Environmental Racism in Death Alley, Louisiana
Phase I Investigative Report

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1. Acknowledgments

This investigation was commissioned by RISE St. James, a faith-based, fenceline community activist organization based in St. James, Louisiana.[1] Our work is guided by their strategic brilliance, wisdom, and contribution to our research process. Along with RISE, we are fortunate to be grounded within a large coalition of collaborating institutions without whom this investigation would not have been possible. These collaborating institutions include (in alphabetical order): Center for Constitutional Rights (CCR), Center for International Environmental Law (CIEL), The Descendants Project, Earthworks, Healthy Gulf, Imperial College London, Louisiana Bucket Brigade (LBB), Louisiana Museum of African American History (LMAAH), The Human Rights Advocacy Project, Loyola New Orleans College of Law, The Ethel and Herman L. Midlo Center for New Orleans Studies, Whitney Plantation Museum. We have learned so much together.

In addition to these institutional collaborators, we have consulted with a number of individuals on elements of the investigation, as well as the drafting of this report. These individuals include Sharon Lavigne, August Gomez, Milton Cayette, Chasity White, Stephanie Cooper, Jo Banner, Joy Banner, Jordan Brewington, Leon A. Waters, Don Hunter, D. Ryan Gray, Salvador Navarro-Martinez, Devin Ngetich, Ludovico Palmeri, Bryan C. Lee, Jr., Jeremy Blum, Tammie Mills, and Alahna Moore.

Our methodology is indebted to two strands of work: 1. the multigenerational efforts of Louisiana's Black descendant communities-at-large and individual genealogists, scholars, and people's historians to defend, retain, and recover knowledge of the locations of their ancestral sites, and 2. the foundational work on cartographic regression laid by the archaeology firm Coastal Environments, Inc., which has a dedicated staff of archaeologists and historians working to unearthing the true history and culture of Louisiana, a rarity in the current climate of for-profit archaeology.

Our research is but one link in a long chain of resistance. All of our research will be made open source and available to Louisiana's descendant communities to support their longstanding efforts to recover lost and erased ancestral sites and to demand environmental justice and reparations.

2. Introduction

In 2015, two cemeteries holding the remains of over 1,000 historically enslaved people were uncovered on the Monroe/Houmas and Bruslie (Brulé) Plantations, now owned by Shell Oil Company,[2] during a survey for a proposed expansion of the Shell Convent Refinery, which occupies the adjacent Bruly (Tureaud), Union, and Bagatelle Plantations.[3] For decades, Black residents of neighbouring communities had attempted to alert archaeologists and state officials to the locations of these cemeteries – only to have their ancestral knowledge dismissed, their ancestral burial grounds left to fall into neglect and under the threat of development.

[1] *RISE St. James [Facebook].* https://www.facebook.com/risestjames/.
[2] A US subsidiary of Dutch/British joint-venture Royal Dutch Shell.
[3] Terry L. Jones, "Slave cemetery dedication Saturday at Shell refinery in Ascension drawing national media interest", *The Advocate*, March 23, 2018, https://www.theadvocate.com/baton_rouge/news/article_b37d1002-2ec7-11e8-8ebc-0fae4d886d88.html/.

When, in 2018, the petrochemical company Formosa Plastics announced its plans to construct a new 3.5-square mile plastic nurdles[4] production complex (the so-called 'Sunshine Project'), they hired archaeology firm Cox McLain to conduct a cultural resources survey in accordance with federal law.[5] (Section 106 of the National Historic Preservation Act [NHPA][6] requires any development activity permitted by a federal agency to take into account the effects of the undertaking on historic properties.)[7] Cox McLain's survey determined that no historic properties were eligible for inclusion on the National Register of Historic Places—and it found no cemeteries. Formosa's permits were approved.

Yet members of RISE St. James knew that there were unmarked graves on that land. They hired Coastal Environments, Inc., an environmental consulting firm, to investigate[8] Cox McLain's archaeological findings. On 23 December 2019, the Center for Constitutional Rights, RISE's legal counsel, announced the identification of four cemeteries on several plantations, three of which compose Formosa's property.[9] The 'Sunshine Project' is permitted by the state to release 1.6 million pounds of toxic air pollutants in a parish where existing plants already produce 1.4 million pounds of toxic air pollutants annually. Included in these figures are 7.7 tonnes (15,400 pounds) of ethylene oxide—a highly carcinogenic chemical gas linked to breast and lymphatic cancer.[10] The plant's construction has been vigorously contested by local communities who are already overburdened by some of the most toxic air in the United States.

Louisiana's Petrochemical Corridor overlays a territory formerly called 'Plantation Country.' By the time slavery was abolished in 1865, more than five hundred sugarcane plantations formed a seamless mosaic straddling both sides of the lower Mississippi River. Today, more than two hundred of these fallow plantation sites are occupied by some of the nation's most polluting petrochemical facilities. Historically, at least one, and sometimes as many as three cemeteries for enslaved peoples were established on each plantation, by the enslaved themselves. There are therefore hundreds, if not thousands,[11] of cemeteries at risk from industrial activity.

In the 1980s, local residents began to refer to the region as 'Cancer Alley'. Today, seven of the ten census tracts with the highest rates of cancer in the nation are

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[4] Nurdles are cylindrical-shaped, pre-production plastic pellets; a nurdle is the smallest unit of plastics production.
[5] See: Rush, et al, 2018.
[6] National Park Service, "National Historic Preservation Act, Section 106", *Department of the Interior,* 2012. Available at: https://www.nps.gov/history/tribes/Documents/106.pdf/.
[7] Historic properties are any prehistoric or historic districts, sites, buildings, structures, or objects that are eligible for or already listed in the National Register of Historic Places. Also included are any artifacts, records, and remains(surface or subsurface)that are related to and located within historic properties and any properties of traditional religious and cultural importance to Tribes or NHOs.
[8] Coastal Environments, Inc. Cartographic Regression Analysis of Certain Tracts of Land Located in T.11S and T.12S., R.15E. (Southeastern Land District West of the Mississippi River), St. James Parish, Louisiana, February 19, 2020.
[9] Center for Constitutional Rights, 'Letter to St. James Parish Council re: Request to Rescind Decision Set out in Resolution 19-07 Granting Formosa's Land Use Application in Light of Previously Undisclosed Information Revealing the Existence of Burial Sites of Enslaved People on Property Proposed for a Formosa Plastics Plant', December 23, 2019. Available at: https://ccrjustice.org/sites/default/files/attach/2019/12/RISE%20Letter%20to%20St.%20James%20Parish%20Council%20Burial%20Sites%2012.23.2019.pdf.
[10] Andrew J. Yawn, "'St. James is full': New Cancer Alley plant may double toxic pollutants, EPA data shows", March 19, 2020. Available at: https://eu.tennessean.com/in-depth/news/american-south/2020/03/19/st-james-parish-louisiana-cancer-alley-formosa-plant-pollution/4809422002/
[11] Kevin McGill, "As Shell preserves Louisiana slave burial ground, question persists: Where are the rest?", *The Advocate,* June 14, 2018, https://www.theadvocate.com/baton_rouge/news/article_5a1ab0fa-6fdb-11e8-b6d6-932aad7138e2.html/.

located there[12] and residents now refer to their homeland by an even more damning and all-encompassing epithet: 'Death Alley'. Sharon Lavigne, founder of RISE, has told us that she feels as though she is 'on death row, just waiting to die.' She wants, above all, to stop the industry from digging up her ancestors to build more of the plants that are killing her community.

In 2014, the St. James Parish Council passed a comprehensive plan said to 'sustain the values of its citizens.'[13] The document begins by reminiscing about a bygone era of 'luxurious living and delightful ease', when acres of land were 'counted by thousands and slaves by hundreds'. It goes on to write off the majority-Black community of Burton Lane as 'industrial' and prefigure the majority-Black community of Welcome as 'existing residential/future industrial'.[14]

Prior to the construction of a petrochemical plant, the operating corporation must apply for water, air, and land use permits from federal, state, and local agencies. In theory, the permitting process is designed to mitigate the industry's impact on commonly held resources: the air, the water, and the land. Yet because this regulatory regime is built on a deep foundation of structural racism, it effectually regulates communities, along with their culture and history, out of existence. Ecological degradation, climate change and cancer risk are contemporary inheritances, and by-products, of colonial genocide and slavery. Through the lens of petrochemical plantation burial grounds, we can recognise Death Alley as a 300-year-old continuum of environmental racism.

If toxic air is a monument to slavery, how do we take it down? Louisiana state law has some of the most comprehensive legal protections for cemeteries in the nation.[15] Once a body is interred, that land is 'dedicated' as a cemetery and is protected into perpetuity. In order to protect the land, and the people living on that land, we must locate hundreds of missing cemeteries before industry breaks ground.

RISE St. James has commissioned Forensic Architecture to gather evidence in support of their claims for accountability and reparations and develop a predictive method for identifying the locations of antebellum Black cemeteries before industry breaks ground. Our investigation draws focus to elements of the climate of racism[16] that linger just beyond the threshold of visibility: the lethal chemical agents that pervade the air, and the traces of erased Black cemeteries that cling to the surface of the earth. Together with a broad coalition of activists, archaeologists, people's historians, and scholars, RISE and Forensic Architecture are locating a path forward, guided by a locally imagined reconceptualization of 'historical preservation' that recognizes ecological reparations as an impediment to petrochemical development.

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[12] Yawn, 2020.

[13] St. James Parish Government, "Exhibit A, March 5th 2014 Resolution, St. James Parish Planning Commission, St. James Parish Government Comprehensive Plan 2031", *South Central Planning and Development Commission*, March 5, 2014. Available at: http://www.stjamesla.com/DocumentCenter/View/283/St-James-Parish-Comprehensive-Plan-PDF?bidId=/.

[14] The original 30-year plan was drafted in 2011 as part of a public planning process. The document was later revised and adopted in 2014 without further public consultation. The revised version changes the designation of parts of the 5th district from "residential" to "residential/future industrial". It was after this plan that St. James came to be known as an "industrial crude hub". According to ProPublica (2019) 7 facilities were approved since then and 5 awaited approval. Of these, at least 2 have been approved (Formosa and Ergon expansion).
See: RISE St. James and the Louisiana Bucket Brigade, "A Plan without a People: Why the St. James Parish 2014 Land Use Plan Must Be Changed", June 2019. Available at: https://labucketbrigade.org/a-plan-without-people/.

[15] See: Division of Archaeology, Office of Cultural Development, State of Louisiana, "State Legislation". Last accessed: June 24, 2021. Available at: https://www.crt.state.la.us/cultural-development/archaeology/CRM/state-legislation/index/.

[16] Inspired by Christina Sharpe, *In the Wake: On Blackness and Being* (Croydon: Duke University Press, 2016).

2.1 About Forensic Architecture

Forensic Architecture (FA) is a cutting edge investigative research agency based at Goldsmiths, University of London. Since 2010, FA has developed original and ground-breaking investigative techniques and deployed them in over 70 bold and impactful investigations. We work in partnership with communities affected by human rights violations and state violence, alongside leading media outlets including the New York Times and the Guardian, activists, legal teams, and NGOs including Greenpeace, Amnesty, Bellingcat, and Human Rights Watch.

We have provided spatial research and evidence for numerous human rights investigations and prosecutions under international law, including at the UN General Assembly in New York in October 2013 and the Human Rights Council in Geneva in 2014 (on drone warfare via the UNSRCT[17]).

Our report on the Use of White Phosphorous in Urban Environments was presented at the UN Human Rights Council Geneva in November 2012 and in March 2011 at the Israeli High Court (for Yesh Gvul via Michael Sfrad).

The Forensic Oceanography team (Charles Heller and Lorenzo Pezzani) from Forensic Architecture presented the case of the Left to Die Boat before the French Tribunal de Grand Instance in April 2012, the Brussels Tribunal de première instance in November 2013, and in the courts of Spain and Italy on June 2013.

The Gaza Platform and our Rafah: Black Friday report about the 2014 Gaza War, developed together with Amnesty International, was submitted to the UN Independent Commission of Inquiry on March 2015 and to the ICC[18] in March and September 2015.

We presented evidence in the Israeli High Court for the (Palestinian) village of Battir vs. the Ministry of Defence through Michael Sfard, who won this case on 4 January 2015.

Our 2017 investigation into the murder of Halit Yozgat in Germany was presented to multiple state and federal parliamentary inquiries in the country. Our investigation into the murder of Pavlos Fyssas was played before the Court of Appeals of Athens in 2018, and our findings were critical to the conviction of the neo-Nazi organisation.

Our investigation into the presence of Russian military units in eastern Ukraine in 2014 was submitted to the European Court of Human Rights in 2019 as part of an ongoing case.

In 2020, our investigation into intentional fire-setting to clear rainforest land in Papua contributed to legal challenges against the palm oil agglomerate Korindo, by Greenpeace and partners, and was presented in Indonesian courts.

For more info, please visit: www.forensic-architecture.org

[17] United Nations Special Rapporteur for Counter Terrorism
[18] International Criminal Court

2.2 Issues to be addressed

Since September 2020, Forensic Architecture has undertaken Phase 1 of a multifaceted investigation into the spatial logics imposed by colonialism and slavery that have produced a persistent regional condition of environmental racism known today as 'Death Alley'.

Louisiana's air emissions standards are among the loosest in the US.[19] According to ProPublica, the state 'does not regularly monitor air near major polluters like other states... [and w]hile the EPA considers the effect of a variety of chemicals, taken together, Louisiana only looks at one chemical at a time, potentially undercounting the true effect on air quality.'[20] To expose the scores of criteria pollutants and toxic air pollutants impacting communities in Death Alley, we have mobilised a suite of techniques, including fluid dynamics simulation and optical gas imaging, that can render invisible lethal agents visible. Our modelling enables us to bring enhanced visibility to the longstanding claims of those communities being smothered by toxic clouds.

During the first half of the 19th century, in the lead-up to the American Civil War, colonial land grants were rapidly consolidated into industrial plantations spanning thousands of acres and worked by hundreds of enslaved people. The vast scale of industrialised agriculture necessary for the profitable cultivation of sugarcane laid the ground for the region's spatio-economic transition to industrial petrochemical production. As we have learned through conversations with Mr. Leon A. Waters, Co-founder and Board Chairperson of the Louisiana Museum of African American History (LMAAH), the Petrochemical Corridor first emerged with the arrival of the New Orleans Refining Company (NORCO, now owned by Shell Oil Company) in 2016, and expanded rapidly during the first plastics boom of the 1960s.[21] NORCO transformed the Black 'freetown' communities of Diamond and Sellers, which had grown out of the ruins of the Prospect and Good Hope Plantations, into 'fenceline' communities that neighbour large-scale industrial facilities; it also likely crushed numerous unmarked burial grounds in the process.[22] NORCO inherited a mindset that readily sacrifices Black life, history, and culture in the pursuit of profit – development patterns that persist to this day.

While most cemeteries are unmapped, when we do find them (whether because they are known to local residents, located by sympathetic archaeologists, or stumbled upon during the course of industrial development), they appear at first to exist where one would least expect them: isolated in seas of cultivated sugarcane fields. When considered within the cold calculus of the slave-powered plantation regime, we can discern a certain logic: their siting was a by-product of the plantation's development.

FA has sourced and interpreted a collection of primary source documents spanning 300 years. Through it, we can discern the spatial logics of the industrial sugarcane

[19] Tristan Baurick, "Welcome to 'Cancer Alley,' Where Toxic Air Is About to Get Worse." *ProPublica*, October 30, 2019, https://www.propublica.org/article/welcome-to-cancer-alley-where-toxic-air-is-about-to-get-worse/.
[20] ibid.
[21] A parish is a county in Louisiana. The exact extent of the region varies; for the purposes of this study, our definition includes all or parts of West and East Baton Rouge, Iberville, Ascension, St. James, St. John the Baptist, St. Charles, Jefferson, and Orleans Parishes. See: Tegan Wendland, *Louisiana's Chemical Corridor Is Expanding. So are Efforts to Stop it*, *NPR*, March 20, 2020, https://www.npr.org/2020/03/20/814882296/louisianas-chemical-corridor-is-expanding-so-are-efforts-to-stop-it/.
[22] Conversation with Leon A. Waters, Co-founder and Board Chairperson, Louisiana Museum of African American History, February 2, 2021.

plantation, decode the symbology used to represent cemeteries and other landmarks of the necro-industrial landscape, learn to read the surface of the earth for traces of the past left off of these maps, and track the transformation and persistence of land use practices across the developmental stages of corporate-colonial capitalism along the lower Mississippi River.

If a development requires federal permits, the developer must commission an archaeological firm to conduct a 'cultural resources survey' to identify any cultural and historical resources that would be impacted by the development. In theory, Louisiana's state laws on cemetery protection are among the most comprehensive in the country. These laws were drafted in response to the federal Native American Graves Protection and Repatriation Act (NAGRPA) of 1992 and were designed to close many of the gaps in cemetery protections at that time. These state laws were designed to give special consideration to the unique precarity of indigenous burial grounds. There are no laws, however, that take into consideration the precarity of Black burial grounds, which are themselves uniquely threatened by present-day industrial development, as well as by centuries of dehumanisation, devaluation, neglect, and erasure. As they stand, state and federal laws, and the regulatory policies that enforce them, are powerless to combat the rampant conflicts of interest that pervade decisions around land use in Louisiana's Petrochemical Corridor. Still, these lacunae in the law also offer possibilities for transformation. First, however, the case for the sacredness of this imperilled landscape must be made. FA has built a body of evidence that local residents can use to make this case.

3. Research Framework

3.1 Sources

In the process of the investigation, Forensic Architecture has relied upon a significant number of primary sources and material, obtained through different repositories. This material includes, but is not limited to, the following categories: surveys and maps; aerial and satellite imagery; government regulatory and property databases; archaeology reports; archival imagery; and ground footage. The most significant sources are listed below:

SURVEYS AND MAPS

1. **1821, Auguste Bonnet.** 'Manuscript 25 June 1821 Survey of the Property of Robert Conway, Folder 13, RJC, E.L.25.1988'.
2. **1858, A. Persac.** 'Norman's Chart of the Lower Mississippi River'. New Orleans, Louisiana: B. M. Norman.
3. **1877, U.S. Coast Survey (USCS).** 'Mississippi River Louisiana from New Orleans to Point Houmas (Series)'. 1:20,000. Registers No. 1429a, 1429b, 1480a, 1480b, 1481a, 1481b.
4. **1878, U.S. Coast Survey (USCS).** 'Mississippi River Louisiana from Soniat Plantation to Point Houmas (Series)'. 1:20,000. Sheets No. 9-13.
5. **1894, Mississippi River Commission (MRC).** 'Survey of the Mississippi River (Series)'. 1:20,000. Charts No. 66-75.
6. **Survey Plats, U.S. Bureau of Land Management (BLM).** Dated between 1810-1910.
7. **Topographical Quadrangles, U.S. Geological Survey (USGS).** Dated between 1892-1949, various scales.

AERIAL AND SATELLITE IMAGERY

1. **1940, U.S. Department of Agriculture (USDA).** 'Aerial Imagery of Ascension, St. James, and St. John Baptist Parishes, Louisiana.' 1:20,000.
2. **1952, U.S. Geological Survey (USGS).** 'Aerial Imagery of Ascension, St. James, and St. John Baptist Parishes, Louisiana'. 1:69,000.
3. **1961, U.S. Geological Survey (USGS).** 'Aerial Imagery of Ascension, St. James, and St. John Baptist Parishes, Louisiana'. 1:22,000.
4. **1970, U.S. Geological Survey (USGS).** 'Aerial Imagery of Ascension, St. James, and St. John Baptist Parishes, Louisiana'. 1:62,405.
5. **1985, U.S. Geological Survey (USGS).** 'Aerial Imagery of Ascension, St. James, and St. John Baptist Parishes, Louisiana'. 1:67,000.
6. **2005, U.S. Department of Agriculture (USDA), Farm Service Agency.** 'Aerial Imagery of Ascension, St. James, and St. John Baptist Parishes, Louisiana (NAIP)'.
7. **2021, Google Earth.** 'Satellite Imagery of Ascension, St. James, and St. John Baptist Parishes, Louisiana'.

DATASETS

1. **Permitted and Actual Emissions by Radius Report, 2019.** Emissions Reporting and Inventory Center (ERIC), Air Permitting Division, Louisiana Department of Environmental Quality. 80km radius from -90.82323, 29.97088.
2. **Lines, Coastal Management Permits, Feb 2021.** Louisiana Department of Natural Resources.
3. **Development-Ready Sites, Feb 2021.** Louisiana Economic Development.
4. **Seventh Census of the United States, 1850.** United States Department of the Census.
5. **Eighth Census of the United States, 1860.** United States Department of the Census.
6. **Nonpopulation Census Schedules for Louisiana, 1850-1880.** United States Department of the Census.
7. **Parcels, 2020.** Ascension Parish Tax Assessor.
8. **Parcels, 2020.** St. James Parish Tax Assessor.
9. **Parcels**, **2020.** St. John the Baptist Parish Tax Assessor.

ARCHAEOLOGY REPORTS

1. Coastal Environments, Inc. Cartographic Regression Analysis of Certain Tracts of Land Located in T.11S and T.12S., R.15E. (Southeastern Land District West of the Mississippi River), St. James Parish, Louisiana, February 19, 2020.
2. Pearson, Charles. Cultural Resources Survey of Wilton and Helvetia Plantations, St. James Parish, Louisiana. Coastal Environments, Inc, 1979.
3. Port, Dave, and Thurston Hahn. Monroe/Houmas (Site 16AN31) and Bruslie/Brulé (Site 16AN32) Plantations Phase I/II Cultural Resources Investigations Ascension and St. James Parishes, Louisiana, Sep 2015.

4. Rush, Haley, et al. Phase I Archaeological Survey of the Proposed FG LA LLC Project Site with Phase II Testing at 16SJ109, St. James Parish, Louisiana. Cox McLain Environmental Consulting, March 7, 2019.
5. Shuman, Malcolm K., Gabour, Lea Taylor, Kerr, Brandy and Taylor, Phillip K. Phase One Cultural Resources Survey of 673.9 Acres (272.67 Hectares) Proposed for Industrial Use, Burnside, Ascension Parish, Louisiana. Phase One Cultural Resources Survey. Baton Rouge, LA, USA: SURA, Inc., 25 Apr 2014.

ARCHIVAL IMAGERY

1. Garrett, Albert G. *Part of the Quarters Looking from Sugar House toward River*. Photograph, 1907 1905. The Historic New Orleans Collection.
2. Guion, William. *Virtual Tour*. Photograph, n.d. Evergreen Plantation. (009, 012, 013, 022-030).
3. Mugnier, George François. *Back View of Evan Hall with Annex*. Photograph, 1888. The Historic New Orleans Collection.
4. Mugnier, George François. *Birds Eye View, Evan Hall Plantation*. Photograph, 1889. The Historic New Orleans Collection.
5. Mugnier, George François. *Cane Shed*. Photograph, 1889. The Historic New Orleans Collection.
6. Mugnier, George François. *Cane Shed, Evan Hall Plantation*. Photograph, 1889. The Historic New Orleans Collection.
7. Mugnier, George François. *Part of Slave Quarters*. Photograph, 1888. The Historic New Orleans Collection.
8. Mugnier, George François. *Quarters, Evan Hall Plantation*. Photograph, 1889. The Historic New Orleans Collection.
9. Mugnier, George François. *Residence, Evan Hall Plantation*. Photograph, 1889. The Historic New Orleans Collection.
10. Mugnier, George François. *Sugar House, Evan Hall Plantation*. Photograph, 1889. The Historic New Orleans Collection.
11. Sutton, Sam R. *Whitney Plantation*. Photograph, October 1967. The Historic New Orleans Collection.
12. Unknown. *Alphonse & Mac*. Photograph, 1895 1888. The Historic New Orleans Collection.
13. Unknown. *Evergreen*. Photograph, n.d.
14. Unknown. *In the Quarters*. Photograph, 1895 1888. The Historic New Orleans Collection.

