lead to migration of liquid contaminants, and the sites should be periodically monitored.

5. Marine scientists, health professionals, and population dynamics biologists should review the results of their previous studies to ensure their conclusions are still valid given the revelations that these dumpsites exist, and an exposure pathway to humans and other animals is likely present.

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LIST OF ACRONYMS

ATSDR	Agency for Toxic Substances and Disease Registry
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
CIA	Central Intelligence Agency
2,4-D	2,4-Dichlorophenoxyacetic acid
DDT, D-D	Dichloro-diphenyl-trichloroethane
EPA	Environmental Protection Agency
FBI	Federal Bureau of Investigation
FOIA	Freedom of Information Act
HMB-1	Hughes Mining Barge
IRA	Immediate Response Action
MMS	Minerals Management Service
MPRSA	Marine Protection, Research and Sanctuaries Act of 1972
NAS	National Academy of Sciences
NCBC	Naval Construction Battalion Center, Gulfport, Mississippi
NOAA	National Oceanic and Atmospheric Administration
OCSLA	Outer Continental Shelf Lands Act
OIG	Office of the Inspector General
POP	Persistent Organic Pollutant
RMA	Rocky Mountain Arsenal
ROV	Remotely Operated Vehicle

2,4,5-T	2,4,5-Trichlorophenoxyacetic acid
TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin (Dioxin)
VA	Veteran's Administration
WHO	World Health Organization