VIDEO FOOTAGE

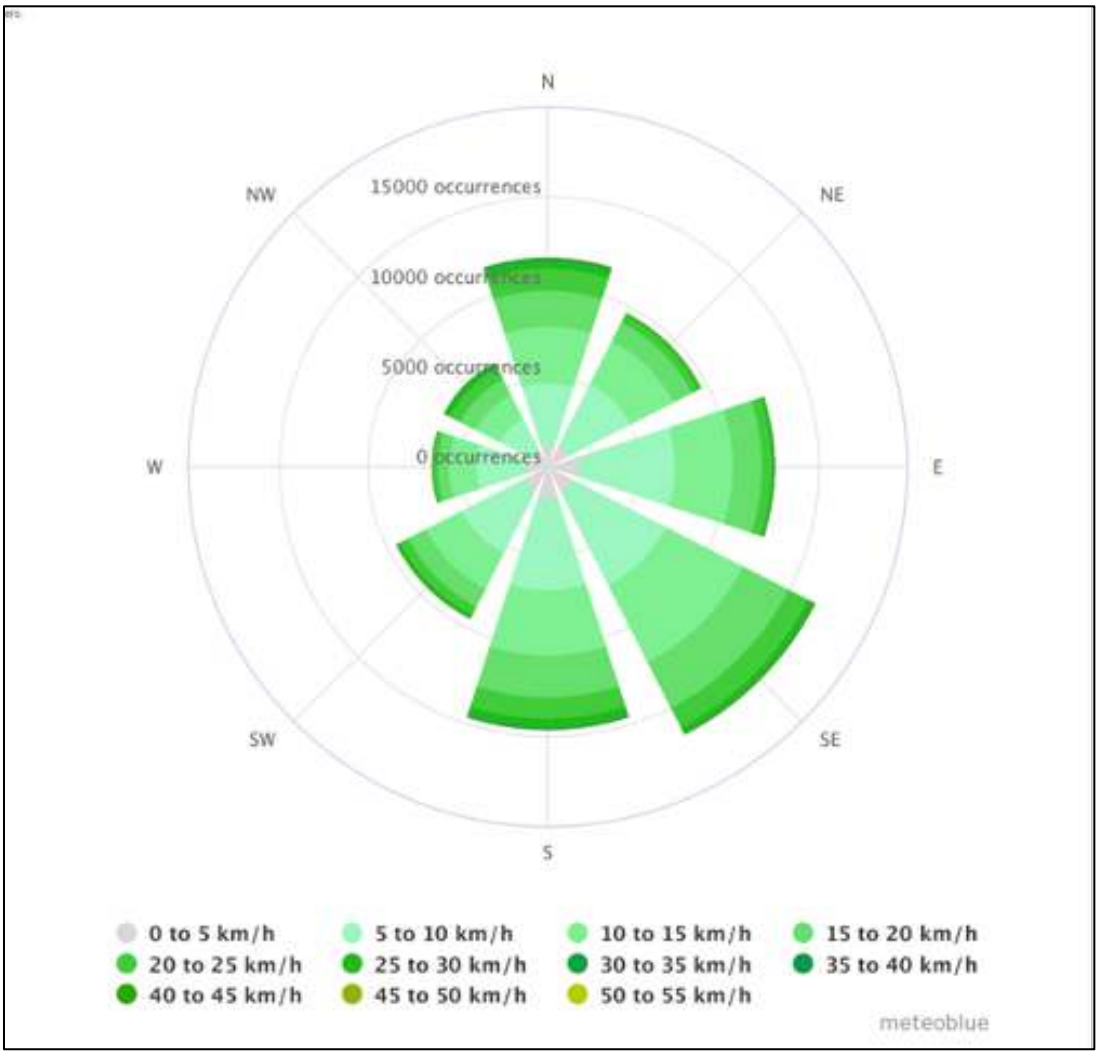
1. **Video footage of a flare at CF Industries Nitrogen professing facility, Donaldsonville, Louisiana.** RISE St. James. 23 Mar 2021.
2. **Drive along Highway 18, St. James, Louisiana.** Milo Daemgen and Bao Ngo. 11 May 2021.
3. **Drone footage of Acadia Plantation Cemetery.** Tammie Mills for Louisiana Bucket Brigade. 19 Aug 2021.
4. **Drone footage of Bruslie Plantation Cemetery.** Tammie Mills for Louisiana Bucket Brigade. 13 Apr 2021.

5. **Drone footage of construction at Formosa Plastics construction site.** Tammie Mills for Louisiana Bucket Brigade. 13 May 2020.
6. **Video footage of RISE St. James Juneteenth 2020 memorial.** Bron Moyi for Louisiana Bucket Brigade.19. Jun 2020.
7. **Video footage of the removal of Lee Monument, New Orleans, Louisiana.** One Drop Pictures. 19 May 2017.
8. **Optical gas imaging of 33 facilities in Ascension, St. James, and St. John the Baptist Parishes.** Forensic Architecture with Earthworks. 18 and 19 May 2021.

3.2 Assessment of sources

3.2.1 Air

Meteorological Data



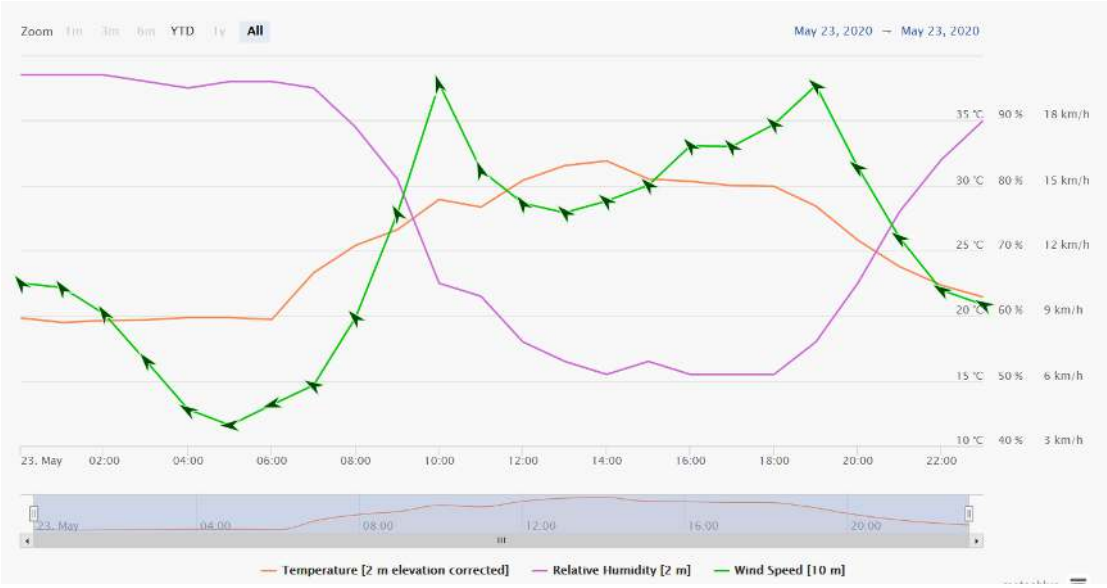
Number of occurrences of various prevailing wind conditions over a period of ten years.

In order to simulate air emissions from facilities in Death Alley, we needed to anchor the model in local weather conditions. We simulated the weather using data from Grand Point, a local weather station in St. James Parish with coordinates of 30.06°N,

90.75°W, accessed through Meteoblue.[23] Meteoblue is a meteorological service created at the University of Basel, Switzerland, which offers consistent weather simulation data in hourly resolution for different altitudes, dating back to 1985. Meteoblue's archived weather simulations are assembled into continuous time series.

The wind rose diagram developed from this archive shows the different prevailing wind conditions over a period of ten years between April 2011 and 2021.

20 Mar 2021 – NE winds (primarily September to November)



23 May 2020 – SE winds. Predominant prevailing wind direction (six months of the year)

[23] https://www.meteoblue.com

14 Aug 2020 – SW winds (primarily July and August)

We selected three days between April 2020-2021 with SE, SW, and NE prevailing wind conditions, ensuring that our simulation captured a broad range of communities in the cross-path of these emissions as the wind changed direction. For each day, we simulated the meteorological conditions for a period of twelve hours, between 7am and 7pm.

Emissions Sources

The Louisiana Department of Environmental Quality, Air Permitting Division, maintains emission inventory (EI) data of both permitted and actual (reported) emissions of criteria pollutants and toxic air pollutants in its Emissions Reporting and Inventory Center (ERIC).[24] It also maintains air permits data in the TEMPO database. The Actual Emissions Report, Permitted Emissions Report, and other information provided on their website are designed to assist industry with the preparation of permit applications and dispersion modelling.

We collected permitted emissions reports from 2019 for six permitted pollutants within a 60km radius from a coordinate centre point of -90.82323, 29.97088: ammonia, benzene, chloroprene, ethylene oxide, nitrogen oxides (nitric oxide and nitrogen dioxide), and particulate matter (PM 2.5). Each permitted emission report is a compendium of information from a variety of permit applications from each facility permitted by LDEQ within the given geographic area. All point sources of criteria pollutants and toxic air emissions are listed for each facility. Many facilities have dozens of emissions points. For each emissions point, we input the longitude and latitude coordinates, stack height and diameter, rate of emission, and exit gas temperature, using those known parameters to model the speed, dispersal, and direction of air emissions across the focus area.

[24] https://business.deq.louisiana.gov/Eric/EricReports

According to an LDEQ document titled 'Limitations of the Actual and Permitted Emissions Reports,'[25] the data provided by these reports must be reviewed by the user and will require additional information and verification for the data to be determined complete and acceptable for each usage. Scanned documents in the Public Records EDMS system should be reviewed for any facilities, permits, equipment, and/or release point/stack data, or any other necessary information that may not be captured in the ERIC and TEMPO databases.

Parish	e Point UTM Easti	Point UTM North	ease Point UTM Z	Latitude	Longitude	ce from Center Po	Emission Rate	mission Rate Unit	Statistical Basis
Ascension	687269.4089	3344601.442	15	30.21853	-91.05424	33866.4	0.01	tons/yr	Annual maxim...
Ascension	687269.4089	3344601.442	15	30.21853	-91.05424	33866.4	0.01	lb/hr	Hourly average
Ascension	687269.4089	3344601.442	15	30.21853	-91.05424	33866.4	0.01	lb/hr	Hourly maximu...
Ascension	693296.1037	3343479.262	15	30.207465	-90.991859	29398.4	0.8	tons/yr	Annual maxim...
Ascension	693296.1037	3343479.262	15	30.207465	-90.991859	29398.4	0.18	lb/hr	Hourly average
Ascension	691703.335	3343175.191	15	30.204975	-91.008453	30029.3	0.81	tons/yr	Annual maxim...
Ascension	691703.335	3343175.191	15	30.204975	-91.008453	30029.3	0.44	lb/hr	Hourly average
Ascension	691457.6699	3343350.741	15	30.206597	-91.010972	30314.8	0.85	lb/hr	Hourly maximu...
Ascension	691269.1943	3343229.697	15	30.205535	-91.012951	30325.7	0.39	tons/yr	Annual maxim...
Ascension	691269.1943	3343229.697	15	30.205535	-91.012951	30325.7	0.22	lb/hr	Hourly average
Ascension	691269.1943	3343229.697	15	30.205535	-91.012951	30325.7	1.35	tons/yr	Annual maxim...

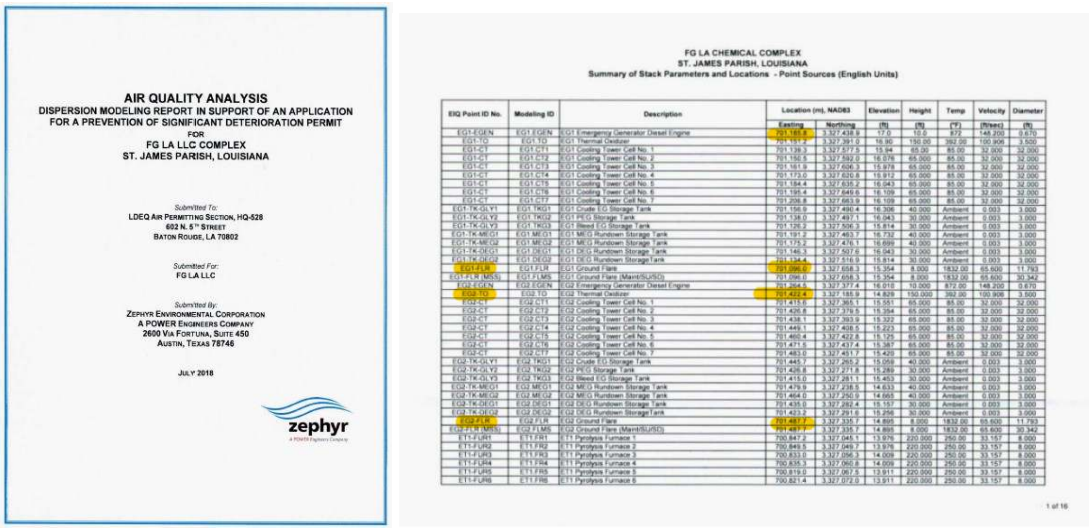
Screenshot from LDEQ ERIC database showing a sample of emission source points and corresponding information, which we used to build our toxic air and criteria pollutants simulation.

We identified two discrepancies in the database and corrected them in accordance with the LDEQ's guidelines. Only data from issued Title V permits and Minor Source/Small Source Mod permits are included in the permitted emissions report; data from open and pending permit applications are not included.

Formosa (dba/permitted as FG LA, LLC) is among the facilities with permits to emit five out of our six selected pollutants: ammonia, benzene, ethylene oxide, nitrogen oxides, and PM 2.5. The coordinates of the emission points for these pollutants were listed incorrectly in their permitted emissions report.

We adjusted them using coordinates listed in a section titled 'Summary of Stack Parameters and Locations' in Formosa's Air Quality Analysis (AQE), which was submitted to LDEQ in Jul 2018.[26] The document was accessed via LDEQ.

[25] "Limitations of the Actual and Permitted Emissions Reports". Air Permitting Division, Louisiana Department of Environmental Quality. Updated Mar 2021.
[26] Zephyr Environmental Corporation (submitted for FG LA LLC), "Air Quality Analysis: Dispersion Modelling Report in Support of an Application for a Prevention of Significant Deterioration Permit for FG LA LLC Complex, St. James Parish, Louisiana", submitted to LDEQ Permitting Section, HQ-528, July 2018.



AIR QUALITY ANALYSIS
DISPERSION MODELING REPORT IN SUPPORT OF AN APPLICATION FOR A PREVENTION OF SIGNIFICANT DETERIORATION PERMIT
FOR
FG LA LLC COMPLEX
ST. JAMES PARISH, LOUISIANA

Submitted To:
LDEQ Air Permitting Section, HQ-528
602 N. 5TH Street
Baton Rouge, LA 70802

Submitted For:
FG LA LLC

Submitted By:
Zephyr Environmental Corporation
A Power Engineers Company
2600 Via Fortuna, Suite 450
Austin, Texas 78746

July 2018

zephyr

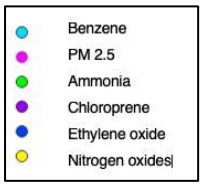
FG LA CHEMICAL COMPLEX
ST. JAMES PARISH, LOUISIANA
Summary of Stack Parameters and Locations - Point Sources (English Units)

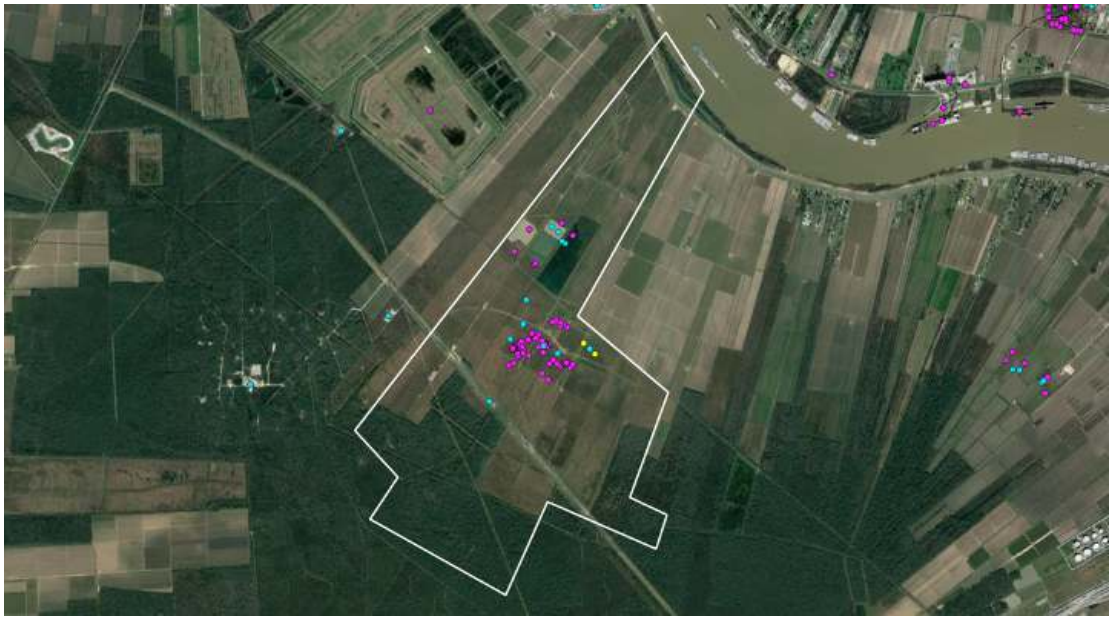
EIQ Point ID No.	Modeling ID	Description	Location (m), NAD83		Elevation	Height	Temp	Velocity	Diameter
			Easting	Northing	(ft)	(ft)	(°F)	(ft/sec)	(ft)
EG1-EGEN	EG1.EGEN	EG1 Emergency Generator Diesel Engine	701,185.6	3,327,438.9	17.0	10.0	872	148.200	0.670
EG1-TO	EG1.TO	EG1 Thermal Oxidizer	701,183.2	3,327,391.0	16.90	150.00	392.00	100.906	3.500
EG1-CT	EG1.CT1	EG1 Cooling Tower Cell No. 1	701,139.3	3,327,577.5	15.94	65.00	85.00	32.000	32.000
EG1-CT	EG1.CT2	EG1 Cooling Tower Cell No. 2	701,150.5	3,327,592.0	16.076	65.000	85.00	32.000	32.000
EG1-CT	EG1.CT3	EG1 Cooling Tower Cell No. 3	701,161.9	3,327,606.3	15.976	65.000	85.00	32.000	32.000
EG1-CT	EG1.CT4	EG1 Cooling Tower Cell No. 4	701,173.0	3,327,620.8	15.912	65.000	85.00	32.000	32.000
EG1-CT	EG1.CT5	EG1 Cooling Tower Cell No. 5	701,184.4	3,327,635.2	16.043	65.000	85.00	32.000	32.000
EG1-CT	EG1.CT6	EG1 Cooling Tower Cell No. 6	701,195.4	3,327,649.6	16.109	65.000	85.00	32.000	32.000
EG1-CT	EG1.CT7	EG1 Cooling Tower Cell No. 7	701,206.8	3,327,663.9	16.109	65.000	85.00	32.000	32.000
EG1-TK-GLY1	EG1.TKG1	EG1 Crude EG Storage Tank	701,156.9	3,327,490.4	16.306	40.000	Ambient	0.003	3.000
EG1-TK-GLY2	EG1.TKG2	EG1 PEG Storage Tank	701,138.0	3,327,497.1	16.043	30.000	Ambient	0.003	3.000
EG1-TK-GLY3	EG1.TKG3	EG1 Bleed EG Storage Tank	701,126.2	3,327,506.3	15.814	30.000	Ambient	0.003	3.000
EG1-TK-MEG1	EG1.MEG1	EG1 MEG Rundown Storage Tank	701,191.2	3,327,463.7	16.732	40.000	Ambient	0.003	3.000
EG1-TK-MEG2	EG1.MEG2	EG1 MEG Rundown Storage Tank	701,175.2	3,327,476.1	16.899	40.000	Ambient	0.003	3.000
EG1-TK-DEG1	EG1.DEG1	EG1 DEG Rundown Storage Tank	701,146.3	3,327,527.6	16.043	30.000	Ambient	0.003	3.000
EG1-TK-DEG2	EG1.DEG2	EG1 DEG Rundown Storage Tank	701,134.4	3,327,516.9	15.814	30.000	Ambient	0.003	3.000
EG1-FLR	EG1.FLR	EG1 Ground Flare	701,086.0	3,327,658.3	15.354	8.000	1832.00	65.600	11.793
EG1-FLR (MSS)	EG1.FLMS	EG1 Ground Flare (Maint/SU/SD)	701,086.0	3,327,658.3	15.354	8.000	1832.00	65.600	30.342
EG2-EGEN	EG2.EGEN	EG2 Emergency Generator Diesel Engine	701,364.5	3,327,377.4	16.010	10.000	872.00	148.200	0.670
EG2-TO	EG2.TO	EG2 Thermal Oxidizer	701,422.4	3,327,185.9	14.829	150.000	392.00	100.906	3.500
EG2-CT	EG2.CT1	EG2 Cooling Tower Cell No. 1	701,415.6	3,327,365.1	15.551	65.000	85.00	32.000	32.000
EG2-CT	EG2.CT2	EG2 Cooling Tower Cell No. 2	701,426.8	3,327,379.5	15.354	65.000	85.00	32.000	32.000
EG2-CT	EG2.CT3	EG2 Cooling Tower Cell No. 3	701,438.1	3,327,393.9	15.322	65.000	85.00	32.000	32.000
EG2-CT	EG2.CT4	EG2 Cooling Tower Cell No. 4	701,449.1	3,327,408.5	15.223	65.000	85.00	32.000	32.000
EG2-CT	EG2.CT5	EG2 Cooling Tower Cell No. 5	701,460.4	3,327,422.8	15.125	65.000	85.00	32.000	32.000
EG2-CT	EG2.CT6	EG2 Cooling Tower Cell No. 6	701,471.5	3,327,437.4	15.387	65.000	85.00	32.000	32.000
EG2-CT	EG2.CT7	EG2 Cooling Tower Cell No. 7	701,483.0	3,327,451.7	15.420	65.000	85.00	32.000	32.000
EG2-TK-GLY1	EG2.TKG1	EG2 Crude EG Storage Tank	701,445.7	3,327,265.2	15.059	40.000	Ambient	0.003	3.000
EG2-TK-GLY2	EG2.TKG2	EG2 PEG Storage Tank	701,426.8	3,327,271.8	15.280	30.000	Ambient	0.003	3.000
EG2-TK-GLY3	EG2.TKG3	EG2 Bleed EG Storage Tank	701,415.0	3,327,281.1	15.453	30.000	Ambient	0.003	3.000
EG2-TK-MEG1	EG2.MEG1	EG2 MEG Rundown Storage Tank	701,479.9	3,327,238.5	14.633	40.000	Ambient	0.003	3.000
EG2-TK-MEG2	EG2.MEG2	EG2 MEG Rundown Storage Tank	701,464.0	3,327,250.9	14.663	40.000	Ambient	0.003	3.000
EG2-TK-DEG1	EG2.DEG1	EG2 DEG Rundown Storage Tank	701,435.0	3,327,282.4	15.157	30.000	Ambient	0.003	3.000
EG2-TK-DEG2	EG2.DEG2	EG2 DEG Rundown Storage Tank	701,423.2	3,327,291.6	15.256	30.000	Ambient	0.003	3.000
EG2-FLR	EG2.FLR	EG2 Ground Flare	701,487.7	3,327,335.7	14.895	8.000	1832.00	65.600	11.793
EG2-FLR (MSS)	EG2.FLMS	EG2 Ground Flare (Maint/SU/SD)	701,487.7	3,327,335.7	14.895	8.000	1832.00	65.600	30.342
ET1-FUR1	ET1.FR1	ET1 Pyrolysis Furnace 1	700,847.2	3,327,045.1	13.976	220.000	250.00	33.157	8.000
ET1-FUR2	ET1.FR2	ET1 Pyrolysis Furnace 2	700,849.5	3,327,049.7	13.976	220.000	250.00	33.157	8.000
ET1-FUR3	ET1.FR3	ET1 Pyrolysis Furnace 3	700,833.0	3,327,056.3	14.009	220.000	250.00	33.157	8.000
ET1-FUR4	ET1.FR4	ET1 Pyrolysis Furnace 4	700,835.3	3,327,060.8	14.009	220.000	250.00	33.157	8.000
ET1-FUR5	ET1.FR5	ET1 Pyrolysis Furnace 5	700,819.0	3,327,067.5	13.911	220.000	250.00	33.157	8.000
ET1-FUR6	ET1.FR6	ET1 Pyrolysis Furnace 6	700,821.4	3,327,072.0	13.911	220.000	250.00	33.157	8.000

1 of 16

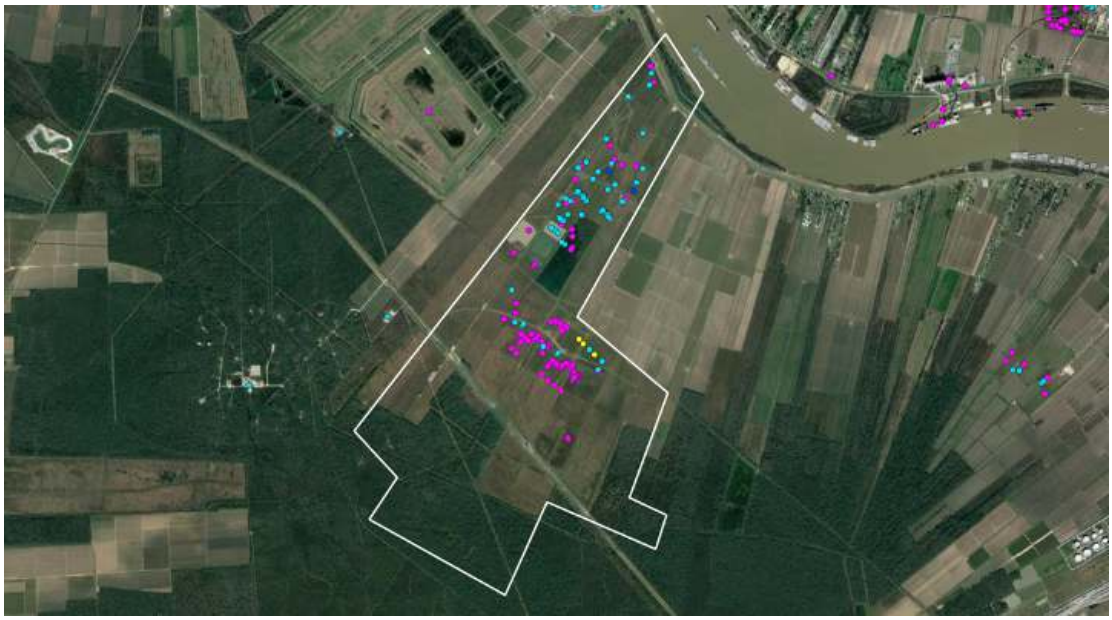
Screenshot of cover and page excerpted from Formosa's Air Quality Assessment.

Key





Location of emissions source points before correction of coordinates.



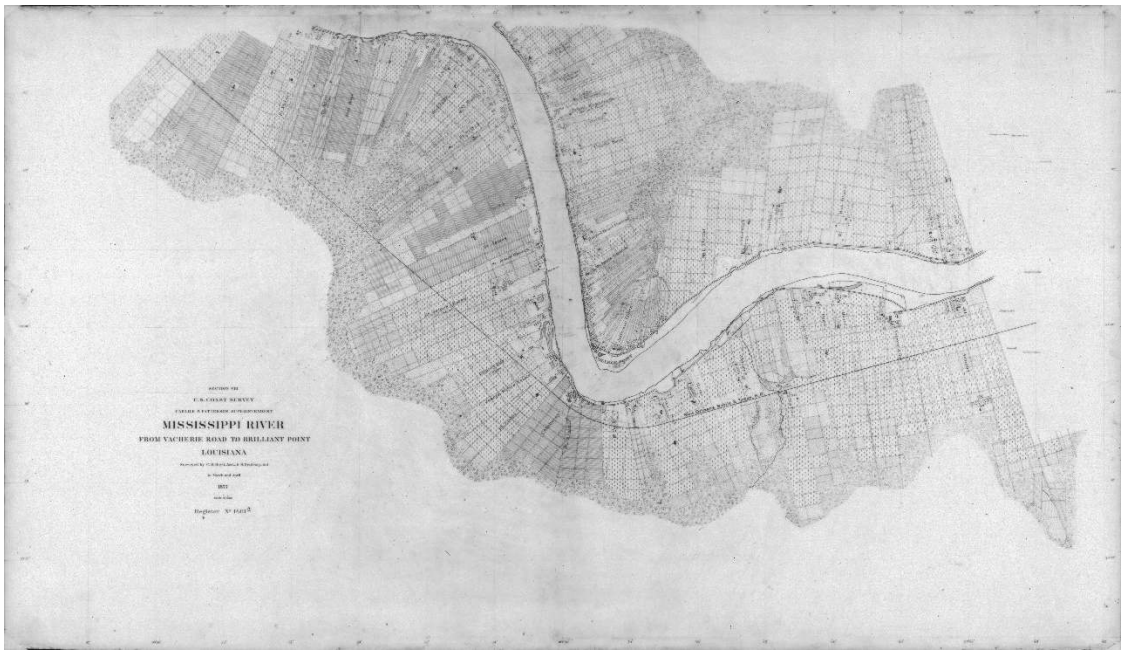
Location of emissions source points after correction of coordinates.

The second discrepancy in the database had to do with the speed of emissions. Some of the emission points were found to have unrealistic exhaust speeds (faster than speed of sound). To correct this, we used average hourly emission rates and limited exhaust speeds to realistic values.

3.2.2 Ground

Cartography

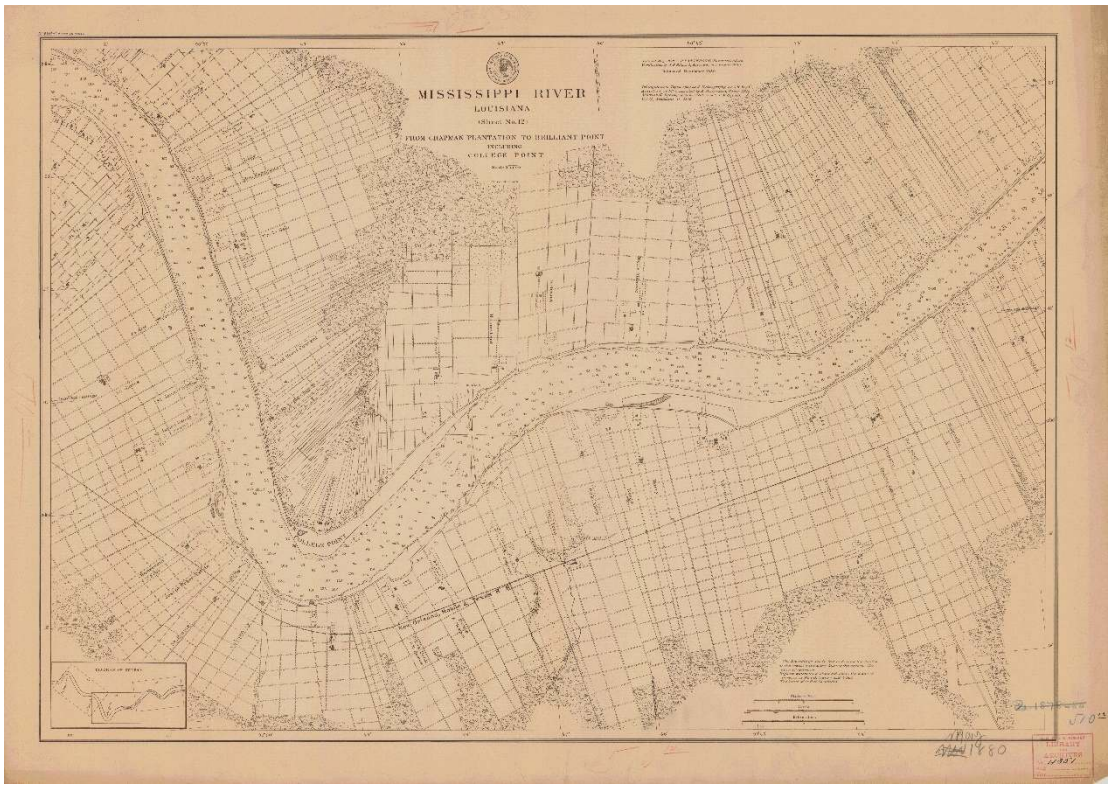
The 19 February 2020 report by Coastal Environments, Inc. provided us with an important starting point for piecing together the historic cartographic record. The earliest cartographic record that Forensic Architecture has located, and that depicts in detail structures, roads, the forest, plantation boundaries and plantation owners, as well as crop classification, is the postbellum US Coast Survey manuscript set, a survey that was conducted during the Reconstruction era between 1876-1877 (referenced herein as USCS 1877). It is comprised of several topographic sheets (T-Sheets) that cover the lower Mississippi River from Point Houmas (westernmost / upriver) until New Orleans and its surroundings (easternmost / downriver). The sheets that were primarily used for the purposes of this investigation are nos. 1429b, 1480a, 1480b, 1481a, and 1481b.



Sheet register no. 1481a, titled 'Mississippi River, Louisiana, from Vacherie Road to Brilliant Point,' from the USCS 1877 series.

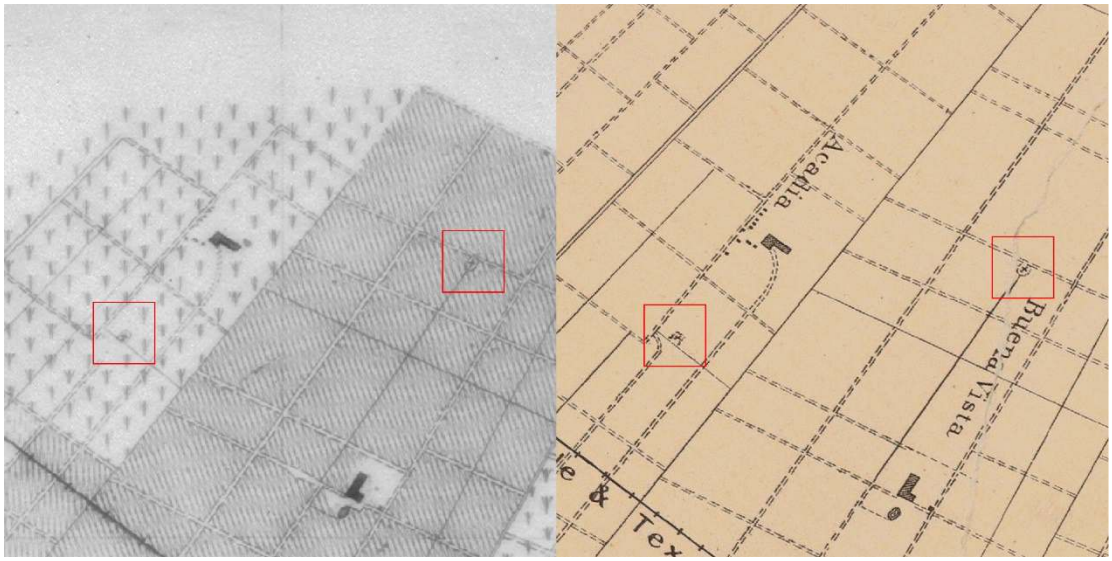
FA sourced another chart series by the US Coast Survey, which appears to be the published edition of the USCS 1877,[27] and is comprised of thirteen sheets covering approximately the same area. This record, referenced herein as USCS 1878, contains similar cartographic information to the manuscript edition, with the most notable exception being the lack of crop classification and symbology. The sheets that were primarily used for the purposes of this investigation are nos. 9, 10, 11, 12, and 13.

[27] Coastal Environments, Inc., 'Cartographic Regression Analysis of Certain Tracts of Land Located in T.11S and T.12S., R.15E. (Southeastern Land District West of the Mississippi River), St. James Parish, Louisiana', 19 February 2020.



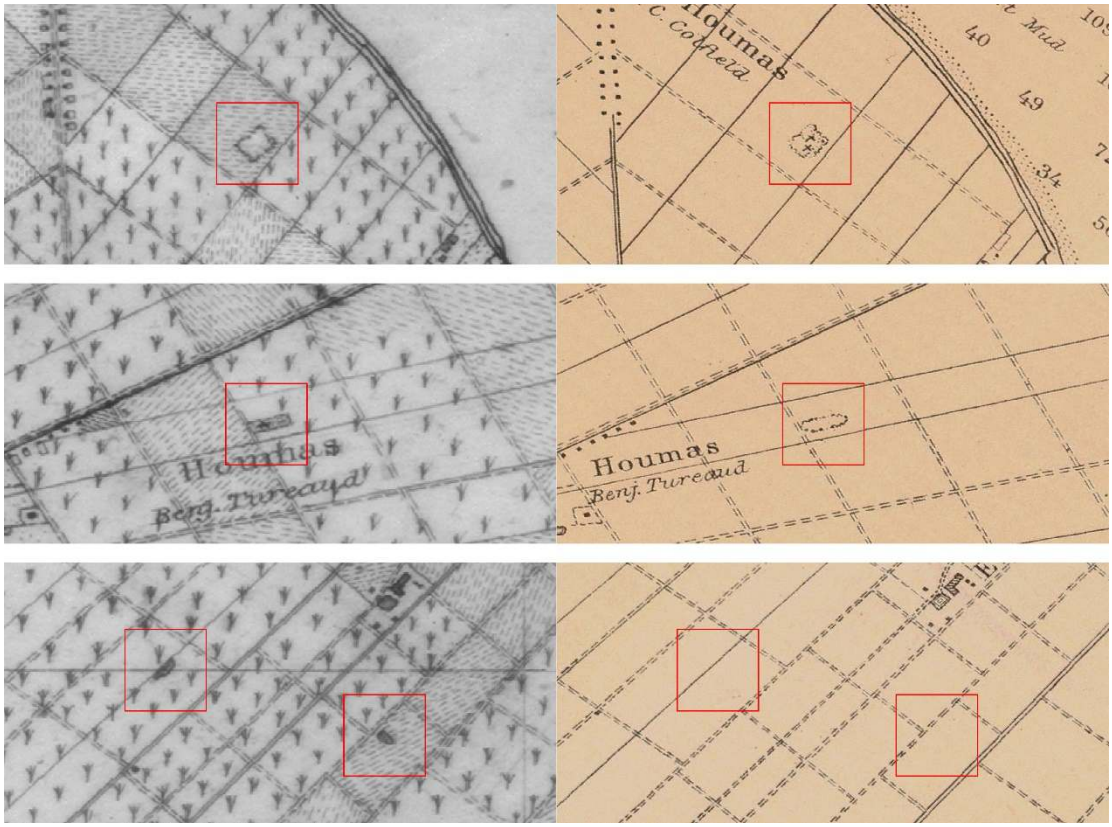
Sheet no. 12, titled 'Mississippi River, Louisiana, from Chapman Plantation to Brilliant Point,' from the USCS 1878 series.

These two series of maps have been particularly significant for this investigation as they are the earliest to contain such detailed cartographic information, and most importantly, are the only maps from that era that appear to record the location of several burial grounds.



Annotated excerpts of sheet no. 1481a (USCS 1877) and sheet no. 12 (USCS 1878) depicting the Acadia and Buena Vista plantation cemeteries in St. James Parish.

However, there are discrepancies in the symbology and marking of the burial grounds within each set of maps, as well as between the two series. In some cases, cemeteries are marked with a stroked lineage and a cross in the middle; in other cases, irregular shapes with a dark grey fill are used; and in several instances, burial grounds depicted in one set of maps are not represented in the other.



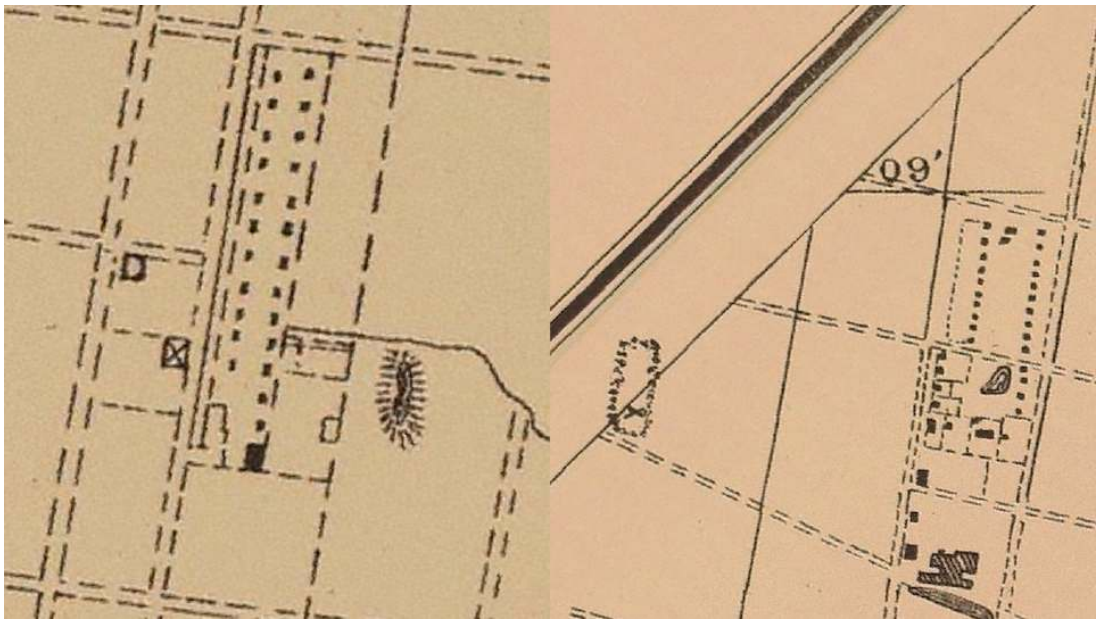
Annotated excerpts of sheets no. 1481a and 1481b (USCS 1877) and sheets no. 12 and 13 (USCS 1878) depicting, from top to bottom, the Point Houmas, Houmas/Monroe, Lauderdale, and Elina plantation cemeteries in Ascension and St. James parishes. Within the same set of maps, as well as between the two series, there are significant divergences in the symbology and marking of the burial grounds.

Each inconsistency requires a different verification practice. In some cases, as with the Monroe/Houmas Plantation Cemetery, a mark can be confirmed simply by cross-referencing the 1877 and 1878 map series. In other examples, such as the Elina and Lauderdale Plantation Cemeteries, we can infer the presence of a cemetery in two ways: (1) by examining the location of the symbol in relation to marked structures, such as slave quarters and sugar mills; and (2) by comparing the filled oval symbol with similar symbols marking known cemeteries, such as the Bruslie/Brulé Plantation Cemetery, which was confirmed during a 2015 phase two archaeological survey by ERM and CEI.[28] There are a range of additional symbols, however, that have neither a clear cartographic reference with which to make a comparison, nor a prior ground survey to confirm that the symbol corresponds with a burial site.

An unknown symbol on the Carroll Plantation is one such example. We can very likely rule out the possibility that the symbol represents a sugar mill pond given its distance from the mapped mill, the identification of another shape likely representing

[28] ERM et al., 'Monroe/Houmas (Site 16AN31) and Bruslie/Brulé (Site 16AN32) Plantations Phase I/II Cultural Resources Investigations Ascension and St. James Parishes, Louisiana', September 2015.

a pond close to the mill, and the unusual quality of its broken edges. No identical shapes have been identified in the 1877 and 1878 map series; the closest analogue is the symbol indicating the Burnside Plantation Cemetery, which is also represented with a broken perimeter. This Burnside Plantation Cemetery is mapped with headstones in the 1894 map. The Carroll Plantation symbol's proximity to the slave quarters (the location of which is consistent with antebellum spatial patterns) is intriguing. We do not, however, have enough information to come to conclusions from the cartographic record alone; ground survey is necessary.



Left: Unknown symbology at the Carroll Plantation in St. John the Baptist Parish. Right: A mapped cemetery at the Burnside Plantation in Ascension Parish.

Such inconsistencies, considered alongside the fact that the majority of the burial grounds of formerly enslaved people would have remained structurally ignored and unregistered by the cartographers of the time, necessitate a close reading of these images, both in relation to one another and as corroborating or contradicting other sets of information. While the cemeteries that are mapped on these two USCS sets provide invaluable information for discerning the logics and patterns that may have dictated the location of other cemeteries, their limited number and inconsistent rendering means that a nuanced understanding of this cartographic record as incomplete, and non-exhaustive, is essential.

Another postbellum cartographic series, the 1894 *Survey of the Mississippi River* by the Mississippi River Commission, illustrates in minute detail structures, paths, canals, levees, elevation contour lines, plantation boundaries and owners, as well as crop classification, and is therefore useful to track changes across the territory. The map series uses triangulation from the USCS 1877 survey, but its elements are based on topographical records conducted in 1894, so the map series is referenced hereafter as MRC 1894. The charts that were primarily used for the purposes of this investigation are nos. 66, 67, 68, 69, 70, 71, 72, 73, 74, and 75.

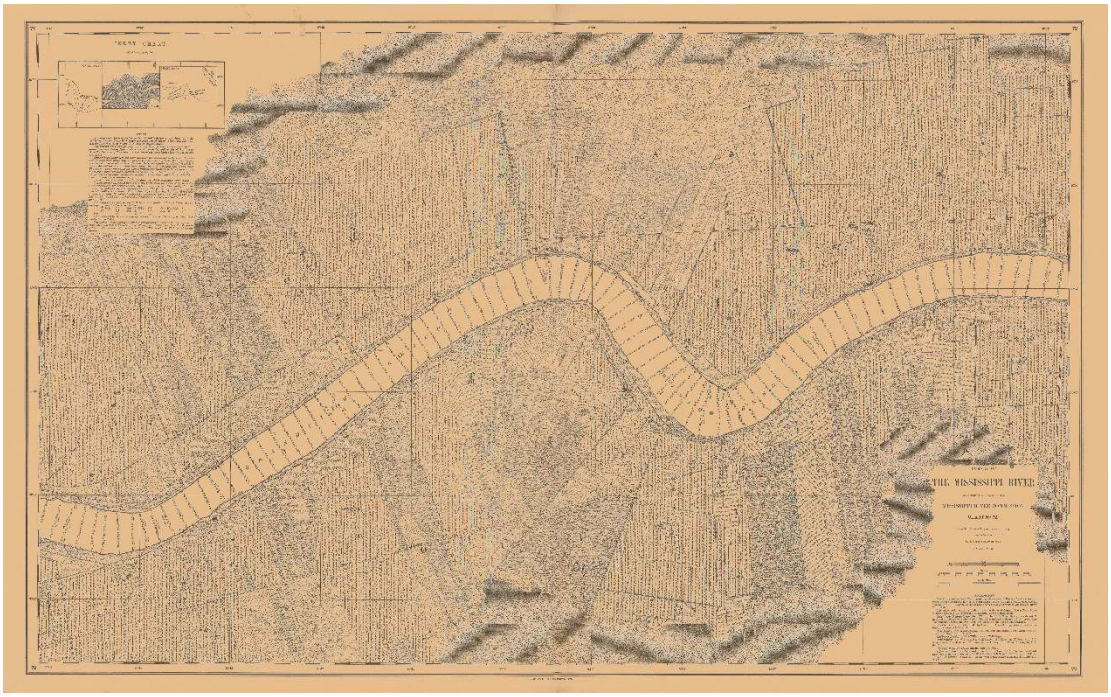
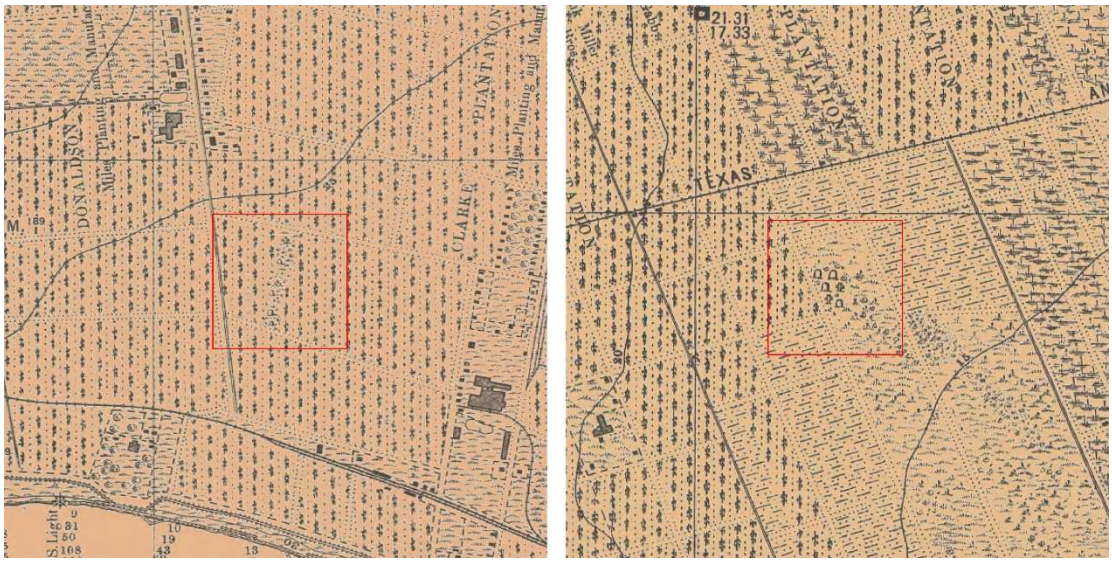


Chart titled "Survey of the Mississippi River, Chart no. 72" from the MRC 1894 series, partially covering St. James and St. John Baptist Parishes.

Despite their level of detail, the MRC 1894 maps do not appear to consistently mark cemeteries. With the exception of the Burnside and Magnolia Plantations' burial grounds, the few other cemeteries that are illustrated on the MRC maps appear to be connected to established churches of the time and are therefore very unlikely to be related to burial grounds of formerly enslaved people.

One nuance to consider is that Catholic churches did make room for the burial of enslaved African Americans in a segregated portion of the church cemetery. In some cases, Catholic plantation owners may have allowed members of their enslaved population to be buried in these mapped churches. Our archaeological consultants tell us, however, that this practice was left to the discretion of the slave master and was inconsistently followed. For example, three cemeteries of enslaved people have been identified on plantation properties (Bruslie Plantation, Union Plantation, and Monroe/Houmas Plantation) owned by the French Catholic Tureaud-Bringier family. A close reading of an archaeological survey conducted by ERM[29] suggests that members of the white family, as well as their overseers, would have been interred at the Ascension of Our Lord Catholic Church. Finally, as archaeologist Ryan Gray notes, changes in church policy could occur rapidly in line with changes in leadership.

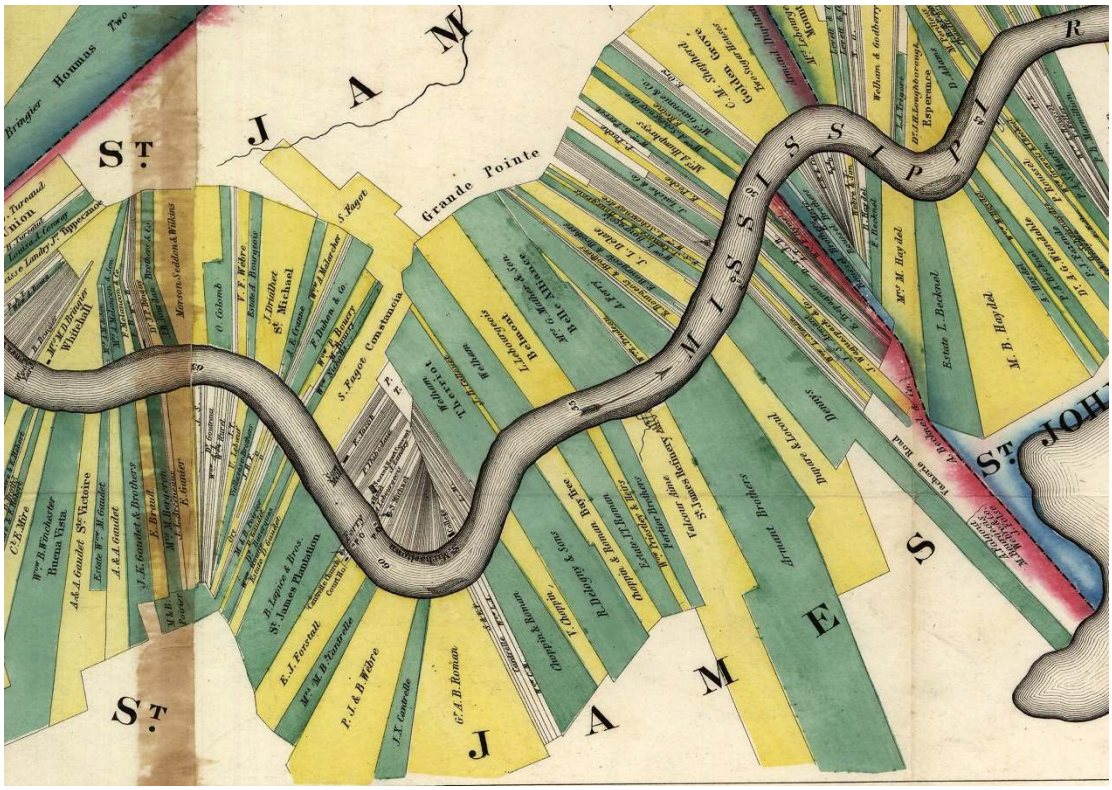
[29] ERM et al.



Annotated excerpts of charts no. 70 and 72 (MRC 1894) depicting the Burnside (Clarke) and Magnolia plantation cemeteries in Ascension and St. James Parishes, respectively.

Alongside these two cartographic series, FA used other surveys and maps, dating back to the 18th century. Contrary to the USCS and MRC maps, these additional sources do not depict accurate topographical elements, but consist of mostly broad (and sometimes cartographically abstract) illustrations of the Mississippi River. Some of them, however, record planation boundaries and owners, as is the case of the 1858 *Norman's Chart of the Lower Mississippi River* by cartographer A. Persac (referenced hereafter as Persac 1858). These are useful in more localised studies, to determine the succession of plantation ownership and the corresponding evolution of plantation names over the decades. In addition, the names help us to understand the consolidation of plantations, which in turn is valuable for understanding the logics that dictate the locations of (and relations between) cemeteries.

Beyond plantation logics, Persac's chart, as the clearest record of antebellum property ownership, also enables us to understand the succession of land ownership and the continuum of land use practices across the decades. In conversations with residents and descendants of the river parishes, among them Leon A. Waters of LMAAH and members of The Descendants Project, the continuity of names and power relations has emerged as a recurrent theme. The surnames of antebellum plantation owners that mark the properties in the 1858 Persac map are carried forward to contemporary records of property ownership. In reading these plantation property charts, one recognises powerful names from state and local government and oil and gas lobby associations. Members of the Descendants Project note that like land ownership, decision-making power over land use remains largely in the hands of a majority-white political and social elite.

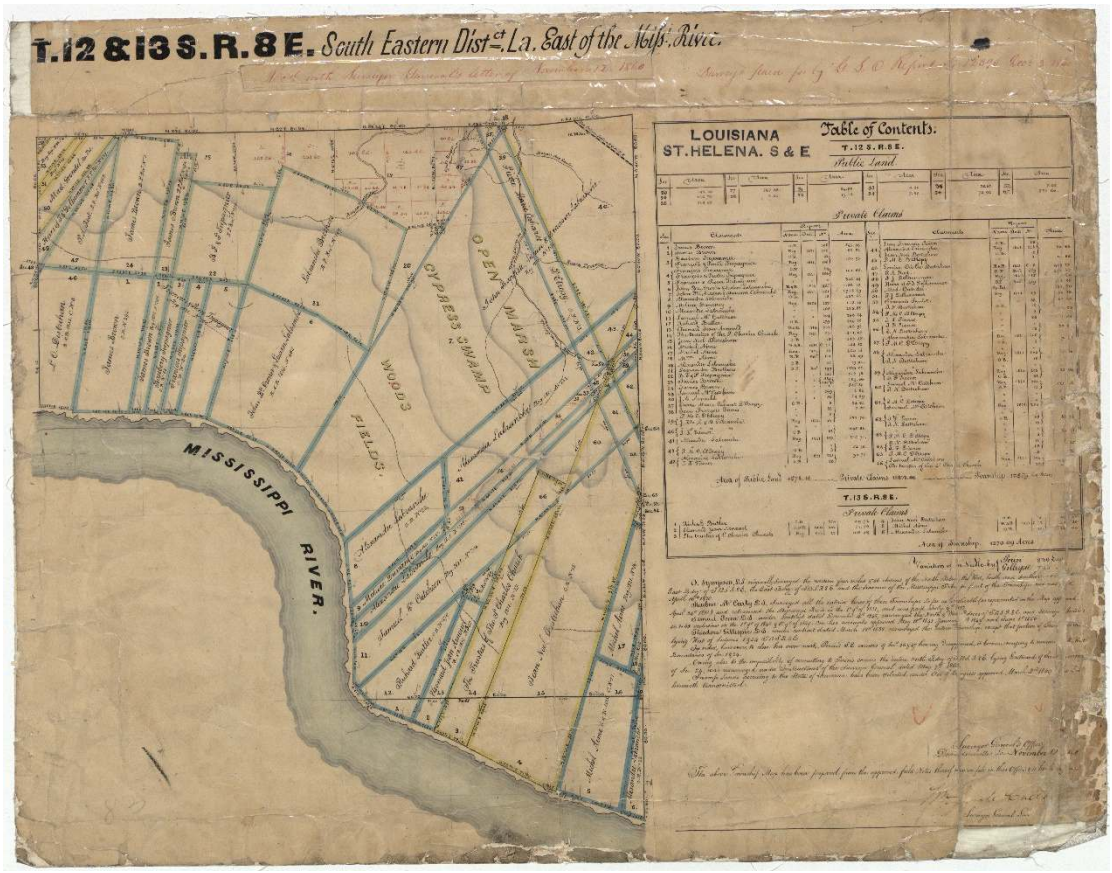


Excerpt from Persac's 1858 "Norman's Chart of the Lower Mississippi River," partially covering St. James Parish.

Plantation boundaries and owners are also recorded in the 19th century cadastral surveys of the US Bureau of Land Management. These surveys are illustrated on so-called survey plats, referenced herein as General Land Office Records (GLO Records), and are dated between 1810-1910. Most of these survey plats do not display much information apart from land boundaries and acreage, subdivisions, and ownership, and are thus deemed useful for more localised studies in determining the succession and consolidation of properties. However, as these records were produced at different times over the course of a century and by different surveyors, there are additional elements in several of the plats that are useful for the purposes of this investigation. Notably, the 1890 survey plat titled 'T.11 S - R.5 E. South Eastern District' is a unique example among those surveys heretofore encountered in that it marks a burial ground. The cemetery is not marked on the USCS or MRC charts. It is located toward the edge of a plantation then claimed by John McDonogh, Jr., and known as Sport/Ferrier.[30] In a second rare example, titled 'T.12 & 13S. R. 8 E. South Eastern District of Louisiana East of the Mississippi River', geologic characteristics such as open marshlands, swamps, woods, and fields are demarcated.

[30] For an in-depth analysis of the Sport/Ferrier and the adjacent Golden Grove plantation cemeteries, see: Donald G. Hunter and Joanne Ryan, 'Golden Grove and Sport Place Plantations: Two Unmarked Plantation Cemeteries in St. James Parish, Louisiana' (Baton Rouge, Louisiana, 2021).

T.11 S – R S E. South Eastern District of Louisiana. Cadastral survey of property claimed by John McDonogh, Jr., 1890 showing rare example of surveyed cemetery.

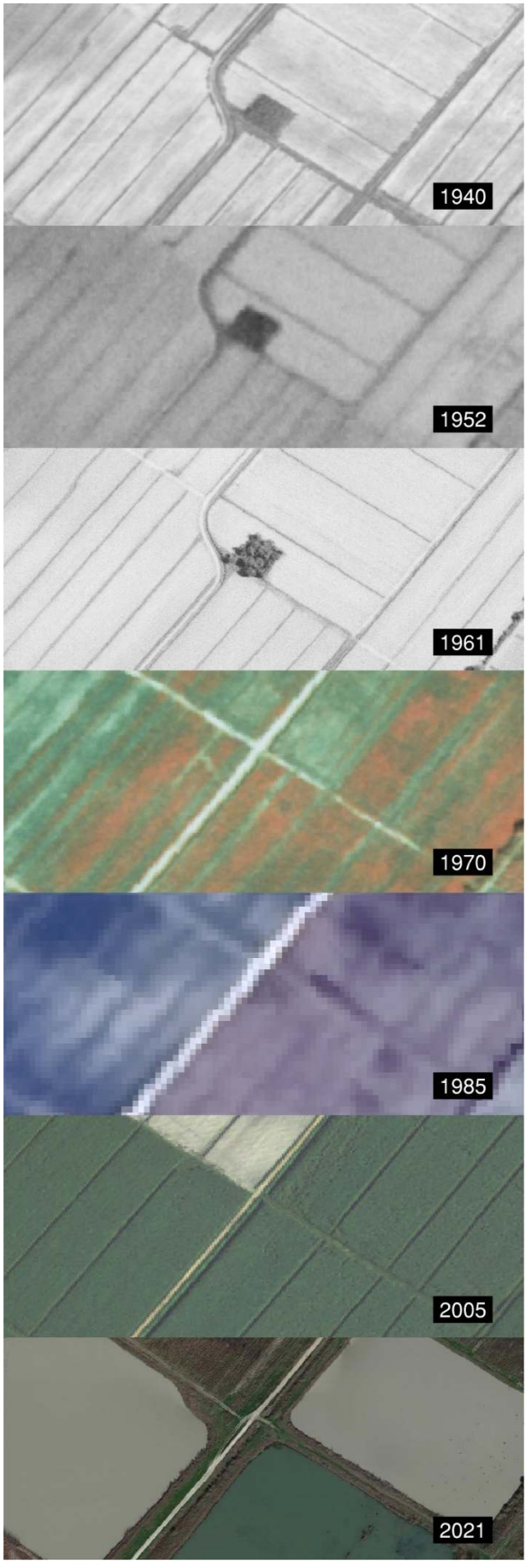


T.12 & 13S. R. 8 E. South Eastern District of Louisiana East of the Mississippi River. Cadastral survey of property showing rare example of demarcation of open marsh, cypress swamp, woods, and fields.

Aerial Imagery

Alongside the map series, several sets of aerial photographs covering the area of study have been sourced and obtained. The earliest series of aerial photographs that we have located dates back to 1940, and was captured by the U.S. Department of Agriculture (referred to hereafter as USDA 1940). FA subsequently sourced aerial imagery of the area for the years 1952, 1961, 1970, 1985 from the U.S. Geological Survey (referred to hereafter as USGS 1952, USGS 1961, USGS 1970, and USGS 1985). Additional imagery has been obtained from the Farm Service Agency of the U.S. Department of Agriculture, through their National Agriculture Imagery Program (NAIP) for the year 2005 (referred to hereafter as NAIP 2005), as well as from Google Earth for the year 2021 (referred to hereafter as GE 2021). The variation in scales, colour ranges, and resolutions among the different images means that some aerial sets offer greater legibility and therefore are more immediately useful than others, which require alternate means of enhancement and translation.

Following page: Excerpts of aerial photographs depicting Acadia plantation cemetery, in 1940, 1952, 1961, 1970, 1985, 2005, and 2021 respectively, illustrating the different levels of pixel resolution and colour range within each aerial set.


1940
1952
1961
1970
1985
2005
2021

Archaeology Reports

The website of the Louisiana Division of Archaeology ('the Division' or 'DOA') describes its mission as the promotion of Louisiana's cultural history through the protection of archaeological sites and preservation of material culture. It is a department of the state government of Louisiana and is responsible for coordinating and implementing state and federal guidelines for the investigation and preservation of prehistoric and historic sites as outlined by the National Historic Preservation Act (NHPA) of 1966. The Division is also invested with the power and responsibility to protect and preserve abandoned cemeteries, unmarked graves, and human remains under the Unmarked Human Burial Sites Preservation Act of 1992 (R. S. 8:671-681) and the Louisiana Historic Cemetery Preservation Act of 2016 (R.S. 25:931-943).

Section 106 of NHPA requires federal agencies to consider the effects of projects they carry out, approve, or fund on historic properties. Section 106 can be triggered both by development activities that occur on federal land and by activities on private land that require the developer to apply for federal permits. The developer's impact assessment should begin at the planning stage of the project, prior to the commencement of construction.

The DOA's responsibility is to oversee all archaeological work conducted within its jurisdiction, ensuring that said work meets the standards set by federal law. The Division sets out these standards in two documents available on its website: 'Report Standards' and 'Field Standards'. Private firms whose activities are subject to Section 106 regulations are required to ensure that their field research and project report meet these standards. Not all development activities require federal permits, however. As such, a broad range of development activities may be conducted by state and private actors without the site first being surveyed for the presence of cultural resources, including cemeteries.

Forensic Architecture received permission to access the DOA's Cultural Resource Management (CRM) database.[31] The database includes an online GIS system recording both standing historical structures and archaeological sites. For each site, a user can access site record forms, supplemental forms, and project reports, where available. Site Record Forms are used to record a newly discovered archaeological site or updates for already established sites. Supplemental Forms are used to record additional information when no physical visit was made to a site. Reports include Phase I (field survey), Phase II (testing) and Phase III (excavation) surveys.

We have accessed, downloaded, and assessed over fifty forms and reports for sites within the research area on record with the DOA. Upon reviewing these documents, we noticed a wide disparity in quality from one report to the next. We believe that these disparities are enabled by several limitations within extant state and federal regulatory processes and standards.

Firstly, the circumstances under which an archaeological survey must be undertaken and a final report must be filed are heavily circumscribed by Section 106. Secondly, the Division's 'Report Standards' articulate the bare minimum mandate for what qualifies as a reasonable and good faith effort to conduct a field survey and produce a subsequent report. Don Hunter, an independent archaeological consultant, tells us

[31] 'Databases'. Office of Cultural Development, Division of Archaeology, State of Louisiana. Available at: https://www.crt.state.la.us/cultural-development/archaeology/CRM/databases/index/.

that he questions whether many of the reports on file with the DOA meet the standards outlined by the Division itself. The level of effort invested by different contractors is highly variable. Some take a great interest and pride in their work; other firms view it simply as a business and recognise that they have to continue to get contracts in order to make a profit (and that a reputation for lenient surveying is valuable in securing further contracts). These factors reveal the possibility of serious and self-defeating conflicts of interest.

Fortunately, a small number of standard bearer reports, among them ERM/CEI (2015)[32] and CEI (2020),[33] help us to elucidate the gap between the bare minimum of standards and the standard to which all surveys of sites of immense historic, cultural, and spiritual significance should be held. Ultimately, as with the cartographic materials we have considered, we cannot consider the archaeological record as represented by the LA Division of Archaeology CRM Database to be complete. That database only conveys what has been reported, whereas even the rigorous field surveys and reports, Don Hunter notes, would never be able to capture everything of value in the field.

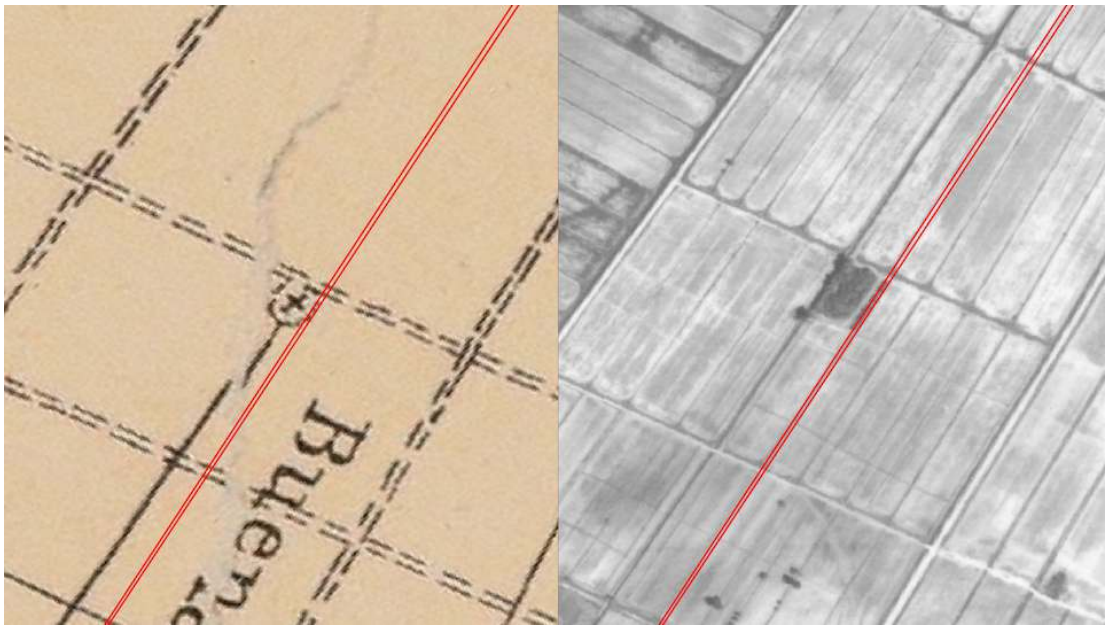
Coastal Management Permits

Permits for coastal development, including pipelines and other infrastructure, Strategic online Natural Resources Information System, Louisiana Department of Natural Resources, 2021.

The Louisiana Department of Natural Resources (LDNR)'s Strategic Online Natural Resources Information System (SONRIS) data mapping portal enables users to access and download permits for development within Louisiana's Coastal Zone as established in Louisiana Revised Statutes Article 49, §214.24.34 We have downloaded shapefiles for permits issued for 'coastal management lines' as of February 2021. This dataset includes oil, gas and petrochemical pipelines and

[32] ERM et al., 'Monroe/Houmas (Site 16AN31) and Bruslie/Brulé (Site 16AN32) Plantations Phase I/II Cultural Resources Investigations Ascension and St. James Parishes, Louisiana'.
[33] Coastal Environments, Inc., 'Cartographic Regression Analysis of Certain Tracts of Land Located in T.11S and T.12S., R.15E. (Southeastern Land District West of the Mississippi River), St. James Parish, Louisiana'.
[34] "Coastal Zone Boundary." State of Louisiana Department of Natural Resources. Available at: http://www.dnr.louisiana.gov/index.cfm?md=pagebuilder&tmp=home&pid=928/.

flowlines, as well as other types of development, such as levee repair, waterlines, and road construction. We have used this data to show where development has potentially impacted cemeteries of enslaved people.



A pipeline permitted to UCAR Pipeline, Inc., authorised in 2008, has potentially desecrated the Buena Vista Plantation Cemetery.

Current Industrial Property Ownership

Each parish tax assessor provides comprehensive information on property ownership within its jurisdiction, available online through an interactive mapping portal, updated annually. We used each parish data portal to identify the current and former owners of industrial facilities and to delineate the property lines, which generally extend far beyond the visible structures. Using this data, we created our own shapefiles, matching the property lines to the best of our ability. Each data portal is introduced with a disclaimer that the information therein is designed for informational and illustrative purposes only and that the assessor assumes no responsibility for errors, omissions, or inaccuracies. As such, our own interpretation must carry this disclaimer.

Future Industrial Sites

Properties in Ascension, St. James, and St. John the Baptist Parishes determined by Louisiana Economic Development to be 'ready' for industrial development. They were on the market for sale as of March 2021.

Louisiana Economic Development maintains a list of certified "development-ready" sites: 'The LED Certified Sites program qualifies industrial sites based on zoning restrictions, title work, environmental studies, soil analysis and surveys. These sites are 180-day development ready and have substantial due diligence studies performed to receive certification'.[35]

We have created shapefiles from this dataset to show the properties that are currently on the market for industrial development and consider the anomalies most at risk of future desecration.

[35] LED certified sites, Louisiana Economic Development, 2021. Available at: https://louisianasiteselection.com/led/Search

4. Methodology

In carrying out this research, Forensic Architecture used a series of multimedia analysis and spatial surveying techniques, tailored to the specific needs of the investigation.

4.1 Air

Above: photograph of to-be-identified tanks at Marathon Garyville Refinery in St. John the Baptist Parish, Louisiana. Below: Optical gas imaging capturing to-be-identified emissions from the same tanks.

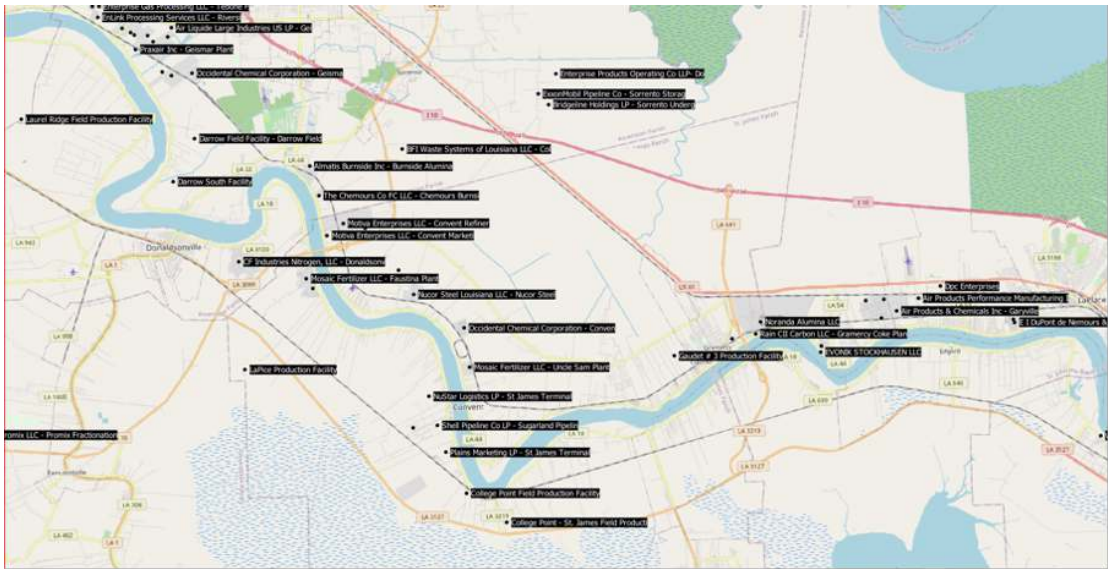
4.1.1 Optical Gas Imaging

Depending on its internal filter, optical gas imaging (OGI) cameras can detect hydrocarbon emissions such as methane and sulphur hexafluoride. With FLIR OGI cameras, broad sections of equipment can be scanned and leaks can be detected from a distance, displaying relevant gases that are invisible to the human eye as visible emission plumes to the camera.

The emissions that are being detected by the OGI cameras have an infrared transmission of 3.2 – 3.4 micrometres, which could be any number of compounds commonly referred as hydrocarbons and solvents depending on how efficient the refining process is within specific facilities.

To determine the exact type of hydrocarbon and solvent emissions detected by OGI camera, further laboratory analysis and/or representative samples must be acquired from the Louisiana Department of Environmental Quality laboratory.

4.1.2 Modelling and Fluid Dynamics



Facilities included in our model from the EPA Toxic Release Inventory (TRI) database.

The Department of Mechanical Engineering at Imperial College London (ICL) has been at the forefront of model development for fluids dynamics since the 1970s. Fluid models developed at ICL have been used extensively in aerospace, car manufacturing, and chemical industries. They have been used to train hundreds of PhDs and investigate complex fluid behaviour. The increase of computing power and parallel processing gave rise to novel, high-fidelity Large Eddy Simulation (LES) techniques, which are used to model large scale turbulent mixing and fluid problems. LES can provide the required 'optics' to trace the movements of particles and gaseous compounds through space and time. This can apply to particles of a bomb cloud through the air, the gunshot residue expelled by a firearm, tear gas discharged in urban spaces, or clouds of toxins emitted from petrochemical facilities.

Using local meteorological data (such as temperature and wind direction), urban and spatial conditions such as the topography of the region and distribution of coordinates of emissions points, and time conditions such as time coordinates and rates of emission, concentration of toxins in an airspace can be estimated in both space and time.

Our LES model was developed for a region along the Mississippi River that includes the parishes of St. John the Baptist, St. James, and Ascension. According to the

2014 EPA National Air Toxics Assessment,[36] over fifty facilities with emissions significant enough to require reporting to the EPA are located within this territory. The LES model has a spatial resolution of 180m x 200m x 24m (the height resolution stretches from 24 metres above the ground to altitudes greater than one kilometre). The LES model was based on a 3D topographic model corresponding to elevation data of 'Louisiana the Northern Gulf of Mexico (NGOM)'. The NGOM topobathymetric elevation model integrates over 400 different data sources including topographic and [37] hydrographic surveys, side-scan sonar surveys, and multibeam surveys obtained from NOAA, USGS, the State of Louisiana, the U.S. Army Corps of Engineers, FEMA, and other agencies. The LiDAR and bathymetry surveys were sorted and prioritised based on survey date, accuracy, spatial distribution, and point density to develop a model based on the best available elevation data. The spatial resolution is 3 metres and extends from the Florida/Alabama border on the east to the Louisiana/Texas border on the west. The temporal range of the input topography and bathymetry is 1888 to 2013.

4.2 Ground

4.2.1 Cartographic Regression

To process the cartographic resources and imagery that have been sourced and obtained, FA has employed a methodology called 'cartographic regression'. Cartographic regression refers to the process of using historical surveys, maps, and aerial photographs overlaid on contemporary imagery in order to track changes in the territory and 'determine how past landscape elements correspond to those in the modern world." [38] Cartographic regression is increasingly used in archaeological surveys as a method of evaluating probable locations of cultural resources. Archaeological researchers utilise manual overlays and adjustments to 'get the [two] images to the same scale and orientation[39] CEI's 2020 report is the most thorough example of the technique's application that we have encountered in our research.

While the use of this methodology for localised studies is increasingly common, FA has employed a spatial technique that allows the flexible handling and superimposition of hundreds of different images covering a much larger area (Death Alley) than what a 'photographic' overlay would allow. This technique includes the clipping, *mosaicing* (when needed), and *georeferencing* of images within QuantumGIS (QGIS), an open-source Geographic Information System application.[40]

Mosaicing is the process of stitching together different aerial images that have overlapping coverage. The technique is similar to 'panoramic photomerge', and can be done through various projection systems, in order to ensure that no or minimal distortion is achieved. The process of blending together the images facilitates the subsequent stages of the georeferencing, as the georeferencing is then applied to fewer images (the mosaics) than would have been required without the photomerge.

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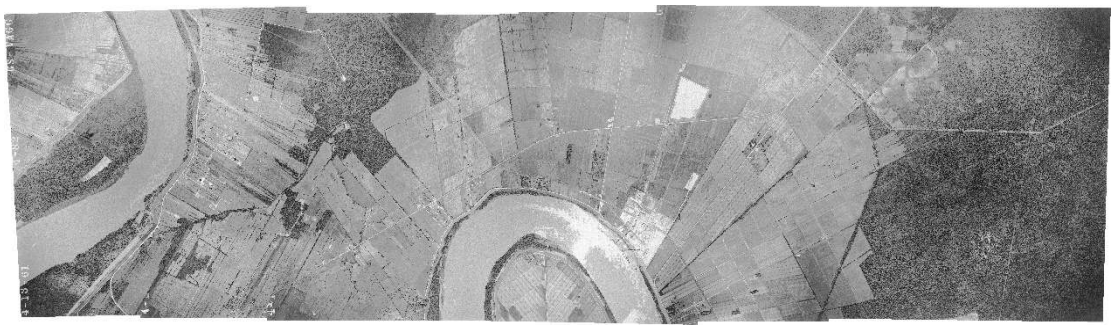
[36] "National Toxic Air Assessment", Environmental Protection Agency, 2014. Available at: https://www.epa.gov/national-air-toxics-assessment/2014-nata-map/.
[37] A point cloud is a 3-dimensional cluster of data-points in space. Each data-point has an X, Y & Z coordinate. Each data-point can also be ascribed an RGB value. In the context of this point-cloud simulation, each data-point represents a particle in space, which has been simulated as an emissions particulate based on known-emissions and wind-data sets for a given date in our investigation area.
[38] 'Coastal Environments, Inc., 'Cartographic Regression Analysis of Certain Tracts of Land Located in T.11S and T.12S., R.15E. (Southeastern Land District West of the Mississippi River), St. James Parish, Louisiana', 7.
[39] Coastal Environments, Inc., 7.
[40] https://qgis.org/

It also contributes to the creation of larger areas of ‘seamless’ compositions, without the interruption of the marked edges of the aerial photographs.

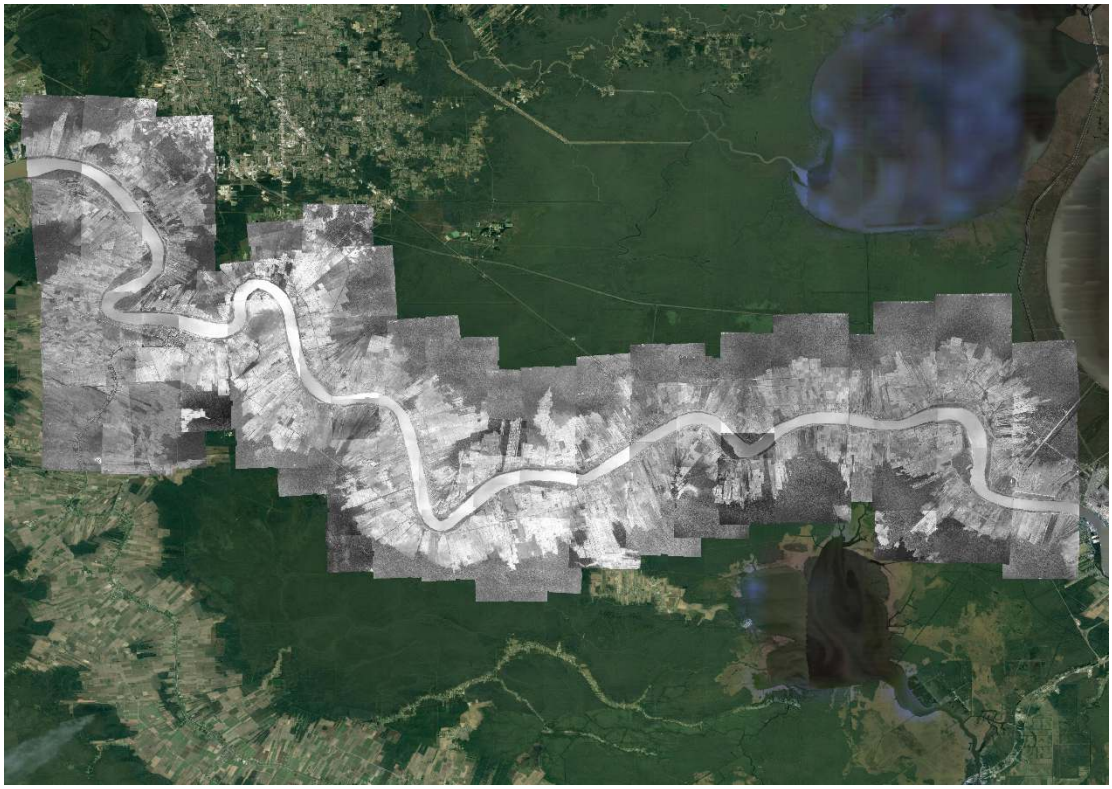


Aerial photographs 1VAGG00040082, 1VAGG00040083, 1VAGG00040084, 1VAGG00040085, 1VAGG00040086, 1VAGG00040087, and 1VAGG00040088 from the USGS 1961 set, partially covering Ascension Parish, stitched together in an aerial mosaic.

Georeferencing refers to the technique of assigning geographical information (location data) to an aerial or satellite image, a scanned survey, photograph, or map, so that any Geographic Information System application or other mapping software can accurately ‘place' the image within a geographical frame of reference. The geographical frame of reference that has been the main basis for all the images in this research is the GE 2019 satellite imagery. The georeferencing technique is processed internally within the QGIS, using its ‘Georeferencer’ tool, by assigning pixels on the images to specific locations in the frame of reference. When enough reference points have been assigned, the application adjusts the rotation and scale of the image in order to accurately place it within the selected geographical frame. If corrections are required to reach a precise overlay, the process is repeated, and this technique is then replicated for all the other aerial images.

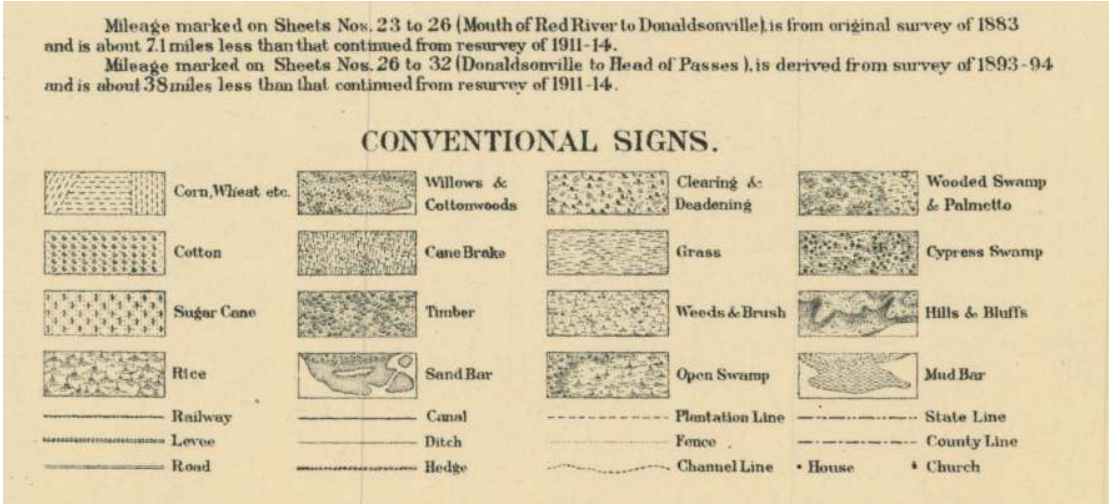
For the purposes of this investigation, the sources that required georeferencing were the historic surveys and maps (USCS 1877, USCS 1878, MRC 1894, and GLO Records) and the aerial imagery from the USDA 1940, USGS 1952, USGS 1961, USGS 1970, and USGS 1985 aerial sets. The NAIP 2005, as well as the GE 2019 sets, already contained exact geographical information. The maps and imagery then appear as layers within the QGIS application, and their visibility can be flexibly adjusted or toggled on and off, in order to facilitate their analysis.

Sheet no. 12, titled "Mississippi River, Louisiana, from Chapman Plantation to Brilliant Point," from the USCS 1878 series, georeferenced within QGIS, and overlayed on top of 2021 Google Earth satellite imagery.

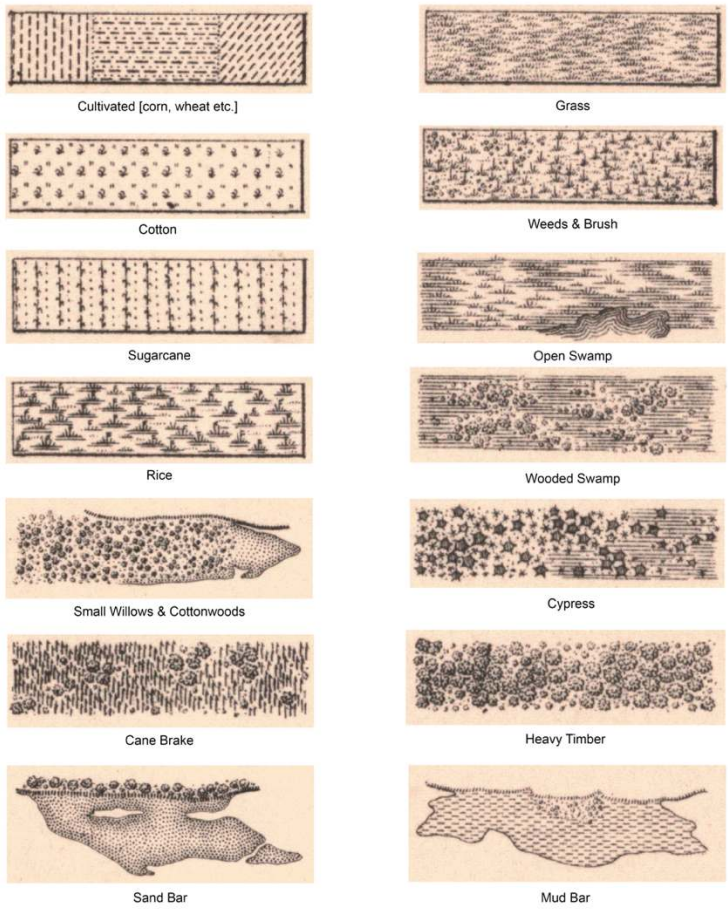


More than one hundred aerial photographs from 1940 (USDA), mosaiced and georeferenced within QGIS, and overlayed on top of 2021 Google Earth satellite imagery.

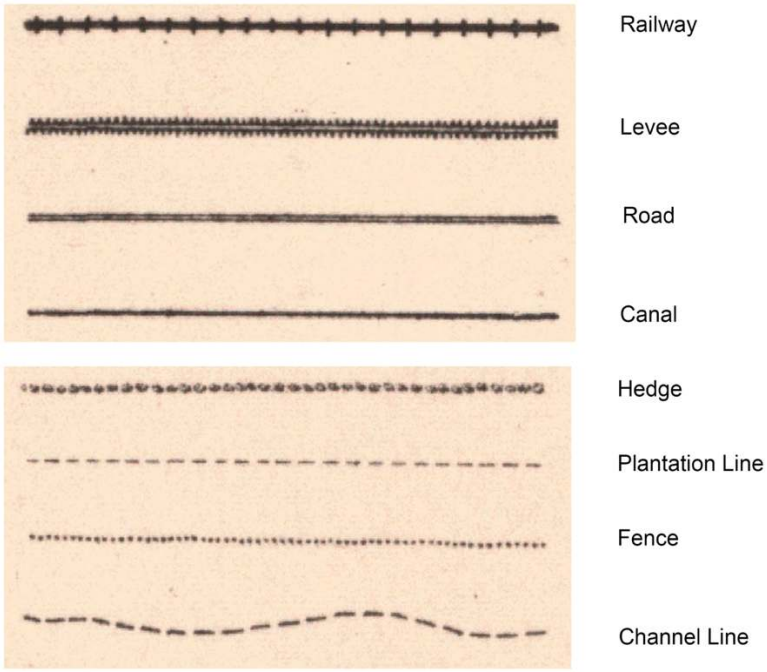
Once georeferenced, the USCS 1877, USCS 1878, and MRC 1894 maps were analysed. Only the MRC 1984 charts include a key for interpreting their symbology. They identify certain elements, including crop classification and ecological features, differentiating between, for example, grass/weeds and bush, cypress swamp and wooded swamp, sand bar and mud bar. Notably, however, they omit cemeteries. The MRC 1894 symbology in part aided our reading of the USCS 1877 symbology. Yet the symbology remains in many instances unclear, indiscernible, and inconsistent.



Key from MRC 1894 showing the symbology used to depict crop typology and ecological features of the plantation landscape.

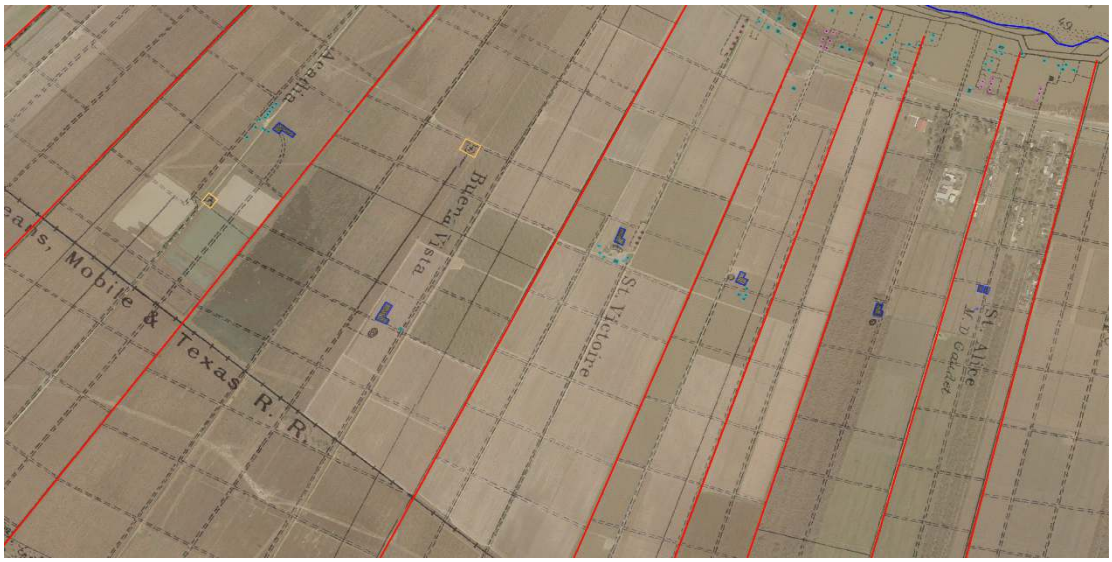


Edited and enhanced key from MRC 1894 showing the symbology used to depict crop typology and ecological features of the plantation landscape.



Edited and enhanced key from MRC 1894 showing the symbology used to depict linear features of the plantation.

We created vector lines and polygons for the various plantation components. First, we outlined and classified property borders, canals, roads, the main plantation road (central axis), and field paths. We then outlined structures, classifying slave quarters and postbellum housing, sugar mills and other outbuildings, and when discernible, the slave master's big house. Throughout, we outlined clearly mapped cemeteries, classifying them as 'certain'. Shapes not immediately identified were classified as 'uncertain'. If a cemetery or other structure was uncertain in one map, we consulted the corresponding map in the other series.



USCS 1878 chart with vector interpretation of plantation components: plantation property lines (red), sugar mills (dark blue), outbuildings (teal), slave quarters (red), and cemeteries (yellow).

The following software was used for the cartographic regression:

- Adobe Photoshop for clipping images and producing aerial mosaics
- QuantumGIS (QGIS; an open-source software) for the georeferencing, analysis, and processing of cartographic resources, aerial imagery, and datasets

4.2.2 3D Modelling

For Forensic Architecture, the 3D model operates as an investigative tool. For this research, we used 3D modelling to cross-reference our cartographic regression analysis of plantation components with archival photographs and other materials, creating an interactive 3D environment of a sugarcane plantation.

Screenshot from FA investigative video If toxic air is a monument to slavery, how do we take it down? *featuring an archival photograph. George François Mungier. 'Quarters, Evan-Hall Plantation'. 1889. Stereograph. Courtesy The Historic New Orleans Collection.*

A plantation is equal parts industrial facility, farm, prison, death camp, and luxury estate. It was designed to enforce racial segregation, incarceration, surveillance and forced labour – capitalist tools wielded to maximise productivity and profit.

In our model, we chose to disregard the still-romanticised 'Big House' of the slave master and focus instead on the under-researched world at the back of the plantation, where enslaved Black people were forced to live, labour, and die.

Because no 'complete' plantation complex remains intact, our model is a composite of several plantations, selected based on the availability of relevant historical photographs, architectural drawings, and property surveys. Four former plantations were selected for reconstruction: Whitney, Becknel (Evergreen), Evan Hall, and Houmas/Monroe. Each rendered plantation focused on a specific component, and collectively these reconstructed sites provide insight into the reorganisation of life and management of death on a complete and fully 'functioning' plantation complex.

The Becknel (Evergreen) Plantation was reconstructed for its slave quarters, which remain in place to this day. The Whitney Plantation was chosen for its front buildings and general spatial organisation, captured in a rare aerial photograph from 1940. Evan Hall Plantation was selected for its sugar house, captured in a series of photographs from 1884. From the Houmas (Monroe) Plantation, we reconstructed the dynamic spatial relationship between the forest (surveyed in 1821 and mapped in 1877/1878) and the Houmas (Monroe) Plantation Cemetery, which was likely established in the late 1820s.[41]

[41] ERM et al., 'Monroe/Houmas (Site 16AN31) and Bruslie/Brulé (Site 16AN32) Plantations Phase I/II Cultural Resources Investigations Ascension and St. James Parishes, Louisiana', 8–38.

A screenshot from our UE model showing the extent of the fields and forest at the Monroe/Houmas plantation as surveyed in 1821.

A screenshot from our UE virtual environment depicting the Monroe/Houmas Plantation Cemetery, a sacred grove of trees planted by the plantation's enslaved population.

We used Rhinoceros 3D to reconstruct buildings for our model. We then worked with a professional animator and modeller to create a virtual environment using the software Unreal Engine (UE).[42] The 3D environment is the product of our cartographic interpretation. It enabled us to carry the plantation logics we had determined in two dimensions into three-dimensional space, giving us a better sense of the scale and organisation of the landscape. In studying our model, it became evident to us why a single plantation would have multiple sets of slave quarters, as

[42] UE is typically used to create game environments but here was used as a historical reconstruction document and a potential depository of family stories and oral histories.

enslaved people would have had to cross many miles, carrying cane from the rear of the plantation to the mill at the front or middle of the plantation.

Thus, in addition to acting as an analytic space, the 3D environment can also serve as a narrative device for communicating the operational logics of a plantation, its structures of labour, and the spatial patterns through which it extracts value, manages death, and lays the ground for future occupation by petrochemical facilities.

A screenshot from our UE virtual environment, showing a path through the furrows between rows of cane, which enslaved people would have used to cross the plantation and reach the forest unseen at night.

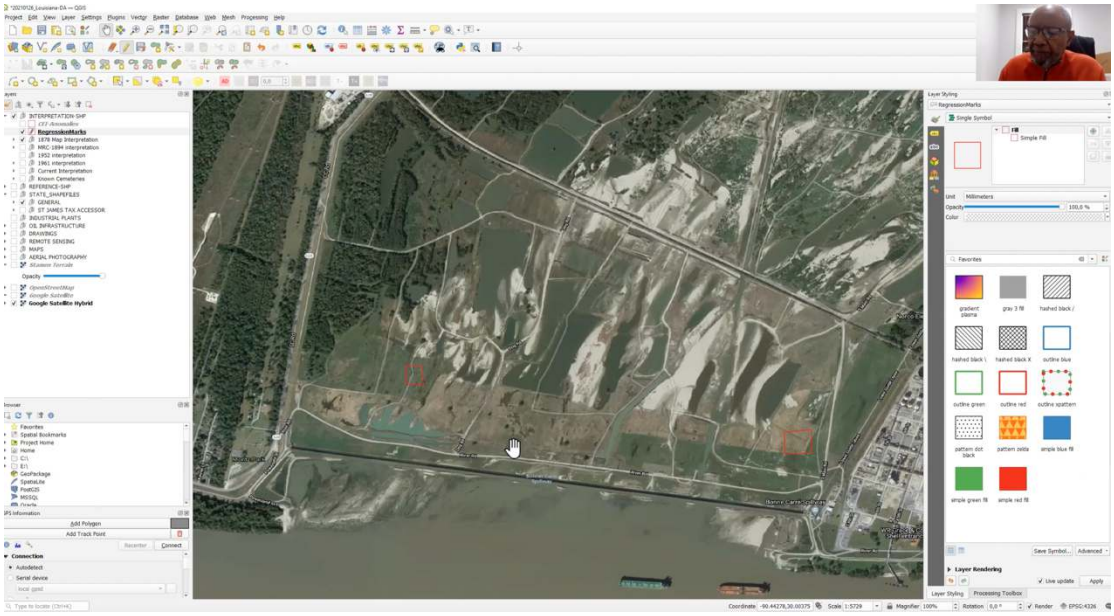
To create the 3D models, FA used the aforementioned historic maps (USCS 1877, USCS 1878, MRC 1894)[43] as the base from which to model the topography and draw the layout and plan of the plantations, including buildings and the details of the landscape, from roads, to crops, to the cypress forest. From here, we used the software Cinema 4D to virtually locate the historical photographs before placing them in Rhinoceros 3D. Within Rhinocerous 3D, building outlines were extended to simple volumes, true to scale. Buildings of interest (those belonging to the world of the enslaved) in each plantation were rendered with a greater degree of detail based on archival media. The other buildings on the modelled plantations were purposely left undetailed as simple volumetric blocks either because we lacked the necessary documentation and/or because they fell outside the research interest or subject focus of a given plantation.

Our understanding and modelling of these buildings was also aided by archaeological reports at some of the sites, primary source documents, and scholarship on the architecture of Louisiana plantation buildings and the surrounding landscape. These materials offered details about sugar processing and the construction of a typical sugar house, life in and around the enslaved people's living quarters, as well as details about the dimensional layout of its farmed land.

[43] For Whitney, Becknel (Evergreen), and Houmas (Monroe) Plantations, the USCS 1878 series was used as a primary source for drawing the layout and plan of the plantations. For Houmas (Monroe), this was supplemented by the USCS 1877 series, as the published map (1878) covering that area had smaller coverage than the original manuscript (1877) one. For Evan Hall, the MRC 1894 served the basis for the 3D modelling, as that area is not covered by either the USCS 1877 or the USCS 1878 series.

4.2.3 Interactive Interviews

Through an 'interactive interview' practice, local activists, archaeologists, historians, and genealogists have lead FA researchers through their homelands and ancestral landscapes. They have graciously shared their stories of searching for missing and erased cemeteries, as well as their knowledge, passed down through the generations, of confirmed cemeteries and other significant anchors, including churches and freetown communities that had grown, in the postbellum era, from rows of slave cabins on formerly slave-powered sugarcane plantations. Combined with the mapping process, storytelling is critical to deciphering the logics around the location of cemeteries, the transformation of the industrial landscape from plantations to petrochemical plants, and the erasure of Black communities, history, and culture by industry. We recognise that the generational transference of knowledge of place is a vital technology; our work is but one link within a multigenerational chain of remembrance and resistance.



Screenshot of a video recording of an interactive interview between Forensic Architecture researchers and Leon A. Waters, Co-founder and Board Chairperson of the Louisiana Museum of African American History, and a local activist, people's historian, and scholar, on 2 February 2021.

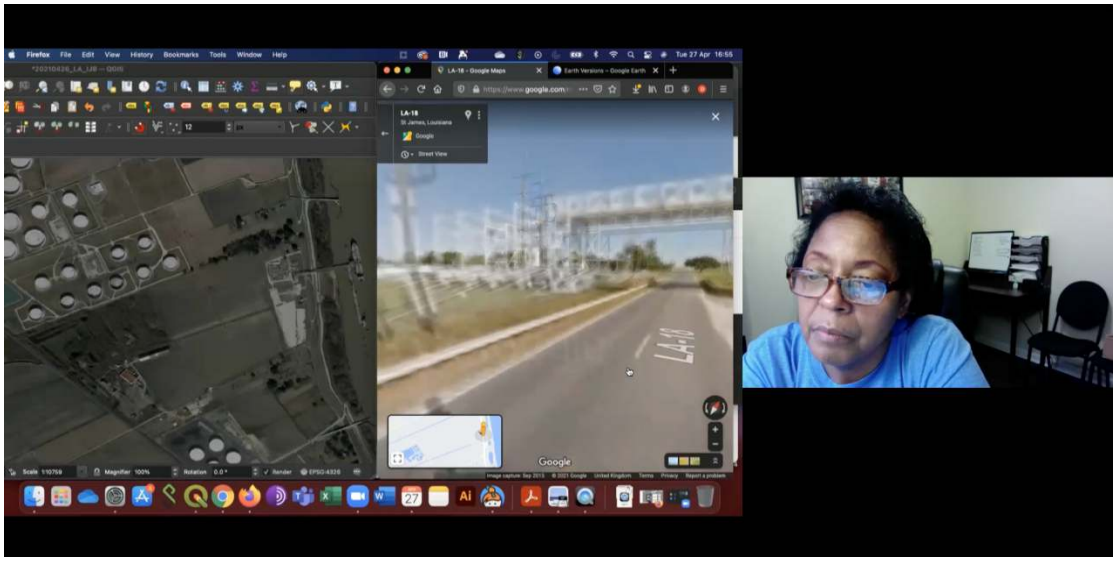
In one interview with Leon A. Waters, we used QGIS via remote screen sharing and were guided to the estimated locations of the Kenner and Kugler Plantation Cemeteries, which hold the remains of people formerly enslaved in St. Charles Parish. Many of the descendants of the interred have resided in the historic Black fenceline communities of Sellers, which was destroyed by the arrival of NORCO, and Diamond, which was dispossessed of its land by Shell Oil Company.

Mr. Waters has traced his ancestry via primary source documents, including Civil War pension records, to Sellers. Conversations with Mr. Waters have revealed the seamlessness of Louisiana's socio-economic transition from one form of racial capitalist exploitation to another: NORCO was constructed in 1916, the same year that his ancestor, Mrs Emily Waters, filed a claim for her Civil War widow's pension, which was due to her in recognition of the service of her formerly enslaved husband.

These conversations have further revealed the side-lining of Black genealogical and ancestral knowledge of cemeteries by state authorities. Mr. Waters directed us to archaeological reports written by archaeological firm R. Christopher Goodwin and Associates, Inc., for the US Army Corps of Engineers in 1986[44] and 1988.[45] These reports attempt to survey two historic Black cemeteries located in St. Charles Parish, Louisiana – the Kugler and Kenner Plantation Cemeteries – which were desecrated by the construction, between 1929 and 1932, of the Bonnet Carré Spillway by the US federal government following major flooding events in 1927.

The construction of the Spillway was approved despite and in defiance of local residents' warnings that cemeteries of historically enslaved people existed on the former plantations purchased by the state for the siting of the spillway. Only when human and funerary remains (including bones, casket fragments, and tombstone fragments) floated onto a nearby access road following the flooding of the spillway in 1975 was the state forced to acknowledge the existence of the cemeteries.[46]

On page two of the 1986 report, the authors refer to the "abandonment" of the two cemeteries in 1929.[47] This curious turn of phrase would seem to imply that the Black descendant community *willingly* gave up their ancestral burial grounds to this state project. On the contrary, descendants like Mr. Waters are denied a voice in decision-making to this day.

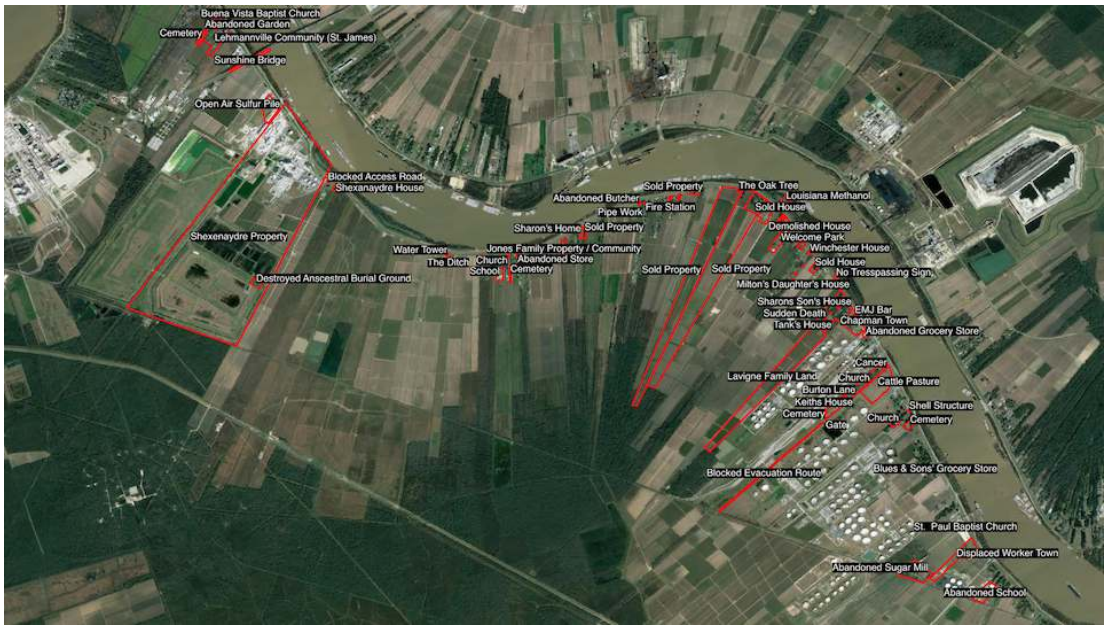


Screenshot of a video recording of an interactive interview between Forensic Architecture researchers and Sharon Lavigne, executive director of RISE St. James, on 27 April 2021.

In another interview with members of RISE St. James, we used QGIS and Google Maps (Street View) to 'drive' with Founder and Director Sharon Lavigne down Highway 18 from St. James High School to Mosaic Agrico's fertilizer plant. St. James

[44] Yakubik, Jill-Karen, et al. 'Cultural Resources Inventory of the Bonnet Carre' Spillway, St. Charles Parish, Louisiana'. COELMN/PD-86/15, Final Report. New Orleans: R. Christopher Goodwin and Associates, 30 September 1986.
[45] Poplin, Eric C., et al. 'Phase 2 of the Cultural Resources Inventory of the Bonnet Carre Spillway, St. Charles Parish, Louisiana'. COELMN/PD-88/04, Final Report. New Orleans: R. Christopher Goodwin and Associates, 15 April 1988.
[46] Yakubik, et al, 2, 24.
[47] Yakibik, 2.

High School was the only high school in the 5th district – until its purchase and subsequent closure by Shandong Yuhuang Chemical Company to enable the construction of the YCI Methanol facility. Along the way, we were introduced to the people and civic institutions (historical and contemporary) of majority-Black communities, including Burton Lane, Freetown, Welcome, and Lemannville, which became critical focal points of our 3D fluid dynamic analysis. Along this route, Sharon Lavigne and RISE members Milton Cayette and Chasity White told us stories of the community's uprooting by industry, which we mapped during the interview, generating an archive of displacement.

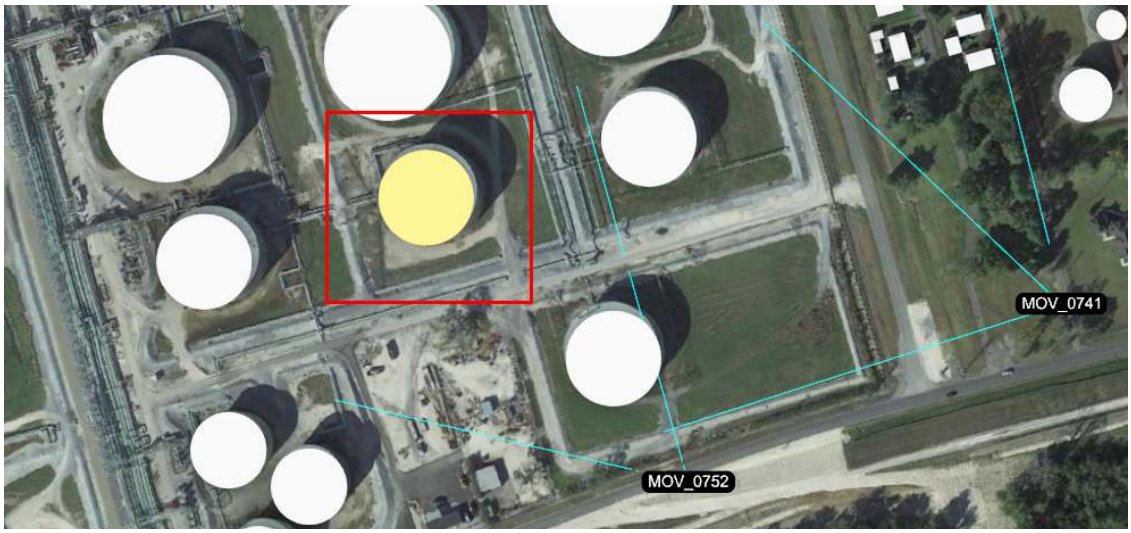


Map of displacement in the 5th District of St. James Parish, Louisiana, as narrated by members of RISE St. James.

5. Research and Analysis

5.1 Air

5.1.1 Determining Emissions Captured in Optical Gas Imaging



Heated Storage Tank 200-6 was emitting hydrocarbons as documented by Mov0752.

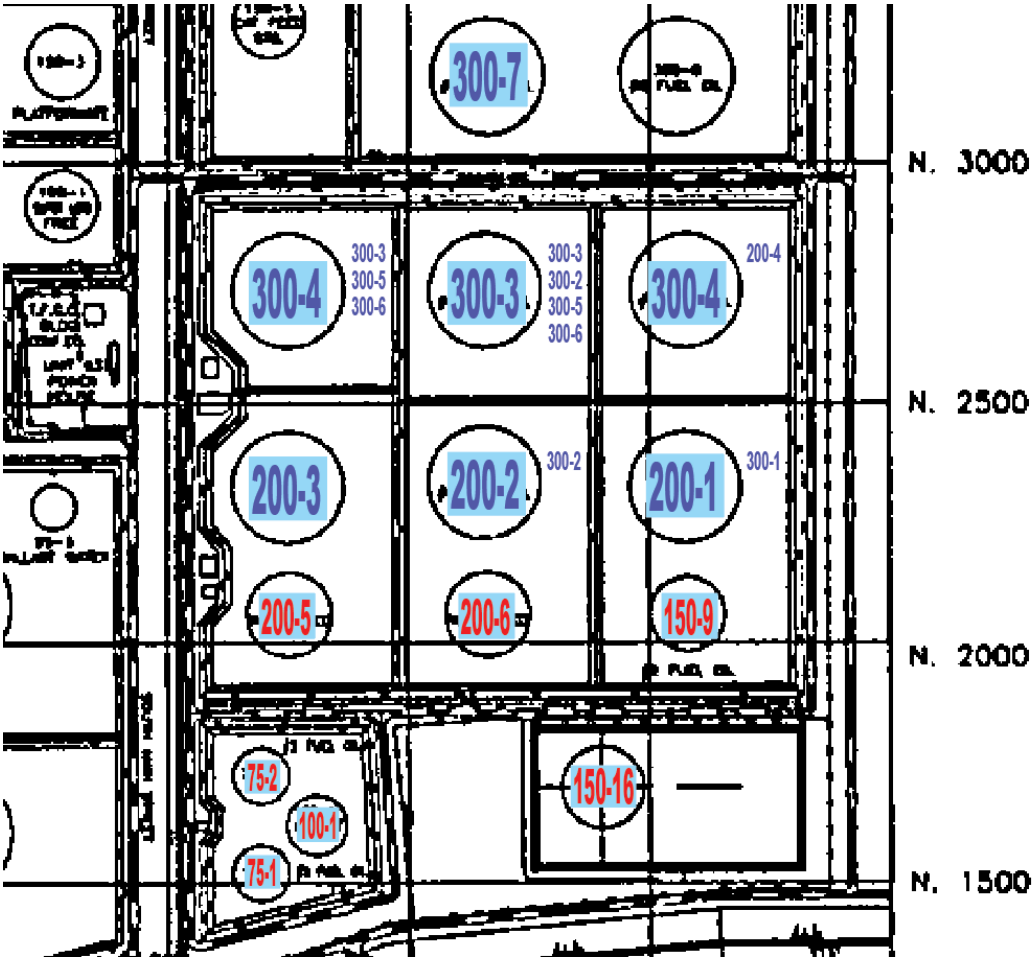


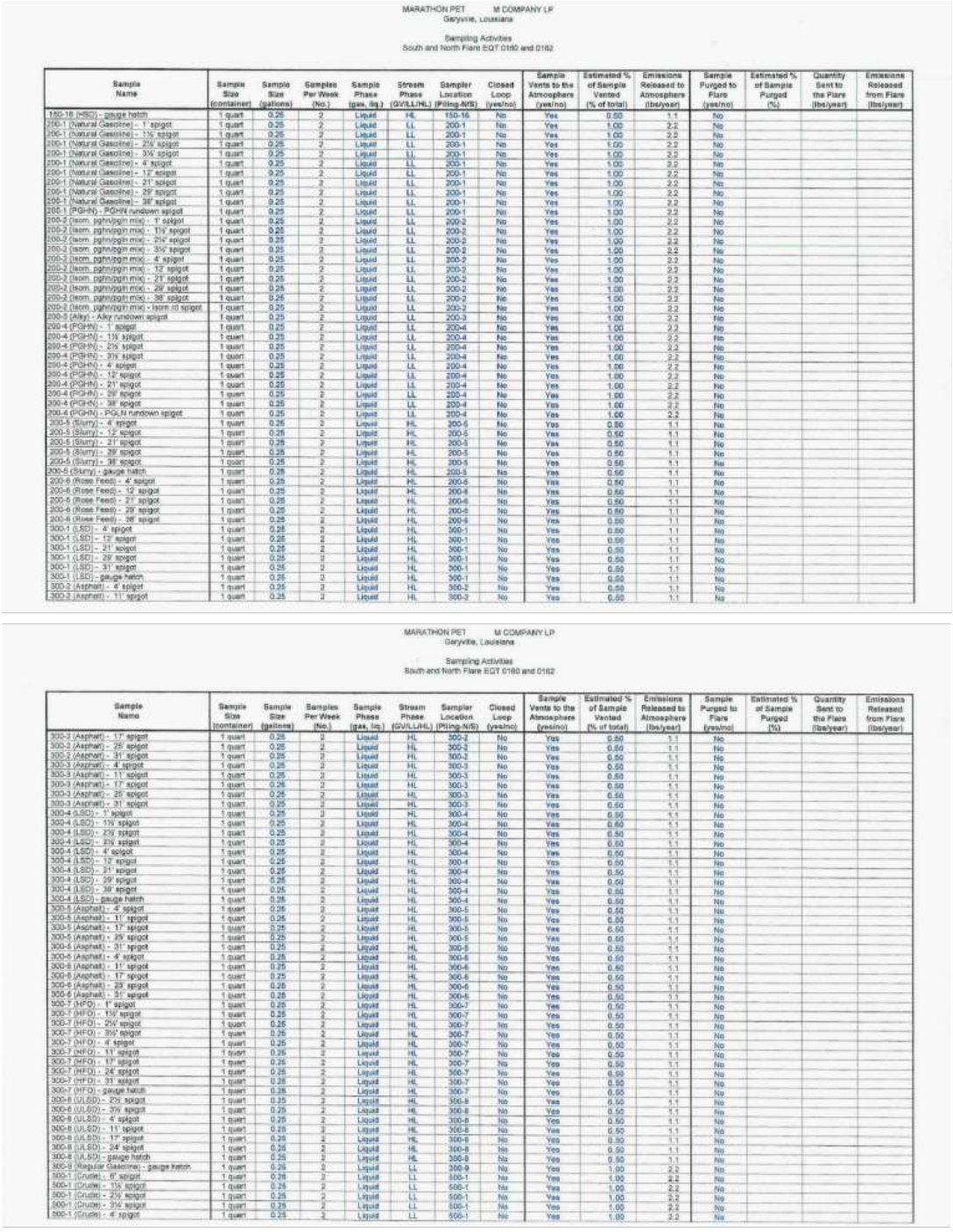
Diagram of tank numbers at the Marathon Petroleum Company. Annotations by FA. Red = certain, Blue = possible, with a list of alternatives alongside.

The first step in determining the content of the heated tanks was to locate their ID number. Tank 200-6 was identified from a photograph captured by the OGI field technicians. Using Google Earth and Google Street View, Forensic Architecture researchers identified the other specific heated tank identification numbers within the facility by cross-referencing diagrams from Title V permit applications submitted to LDEQ and imagery from Google Earth.

We analysed Marathon's Title V permit documents[48] to determine the content of the two tanks shown to emit hydrocarbon gases in the OGI footage. One Title V permit from May 1999 provides a detailed plan of the facility. We then located a Title V Modification Permit Application submitted on 2 March 2017.[49] The 408-page document outlines the number, content, and emissions of each tank at the Marathon Garyville Refinery. It contains a detailed section for each tank, including: 'Tank Identification and Physical Characteristics', 'Liquid Contents of Storage Tank', 'Calculations', and 'Individual Tank Emission Totals'. It also includes a 'Sampling Activities' table that summarises the ID numbers and contents of the tanks. According to the document, Tank 200-6 contains 'ROSE (Residuum Oil Supercritical

[48] 'Electronic Document Management System (EDMS)', Department of Environmental Quality, State of Louisiana, Last accessed July 4, 2021. Available at: https://www.deq.louisiana.gov/page/edms/.
[49] 'DocID: 10524748 (3165 – 3/2/2017 – Permits – Air Quality – Permits – Application – PER20170006)', Marathon Petroleum Company LP, Garyville Refinery, Garyville, LA, Department of Environmental Quality, State of Louisiana. Last accessed: July 4 2021. Available at: https://edms.deq.louisiana.gov/app/doc/view.aspx?doc=10524748&ob=yes/.

Extraction) Feed'. The ROSE process is a solvent-extraction option for recovering high-value de-asphalted gas oil (DAO) from petroleum residuum and other feedstocks.[50]



MARATHON PET M COMPANY LP
Garyville, Louisiana

Sampling Activities
South and North Flare EQT 0160 and 0162

Sample Name	Sample Size (container)	Sample Size (gallons)	Samples Per Week (No.)	Sample Phase (gas, liq.)	Stream Phase (GV/LL/HL)	Sampler Location (Piling-N/S)	Closed Loop (yes/no)	Sample Vents to the Atmosphere (yes/no)	Estimated % of Sample Vented (% of total)	Emissions Released to Atmosphere (lbs/year)	Sample Purged to Flare (yes/no)	Estimated % of Sample Purged (%)	Quantity Sent to the Flare (lbs/year)	Emissions Released from Flare (lbs/year)
150-16 (HSO) - gauge hatch	1 quart	0.25	2	Liquid	HL	150-16	No	Yes	0.50	1.1	No			
200-1 (Natural Gasoline) - 1' spigot	1 quart	0.25	2	Liquid	LL	200-1	No	Yes	1.00	2.2	No			
200-1 (Natural Gasoline) - 1½' spigot	1 quart	0.25	2	Liquid	LL	200-1	No	Yes	1.00	2.2	No			
200-1 (Natural Gasoline) - 2½' spigot	1 quart	0.25	2	Liquid	LL	200-1	No	Yes	1.00	2.2	No			
200-1 (Natural Gasoline) - 3½' spigot	1 quart	0.25	2	Liquid	LL	200-1	No	Yes	1.00	2.2	No			
200-1 (Natural Gasoline) - 4' spigot	1 quart	0.25	2	Liquid	LL	200-1	No	Yes	1.00	2.2	No			
200-1 (Natural Gasoline) - 12' spigot	1 quart	0.25	2	Liquid	LL	200-1	No	Yes	1.00	2.2	No			
200-1 (Natural Gasoline) - 21' spigot	1 quart	0.25	2	Liquid	LL	200-1	No	Yes	1.00	2.2	No			
200-1 (Natural Gasoline) - 29' spigot	1 quart	0.25	2	Liquid	LL	200-1	No	Yes	1.00	2.2	No			
200-1 (Natural Gasoline) - 38' spigot	1 quart	0.25	2	Liquid	LL	200-1	No	Yes	1.00	2.2	No			
200-1 (PGHN) - PGHN rundown spigot	1 quart	0.25	2	Liquid	LL	200-1	No	Yes	1.00	2.2	No			
200-2 (isom, pghn/pgln mix) - 1' spigot	1 quart	0.25	2	Liquid	LL	200-2	No	Yes	1.00	2.2	No			
200-2 (isom, pghn/pgln mix) - 1½' spigot	1 quart	0.25	2	Liquid	LL	200-2	No	Yes	1.00	2.2	No			
200-2 (isom, pghn/pgln mix) - 2½' spigot	1 quart	0.25	2	Liquid	LL	200-2	No	Yes	1.00	2.2	No			
200-2 (isom, pghn/pgln mix) - 3½' spigot	1 quart	0.25	2	Liquid	LL	200-2	No	Yes	1.00	2.2	No			
200-2 (isom, pghn/pgln mix) - 4' spigot	1 quart	0.25	2	Liquid	LL	200-2	No	Yes	1.00	2.2	No			
200-2 (isom, pghn/pgln mix) - 12' spigot	1 quart	0.25	2	Liquid	LL	200-2	No	Yes	1.00	2.2	No			
200-2 (isom, pghn/pgln mix) - 21' spigot	1 quart	0.25	2	Liquid	LL	200-2	No	Yes	1.00	2.2	No			
200-2 (isom, pghn/pgln mix) - 29' spigot	1 quart	0.25	2	Liquid	LL	200-2	No	Yes	1.00	2.2	No			
200-2 (isom, pghn/pgln mix) - 38' spigot	1 quart	0.25	2	Liquid	LL	200-2	No	Yes	1.00	2.2	No			
200-2 (isom, pghn/pgln mix) - isom rd spigot	1 quart	0.25	2	Liquid	LL	200-2	No	Yes	1.00	2.2	No			
200-3 (Alky) - Alky rundown spigot	1 quart	0.25	2	Liquid	LL	200-3	No	Yes	1.00	2.2	No			
200-4 (PGHN) - 1' spigot	1 quart	0.25	2	Liquid	LL	200-4	No	Yes	1.00	2.2	No			
200-4 (PGHN) - 1½' spigot	1 quart	0.25	2	Liquid	LL	200-4	No	Yes	1.00	2.2	No			
200-4 (PGHN) - 2½' spigot	1 quart	0.25	2	Liquid	LL	200-4	No	Yes	1.00	2.2	No			
200-4 (PGHN) - 3½' spigot	1 quart	0.25	2	Liquid	LL	200-4	No	Yes	1.00	2.2	No			
200-4 (PGHN) - 4' spigot	1 quart	0.25	2	Liquid	LL	200-4	No	Yes	1.00	2.2	No			
200-4 (PGHN) - 12' spigot	1 quart	0.25	2	Liquid	LL	200-4	No	Yes	1.00	2.2	No			
200-4 (PGHN) - 21' spigot	1 quart	0.25	2	Liquid	LL	200-4	No	Yes	1.00	2.2	No			
200-4 (PGHN) - 29' spigot	1 quart	0.25	2	Liquid	LL	200-4	No	Yes	1.00	2.2	No			
200-4 (PGHN) - 38' spigot	1 quart	0.25	2	Liquid	LL	200-4	No	Yes	1.00	2.2	No			
200-4 (PGHN) - PGLN rundown spigot	1 quart	0.25	2	Liquid	LL	200-4	No	Yes	1.00	2.2	No			
200-5 (Slurry) - 4' spigot	1 quart	0.25	2	Liquid	HL	200-5	No	Yes	0.50	1.1	No			
200-5 (Slurry) - 12' spigot	1 quart	0.25	2	Liquid	HL	200-5	No	Yes	0.50	1.1	No			
200-5 (Slurry) - 21' spigot	1 quart	0.25	2	Liquid	HL	200-5	No	Yes	0.50	1.1	No			
200-5 (Slurry) - 29' spigot	1 quart	0.25	2	Liquid	HL	200-5	No	Yes	0.50	1.1	No			
200-5 (Slurry) - 38' spigot	1 quart	0.25	2	Liquid	HL	200-5	No	Yes	0.50	1.1	No			
200-5 (Slurry) - gauge hatch	1 quart	0.25	2	Liquid	HL	200-5	No	Yes	0.50	1.1	No			
200-6 (Rose Feed) - 4' spigot	1 quart	0.25	2	Liquid	HL	200-6	No	Yes	0.50	1.1	No			
200-6 (Rose Feed) - 12' spigot	1 quart	0.25	2	Liquid	HL	200-6	No	Yes	0.50	1.1	No			
200-6 (Rose Feed) - 21' spigot	1 quart	0.25	2	Liquid	HL	200-6	No	Yes	0.50	1.1	No			
200-6 (Rose Feed) - 29' spigot	1 quart	0.25	2	Liquid	HL	200-6	No	Yes	0.50	1.1	No			
200-6 (Rose Feed) - 38' spigot	1 quart	0.25	2	Liquid	HL	200-6	No	Yes	0.50	1.1	No			
300-1 (LSD) - 4' spigot	1 quart	0.25	3	Liquid	HL	300-1	No	Yes	0.50	1.1	No			
300-1 (LSD) - 12' spigot	1 quart	0.25	3	Liquid	HL	300-1	No	Yes	0.50	1.1	No			
300-1 (LSD) - 21' spigot	1 quart	0.25	3	Liquid	HL	300-1	No	Yes	0.50	1.1	No			
300-1 (LSD) - 29' spigot	1 quart	0.25	3	Liquid	HL	300-1	No	Yes	0.50	1.1	No			
300-1 (LSD) - 31' spigot	1 quart	0.25	3	Liquid	HL	300-1	No	Yes	0.50	1.1	No			
300-1 (LSD) - gauge hatch	1 quart	0.25	3	Liquid	HL	300-1	No	Yes	0.50	1.1	No			
300-2 (Asphalt) - 4' spigot	1 quart	0.25	3	Liquid	HL	300-2	No	Yes	0.50	1.1	No			
300-2 (Asphalt) - 11' spigot	1 quart	0.25	3	Liquid	HL	300-2	No	Yes	0.50	1.1	No			

MARATHON PET M COMPANY LP
Garyville, Louisiana

Sampling Activities
South and North Flare EQT 0160 and 0162

Sample Name	Sample Size (container)	Sample Size (gallons)	Samples Per Week (No.)	Sample Phase (gas, liq.)	Stream Phase (GV/LL/HL)	Sampler Location (Piling-N/S)	Closed Loop (yes/no)	Sample Vents to the Atmosphere (yes/no)	Estimated % of Sample Vented (% of total)	Emissions Released to Atmosphere (lbs/year)	Sample Purged to Flare (yes/no)	Estimated % of Sample Purged (%)	Quantity Sent to the Flare (lbs/year)	Emissions Released from Flare (lbs/year)
300-2 (Asphalt) - 17' spigot	1 quart	0.25	3	Liquid	HL	300-2	No	Yes	0.50	1.1	No			
300-2 (Asphalt) - 25' spigot	1 quart	0.25	3	Liquid	HL	300-2	No	Yes	0.50	1.1	No			
300-2 (Asphalt) - 31' spigot	1 quart	0.25	3	Liquid	HL	300-2	No	Yes	0.50	1.1	No			
300-3 (Asphalt) - 4' spigot	1 quart	0.25	3	Liquid	HL	300-3	No	Yes	0.50	1.1	No			
300-3 (Asphalt) - 11' spigot	1 quart	0.25	3	Liquid	HL	300-3	No	Yes	0.50	1.1	No			
300-3 (Asphalt) - 17' spigot	1 quart	0.25	3	Liquid	HL	300-3	No	Yes	0.50	1.1	No			
300-3 (Asphalt) - 25' spigot	1 quart	0.25	3	Liquid	HL	300-3	No	Yes	0.50	1.1	No			
300-3 (Asphalt) - 31' spigot	1 quart	0.25	3	Liquid	HL	300-3	No	Yes	0.50	1.1	No			
300-4 (LSD) - 1' spigot	1 quart	0.25	3	Liquid	HL	300-4	No	Yes	0.50	1.1	No			
300-4 (LSD) - 1½' spigot	1 quart	0.25	3	Liquid	HL	300-4	No	Yes	0.50	1.1	No			
300-4 (LSD) - 2½' spigot	1 quart	0.25	3	Liquid	HL	300-4	No	Yes	0.50	1.1	No			
300-4 (LSD) - 3½' spigot	1 quart	0.25	3	Liquid	HL	300-4	No	Yes	0.50	1.1	No			
300-4 (LSD) - 4' spigot	1 quart	0.25	3	Liquid	HL	300-4	No	Yes	0.50	1.1	No			
300-4 (LSD) - 12' spigot	1 quart	0.25	3	Liquid	HL	300-4	No	Yes	0.50	1.1	No			
300-4 (LSD) - 21' spigot	1 quart	0.25	3	Liquid	HL	300-4	No	Yes	0.50	1.1	No			
300-4 (LSD) - 29' spigot	1 quart	0.25	3	Liquid	HL	300-4	No	Yes	0.50	1.1	No			
300-4 (LSD) - 38' spigot	1 quart	0.25	3	Liquid	HL	300-4	No	Yes	0.50	1.1	No			
300-4 (LSD) - gauge hatch	1 quart	0.25	3	Liquid	HL	300-4	No	Yes	0.50	1.1	No			
300-5 (Asphalt) - 4' spigot	1 quart	0.25	3	Liquid	HL	300-5	No	Yes	0.50	1.1	No			
300-5 (Asphalt) - 11' spigot	1 quart	0.25	3	Liquid	HL	300-5	No	Yes	0.50	1.1	No			
300-5 (Asphalt) - 17' spigot	1 quart	0.25	3	Liquid	HL	300-5	No	Yes	0.50	1.1	No			
300-5 (Asphalt) - 25' spigot	1 quart	0.25	3	Liquid	HL	300-5	No	Yes	0.50	1.1	No			
300-5 (Asphalt) - 31' spigot	1 quart	0.25	3	Liquid	HL	300-5	No	Yes	0.50	1.1	No			
300-6 (Asphalt) - 4' spigot	1 quart	0.25	3	Liquid	HL	300-6	No	Yes	0.50	1.1	No			
300-6 (Asphalt) - 11' spigot	1 quart	0.25	3	Liquid	HL	300-6	No	Yes	0.50	1.1	No			
300-6 (Asphalt) - 17' spigot	1 quart	0.25	3	Liquid	HL	300-6	No	Yes	0.50	1.1	No			
300-6 (Asphalt) - 25' spigot	1 quart	0.25	3	Liquid	HL	300-6	No	Yes	0.50	1.1	No			
300-6 (Asphalt) - 31' spigot	1 quart	0.25	3	Liquid	HL	300-6	No	Yes	0.50	1.1	No			
300-7 (HFO) - 1' spigot	1 quart	0.25	2	Liquid	HL	300-7	No	Yes	0.50	1.1	No			
300-7 (HFO) - 1½' spigot	1 quart	0.25	2	Liquid	HL	300-7	No	Yes	0.50	1.1	No			
300-7 (HFO) - 2½' spigot	1 quart	0.25	2	Liquid	HL	300-7	No	Yes	0.50	1.1	No			
300-7 (HFO) - 3½' spigot	1 quart	0.25	2	Liquid	HL	300-7	No	Yes	0.50	1.1	No			
300-7 (HFO) - 4' spigot	1 quart	0.25	2	Liquid	HL	300-7	No	Yes	0.50	1.1	No			
300-7 (HFO) - 11' spigot	1 quart	0.25	2	Liquid	HL	300-7	No	Yes	0.50	1.1	No			
300-7 (HFO) - 17' spigot	1 quart	0.25	2	Liquid	HL	300-7	No	Yes	0.50	1.1	No			
300-7 (HFO) - 24' spigot	1 quart	0.25	2	Liquid	HL	300-7	No	Yes	0.50	1.1	No			
300-7 (HFO) - 31' spigot	1 quart	0.25	2	Liquid	HL	300-7	No	Yes	0.50	1.1	No			
300-7 (HFO) - gauge hatch	1 quart	0.25	2	Liquid	HL	300-7	No	Yes	0.50	1.1	No			
300-8 (ULSD) - 2½' spigot	1 quart	0.25	3	Liquid	HL	300-8	No	Yes	0.50	1.1	No			
300-8 (ULSD) - 3½' spigot	1 quart	0.25	2	Liquid	HL	300-8	No	Yes	0.50	1.1	No			
300-8 (ULSD) - 4' spigot	1 quart	0.25	2	Liquid	HL	300-8	No	Yes	0.50	1.1	No			
300-8 (ULSD) - 11' spigot	1 quart	0.25	2	Liquid	HL	300-8	No	Yes	0.50	1.1	No			
300-8 (ULSD) - 17' spigot	1 quart	0.25	2	Liquid	HL	300-8	No	Yes	0.50	1.1	No			
300-8 (ULSD) - 24' spigot	1 quart	0.25	2	Liquid	HL	300-8	No	Yes	0.50	1.1	No			
300-8 (ULSD) - gauge hatch	1 quart	0.25	2	Liquid	HL	300-8	No	Yes	0.50	1.1	No			
300-9 (Regular Gasoline) - gauge hatch	1 quart	0.25	2	Liquid	LL	300-9	No	Yes	1.00	2.2	No			
500-1 (Crude) - 6' spigot	1 quart	0.25	2	Liquid	LL	500-1	No	Yes	1.00	2.2	No			
500-1 (Crude) - 1½' spigot	1 quart	0.25	2	Liquid	LL	500-1	No	Yes	1.00	2.2	No			
500-1 (Crude) - 2½' spigot	1 quart	0.25	2	Liquid	LL	500-1	No	Yes	1.00	2.2	No			
500-1 (Crude) - 3½' spigot	1 quart	0.25	2	Liquid	LL	500-1	No	Yes	1.00	2.2	No			
500-1 (Crude) - 4' spigot	1 quart	0.25	2	Liquid	LL	500-1	No	Yes	1.00	2.2	No			

Excerpts from Marathon Petroleum Company's Title V Modification Permit Application, 2 March 2017.

The ROSE process separates crude oil residuals by solvent extraction to make usable constituents, including both asphalt-based and asphalted products. To effectively separate these hydrocarbons and squeeze out as much energy as

[50] https://www.gulfoilandgas.com/webpro1/prod1/services.asp?id=286
https://patents.google.com/patent/US20110094937A1/en
https://academic.oup.com/chromsci/article-pdf/38/1/1/833226/38-1-1.pdf

possible, heat must be added. Simply put, according to Marathon's Title V records, this process is occurring inside Storage Tank 200-6.

These findings are consistent with the OGI analysis. According to Earthworks' field technicians, the exterior shell of the tank indicates that the tank is heated; the OGI footage captures the emission of hydrocarbon gases. As heat is added to the process, chemical volatilisation occurs, and because the tank is not equipped with vapour recovery, hydrocarbon emissions are continuously volatilised into the atmosphere.

Asphalt is refined from crude oil, and the product must be heated and stirred to stay liquid; the heating process produces air emissions. Under pressure, when asphalt or No. 6 fuel oil is heated, liquid molecules evaporate into the air. As pressure builds, hydrocarbon and solvent emissions vent into the atmosphere. The emissions detected by the OGI cameras have an infrared transmission of 3.2 – 3.4 micrometres, which could be any number of compounds commonly referred as hydrocarbons and solvents, depending on how efficient the refining process is within specific facilities.

Emissions that begin at the scale of a single tank seep across broad geographies and dozens of communities. We have developed additional techniques that can expand the scale of analysis from Lions to the wider region.

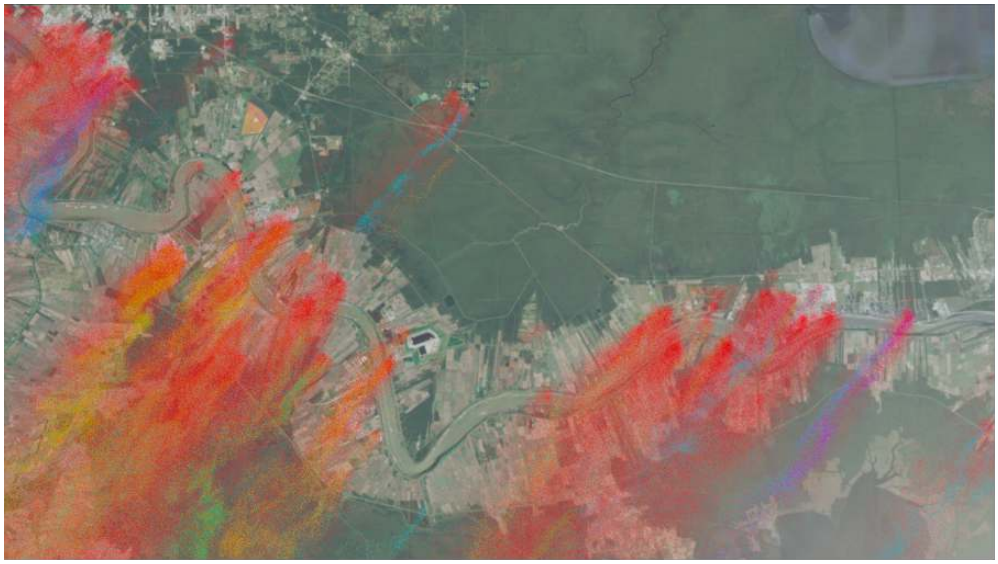
4.2.4 Large Eddy Simulation of Permitted Emissions

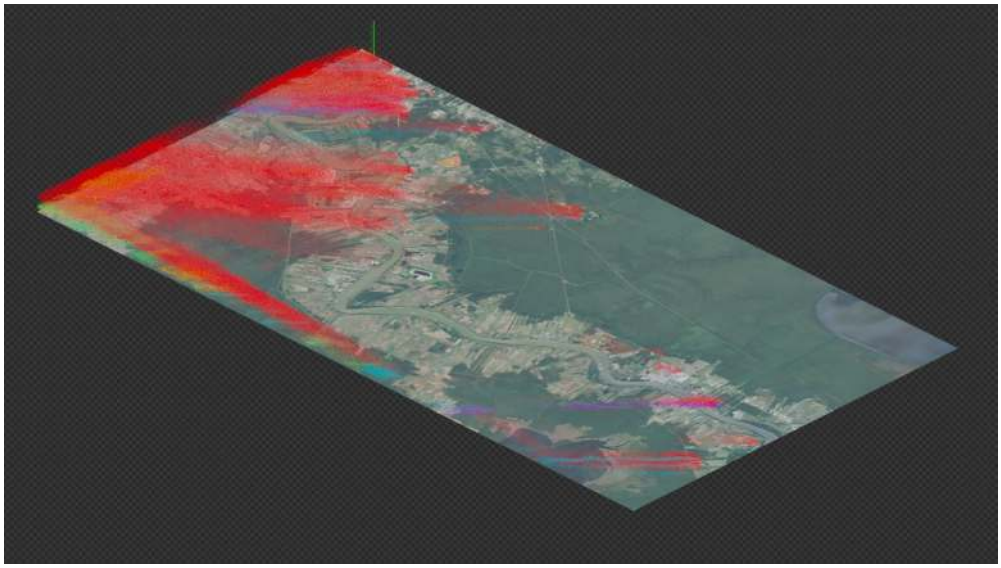
Using the meteorological data described in section 4.1, above, we developed a large eddy simulation of permitted emissions for the three selected dates. Each of the simulations includes a 3D point cloud model as a PLY sequence[51] with a three-minute time resolution (200 seconds).[52]

The simulations are navigable and allow for an understanding of the extent and contours of the clouds of each pollutant from within (on the ground and inside communities) and outside of the cloud (the axonometric view).

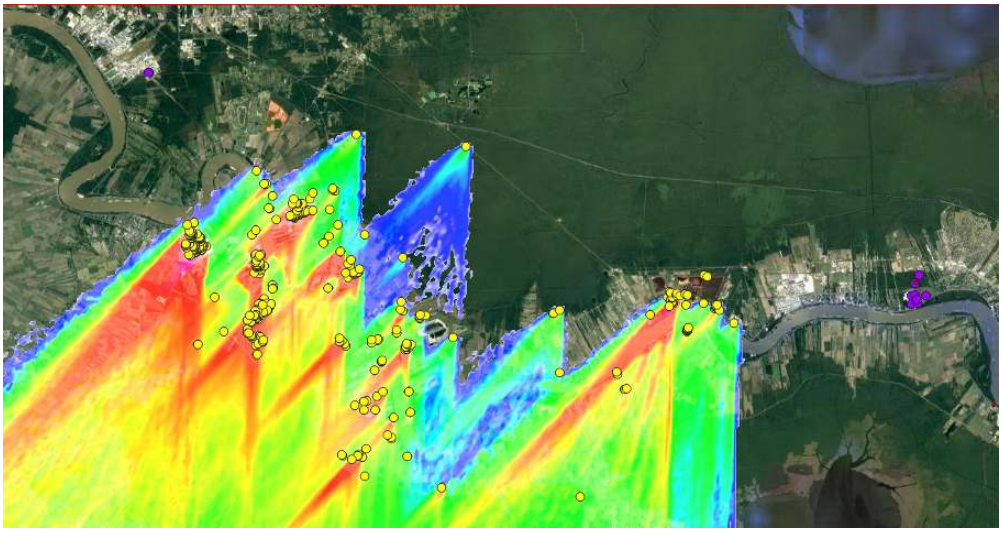
[51] A PLY is a computer file format known as a Polygon File Format, intended as a storage of 3D scanned data. A PLY sequence is a linear series of PLY files, in our case used to represent each PLY file sequenced in time, or to represent the point clouds as animated, rather than as static. We can think of each PLY in the sequence as a frame in a video; only through cycling through all the PLYs in sequence can we witness the moving image. The PLY sequence in this case is a sequence of point clouds.

[52] A 3-minute resolution in this case refers to the 3-minute interval between successive point cloud frames. In other words, time has been drastically sped up, so that the simulation shown in our investigation is fast forwarded.





Stills from our fluid dynamics simulation



Concentration of Nitrogen oxides (NOx), 20 Mar 2021.

Concentration is the amount (mass) of pollutant per volume of air; common units of pollutant concentrations are microg/m3 or mg/m3. The average concentration is the 'typical' or 'mean' concentration over the 12 hours of the simulation.

Moment-to-moment values may be higher or lower than average. For example, as wind changes direction, the average concentration in a particular location decreases. Air quality permits (tend to) refer to average concentration, but in some cases, they also mark absolute limits. LDEQ offers data on average hourly rates of emission, as well as maximum hourly rates of emission.

AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB
t Hours of Ope	Parish	Release Poin	Release Poin	Release Poin	Release Poin	Release Poin	Distance fror	Emission Rat	Emission Rat	Statistical Ba	Phase Descri	Group meml	ERIC Release	Release Point Typ
8760	St. John the I	738636.166	3327343.55	15	30.053928	-90.524792	30761.8	0.01	tons/yr	Annual maximum		UNF 00000001		Stack
8760	St. John the I	738636.166	3327343.55	15	30.053928	-90.524792	30761.8	0.002	lb/hr	Hourly average		UNF 00000001		Stack
8760	St. John the I	738636.166	3327343.55	15	30.053928	-90.524792	30761.8	0.003	lb/hr	Hourly maximum		UNF 00000001		Stack
8760	St. John the I	738636.166	3327343.55	15	30.053928	-90.524792	30761.8	0.01	tons/yr	Annual maximum		UNF 00000002		Stack
8760	St. John the I	738636.166	3327343.55	15	30.053928	-90.524792	30761.8	0.001	lb/hr	Hourly average		UNF 00000002		Stack
8760	St. John the I	738636.166	3327343.55	15	30.053928	-90.524792	30761.8	0.001	lb/hr	Hourly maximum		UNF 00000002		Stack
81	St. John the I	738636.166	3327343.55	15	30.053928	-90.524792	30761.8	0.83	tons/yr	Annual maximum		UNF 00000002		Stack
81	St. John the I	738636.166	3327343.55	15	30.053928	-90.524792	30761.8	20.57	lb/hr	Hourly average		UNF 00000002		Stack
81	St. John the I	738636.166	3327343.55	15	30.053928	-90.524792	30761.8	2527	lb/hr	Hourly maximum		UNF 00000002		Stack
26	St. John the I	738636.166	3327343.55	15	30.053928	-90.524792	30761.8	0.52	tons/yr	Annual maximum		UNF 00000002		Stack
26	St. John the I	738636.166	3327343.55	15	30.053928	-90.524792	30761.8	40	lb/hr	Hourly average		UNF 00000002		Stack
26	St. John the I	738636.166	3327343.55	15	30.053928	-90.524792	30761.8	2527	lb/hr	Hourly maximum		UNF 00000002		Stack
26	St. John the I	738636.166	3327343.55	15	30.053928	-90.524792	30761.8	0.52	tons/yr	Annual maximum		UNF 00000002		Stack
26	St. John the I	738636.166	3327343.55	15	30.053928	-90.524792	30761.8	40	lb/hr	Hourly average		UNF 00000002		Stack
26	St. John the I	738636.166	3327343.55	15	30.053928	-90.524792	30761.8	2527	lb/hr	Hourly maximum		UNF 00000002		Stack
240	St. John the I	738636.166	3327343.55	15	30.053928	-90.524792	30761.8	10.6	lb/hr	Hourly maximum		UNF 00000002,GRP 0000(		Stack
8760	St. John the I	738636.166	3327343.55	15	30.053928	-90.524792	30761.8	0.62	tons/yr	Annual maximum		UNF 00000002		Stack
8760	St. John the I	738636.166	3327343.55	15	30.053928	-90.524792	30761.8	0.14	lb/hr	Hourly average		UNF 00000002		Stack

A sample permitted emissions report highlighting the hourly average rate of emission.

We developed two experiments for calculating the concentration of pollutants on a given day at an elevation of 100m. In the first experiment, only the hourly average rate of emission is calculated for each source point. In the second experiment, emission points that also include an hourly maximum are calculated at their maximum rate of operation for one hour (12:00-13:00) while emitting at their average rate for the rest of the duration of the day. (Notably, residents of St. James have informed us that flaring events – when excess gas is burned off – occur often and for long durations at many facilities, meaning that it is likely that even this second calculation represents a conservative estimate.)

We measured the concentrations against health standards to determine areas and communities that are at risk. We used the NAAQS limits for PM 2.5 and nitrogen oxides, and EPA measures for ammonia, benzene, chloroprene and ethylene oxide. The NAAQS offers a more useful comparison from a legal perspective, but no federal ambient air standard exists for the remaining pollutants (ammonia, chloroprene, ethylene oxide, and benzene). As such, we used the Louisiana standards, which are grossly under-protective, along with 'suggestions' from the Environmental Protection Agency (EPA), which have clearly not been developed in a systematic or standardised manner. The European standards are useful from an advocacy perspective.

- PM2.5: we compared to the NAAQS limits.
- Nitrogen Oxide: we compared to the NAAQS limits.
- Ammonia: Louisiana AAS is 0.64 mg/m^3. The EPA offers the Reference Concentration of 0.5 mg/m^3.

Reference Concentrations are not legally enforceable; rather, they are levels established by the Environmental Protection Agency as the level of exposure for an

average person across a lifetime at which you could expect no significant non-cancer health risks. Because ammonia is not a carcinogen, it makes sense for us to use the Reference Concentration here. For the remaining toxic air pollutants, we will not use Reference Concentrations because there are cancer-specific values that are more protective.

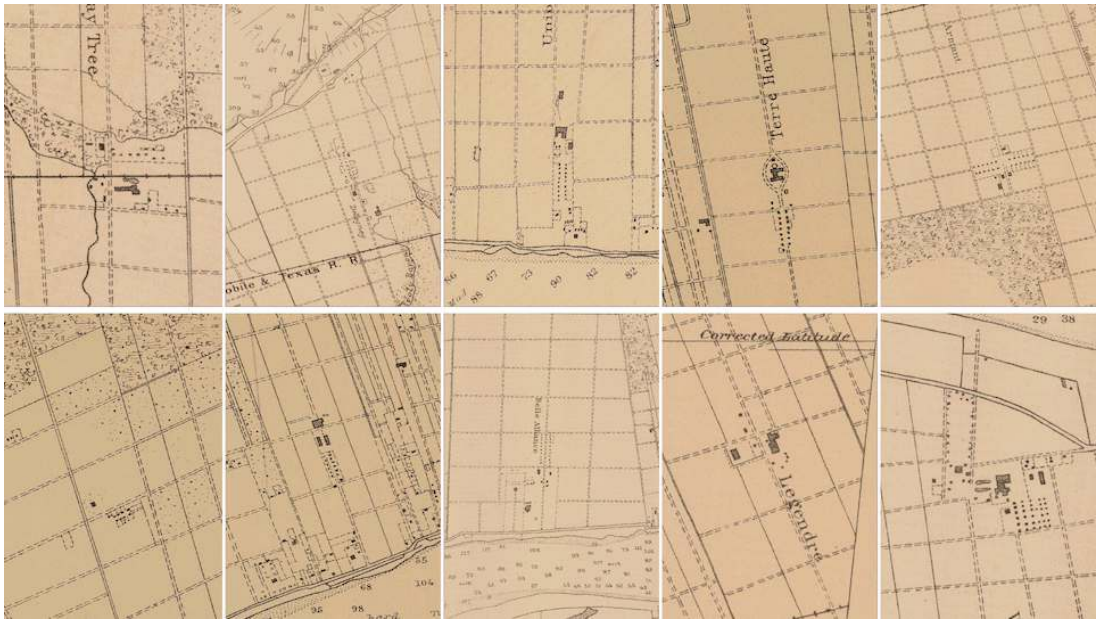
- Benzene: The Louisiana AAS is (12 $\mu g/m^3$). The EPA offers the conservative estimate of 0.13 $\mu g/m^3$ and 1.3 $\mu g/m^3$ for a 1 in a million and 1 in 100,000 cancer risk, respectively.
- Chloroprene: The Louisiana AAS is 857 $\mu g/m^3$. EPA offers the conservative estimates of 0.2 $\mu g/m^3$ and 0.002 $\mu g/m^3$, as target concentrations to protect against cancer risk in this 2016 memo.
- Ethylene oxide: The Louisiana AAS is 1 $\mu g/m^3$. The EPA offers the conservative estimates of 0.0002 $\mu g/m^3$ and 0.02 $\mu g/m^3$, as the ambient concentrations corresponding to a 1 in a million and 1 in 10,000 cancer risk, respectively.

4.2.5 Margin of Error

LES models are sensitive to uncertainty in boundary conditions and topography, which could affect our predictions. Based on previous LES dispersion studies in atmospheric flows, we estimate a maximum error of 5% between the simulations and pollutant real data.[53]

5.2 Ground

5.2.1 Plantation Spatial Logics



[53] See: F. Harms, et al., 'Validating LES-based flow and dispersion models', *Journal Wind Engineering and Industrial Aerodynamics* 99 (2011): 289-295.
See also: Y. Feng, et. al, 'ProLB: A lattice Boltzmann solver of large-eddy simulation for atmospheric boundary layer flows', *Journal of Advances in Modeling Earth Systems*, 2021.

A selection of plantations from USCS 1878 showing the relationship between plantation components, including the living quarters of enslaved people, the industrial sugar mill, roads and paths, fields, forest, and cemeteries.

To determine the probable locations of cemeteries, we needed to understand the broadly consistent logics according to which plantations reorganised life and managed death. The first multinational corporation to occupy Louisiana was the French 'Compagnie des Indes,' or 'Company of the Indies,' which genocidally dispossessed Indigenous peoples of their land and carved indigenous territory into private 'land grants'. During the first third of the 19th century, these grants were consolidated into the large plantations that would come to determine, define, and dominate the landscape.[54] According to Pearson, these plantations:

> *began to exhibit some of the following elements: a landholding large enough to be distinguished from a family farm; a distinctive division of labour and management functions; specialised agricultural production; and distinctive settlement forms and spatial organization.*[55]

These distinctive French colonial settlement forms utilised linear organisational patterns to enforce racial segregation, incarceration, surveillance and forced labour — capitalist tools wielded to maximise productivity and profit. These logics dominated a region spanning hundreds of miles and have persisted to this day.[56]

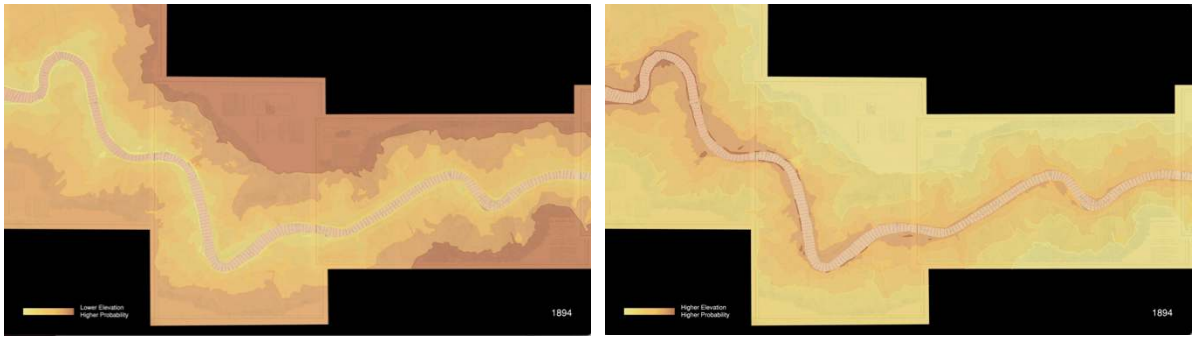
River

The Mississippi River's alluvial depositions over thousands of years have created a natural levee that decreases gradually in elevation toward the backswamps. The high ground has been inhabited for millennia. When colonists arrived to settle Louisiana, they murdered and dispossessed the Indigenous peoples of their ancestral land. For the first hundred years of colonial settlement, prior to the introduction of sugarcane, colonial settlements were restricted to the space along the natural levee.

Sugarcane is a crop of scale; its successful cultivation demands large acreage and a large enslaved population – the latter facilitated by the domestic slave trade and breeding programmes – to work the land.

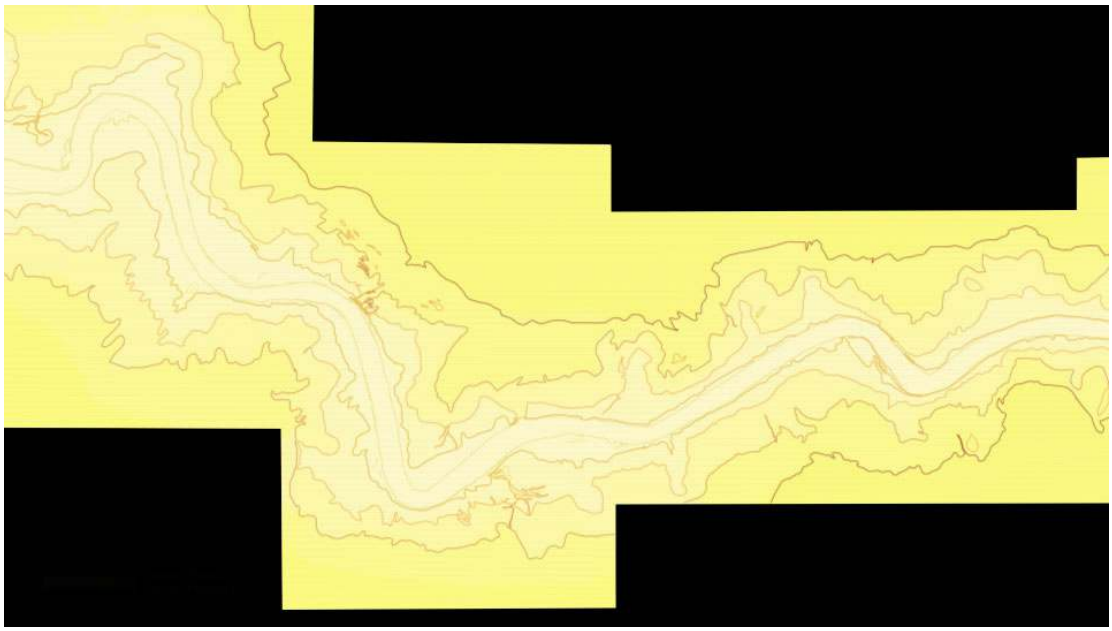
Once the crop reached a viable degree of profitability in the mid-1820s, the plantation economy experienced several decades of exponential growth, as profits accumulated and acreage expanded. The master's domain continued to occupy the high ground, while the world of the enslaved was relegated to low-lying land at the back of the plantation. Across countless archaeology reports, we have seen the high ground close to the river consistently designated as having a high probability of containing cultural resources, and the back of the plantation—the world of the enslaved—as having lower probability of harbouring such sites of value. Lower lying areas are considered high probability sites for cemeteries; so, to search for the burial grounds of formerly enslaved people, we have to invert these topographic logics.

[54] John Burkhardt Rehder, 'Sugar Plantation Settlements of Southern Louisiana: A Cultural Geography' (Unpublished Ph.D., Baton Rouge, Department of Geography and Anthropology, Louisiana State University, 1971), 40–41.
[55] Charles Pearson, 'Cultural Resources Survey of Wilton and Helvetia Plantations, St. James Parish, Louisiana' (Coastal Environments, Inc, 1979), 4–13.
[56] Pearson, 4–13.



Screenshots from the FA video investigation 'If toxic air is a monument to slavery, how do we take it down?' showing inverted topographical logics.

We have identified fifteen mapped and known[57] cemeteries not associated with churches within 700 meters from the river. The proximity to the river indicates the likelihood of an early date of establishment (given the progressive expansion of plantations toward the backswamps from the introduction of sugarcane in the mid-1820s). Because the river flooded regularly prior to the construction of the Army Corps of Engineers' levee system in 1927, many cemeteries, along with other cultural resources, may be submerged. In our probability field, we consider the area between the river and the 700m mark as 'Band A.'



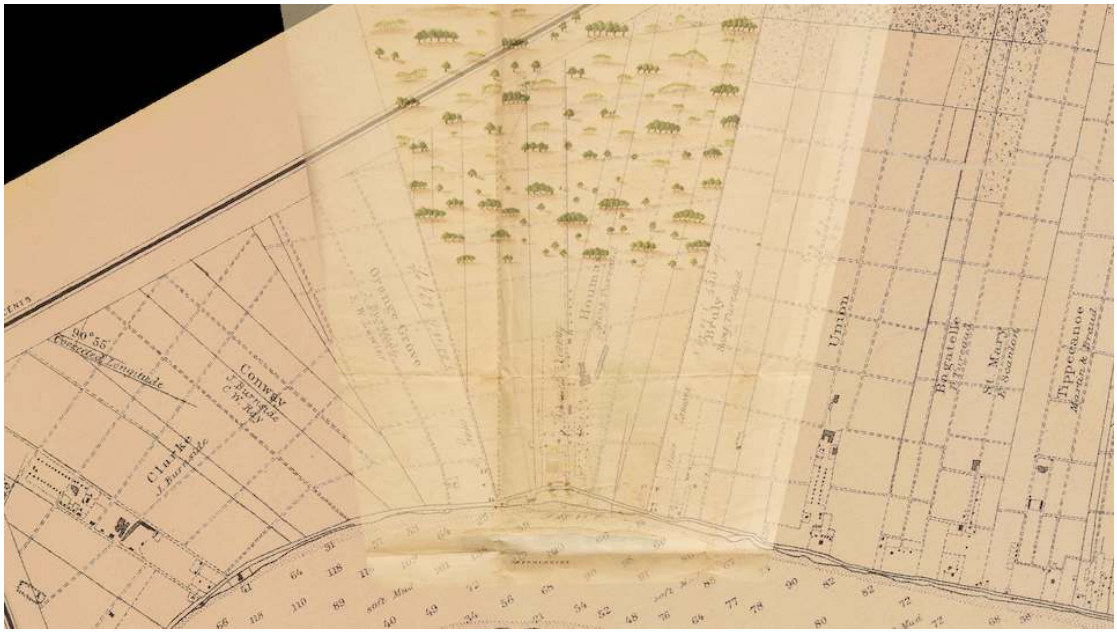
Screenshot from the FA video investigation 'If toxic air is a monument to slavery, how do we take it down?' showing probability field parameter 1: topography.

Forest

Interviews with formerly enslaved people testify to the tendency for pregnant women to labour in the fields throughout their term. If an overseer wanted to whip a pregnant woman, they would notoriously dig a hole in the ground to protect the unborn asset. Some enslaved children were born in the very fields where they would grow up to

[57] St. Michael, 306m; Burnside, 178m; Union, 95m; Columbia, 18m; Ferrier, 0m; Hermitage (Kugler), 343m; Roseland (Kenner), 150m; NP Godfrey, 40m; Davis (Pedescleaux), 270m; Hymel, 379m; Mialaret, 121.5m; White Rose, 643.5; Tigerville, ; Woodland, 120m; Union (St. John Parish), 51m; Hard Times, 101m

work away their lives.[58] As the necro-economy of the sugar plantation reorganised life, so did it manage death. Sugarcane was notorious for being the most dangerous crop to cultivate, and Louisiana's sugar districts bore a negative demographic growth rate among the enslaved population.[59] Many cemeteries would have been established during this period of rapid expansion between 1830 and 1860.



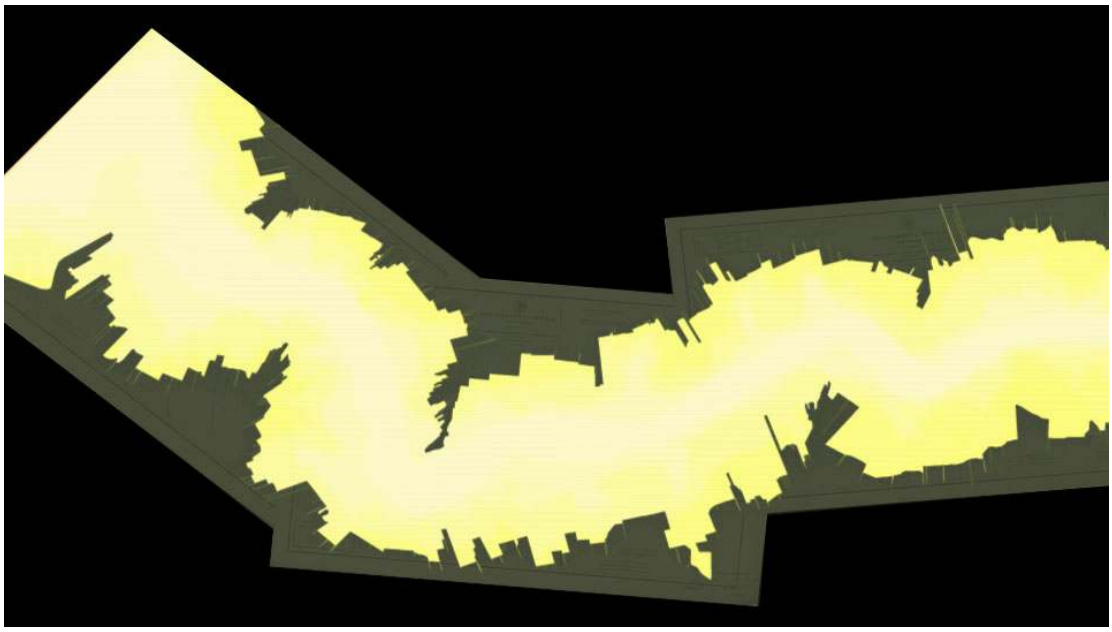
The forest mapped on a 25 June 1821 survey by Auguste Bonnet of the Houmas Plantation, then owned by James R. Conway, against the USCS 1878 chart.

Slave masters would not sacrifice valuable land for Black cemeteries.
As such, enslaved people were interred in uncultivated lands at the back of the plantation, at the edge of the ever-retreating cypress forest. As the plantation expanded over the decades, the forest ebbed, leaving cemeteries of the enslaved marooned as forested islands within seas of cane fields.

Few available records reveal the specifics of the forest's progressive clearance. Among the scores of surveys that we have located, only one depicts the forest in detail. This rare survey is dated 25 June 1821 and was likely drawn prior to the widespread introduction of sugarcane. Our next record of the forest line appears in the USCS 1877 chart. By that time, the forest had retreated 2-3 miles from the river, leaving only a thin band of coverage gradating toward the backswamps.

Because Black cemeteries were established in a liminal zone between the river and forest, the location of cemeteries may reveal the edge of the forest at the time of the cemetery's establishment. While we have no data on cemeteries beyond the edge of the forest mapped in 1878, it remains probable that cemeteries of enslaved people, as well as maroons, exist within the forest as well.

[58] Edward De Bueiw, 'Interview with Edward De Bueiw', in: *WPA Ex-Slave Narrative Project*, 10 June 1940.
[59] 'Slavery in Louisiana', *Whitney Plantation Museum,* https://www.whitneyplantation.org/history/slavery-in-louisiana/. Last accessed: 25 June 2021.



Screenshot from the FA video investigation, showing probability field parameter 2: forest.

Grid

'The sugar plantations are bounded by lines drawn at right angles to the banks of the river, and extending through the forest.'[60]

Colonial land grants divided territory into private parcels. Property lines were drawn perpendicular to the river, and extended 40 to 80 French arpents – a French unit of measurement – or one-and-a-half to three miles, toward the backswamps.

This point approximately three miles or 80 arpents from the river marked the far edge of most colonial land grants. Many plantations cleared land to just about 2/3 of this distance. Property boundaries were drawn from the river to the 40 arpent line; an additional back parcel was sometimes granted to the 80 arpent line.

These parcels were further subdivided into a Cartesian grid by roads, drainage and irrigation canals, and field paths. Each plantation is bisected by a main plantation road, which forms the property's central axis.

The fields were themselves planted in linear rows, with 1.8m spaces between them, wide enough to allow the passage of a two-mule plough.[61] At night, these furrows between rows of cane were reappropriated by the plantation's enslaved population, their paths of daily toil serving as passages for clandestine access to the forest, to perform ritual, ceremony, and burial.[62]

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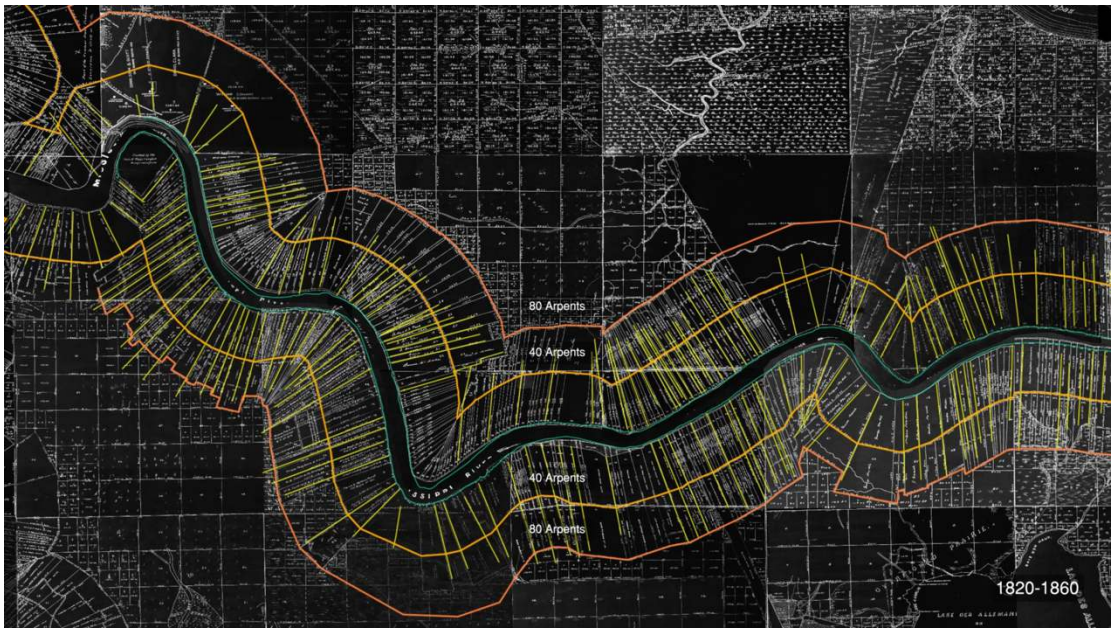
[60] Rehder, 'Sugar Plantation Settlements of Southern Louisiana: A Cultural Geography', 92.
[61] Rehder, 231.
[62] "The slaves' nocturnal culture flourished on the boundaries of the plantation world… Although rectilinear streets led symbolically from the big house to the sugarhouse, the slaves who stole away from the quarters to moonlit vigils followed their own tracks through the plantation. Runaways and fugitives had secret passageways from the woods to the quarters." Richard Follet, *The Sugar Masters: Planters and Slaves in Louisiana's Cane World, 1820-1860* (Baton Rouge: LSU Press, 2005), 266. See also: Elizabeth Ross Hite, 'Interview with Elizabeth Ross Hite', in: *WPA Ex-Slave Narrative Project*, ca. 1940.



Screenshot from the FA video investigation, showing the river line and the 40 and 80 arpent lines against PLSS surveys from 1820-1860.

Screenshots from the FA video investigation, showing the average distance of a sample of mapped cemeteries from plantation property borders and main plantation roads.

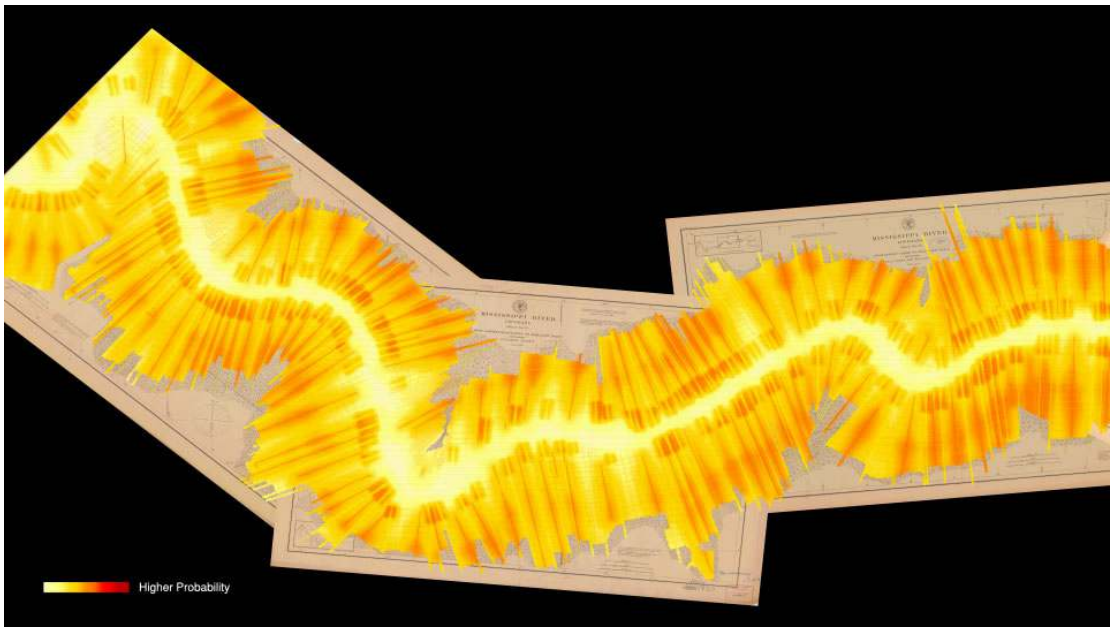
As previously discussed, within our probability field, cemeteries that fall within 700m from the waterline are considered Band A; cemeteries between the 700m point and the 40 arpent line are considered Band B; cemeteries between the 40 arpent line and the 1878 Forest line are considered Band C.

Cemeteries in Band A (close to the river) are likely to have an earlier date of establishment (i.e. ca. 1820 or earlier), when the forest would have had a greater extent of coverage prior to the period of exponential plantation growth over the subsequent decades.

We identified 15 mapped or known cemeteries in Band A, located within 350 meters of the property line.[63] Cemeteries located toward the centre or back of the plantation largely align with or are slightly offset from the central axis. We identified 16 mapped or known cemeteries in Band B, located at an average of 230m from the main plantation road.[64]

[63] St. Michael, 306m; Burnside, 178m; Union, 95m; Columbia (Colomb), 18m; Ferrier, 0m; Hermitage (Kugler), 343m; Roseland (Kenner), 150m; NP Godfrey, 40m; Davis (Pedescleaux), 270m; Hymel, 56m; Mialaret, 119m; White Rose, 51m; Woodland, 120m; Union (St. John Parish), 51m; Hard Times, 101m

[64] Houmas (Monroe), 212m; V. Weber, 0m; Longuevue (Bocage), 110m; Curtis (Myers et al), 145m; Golden Grove, 814m; Hard Times, 88m; Horn, 271; Magnolia, 0m; Unknown (Many), 0m; La Pice (St. James), 217m; Buena Vista, 140.5m; Acadia (Arcadia), 48m; Elina, 273m; Lauderdale, 128m; Point Houmas, 473m; Bruslie, 764m



Screenshot from the FA video investigation, showing probability field parameter 3: grid.

Structures

Structures were strategically located along the plantation grid. As the planters' wealth grew, they expanded their residences into elaborate manors fronting the river, at a conspicuous remove from the rest of the settlement. The locations of industrial facilities and housing for the plantation's enslaved labour force were chosen with efficiency in mind, 'to divide up as much as possible the distance that must be traversed in hauling the wood from the "swamps", the cane from the fields, and the crop to the river for shipment'.[65]

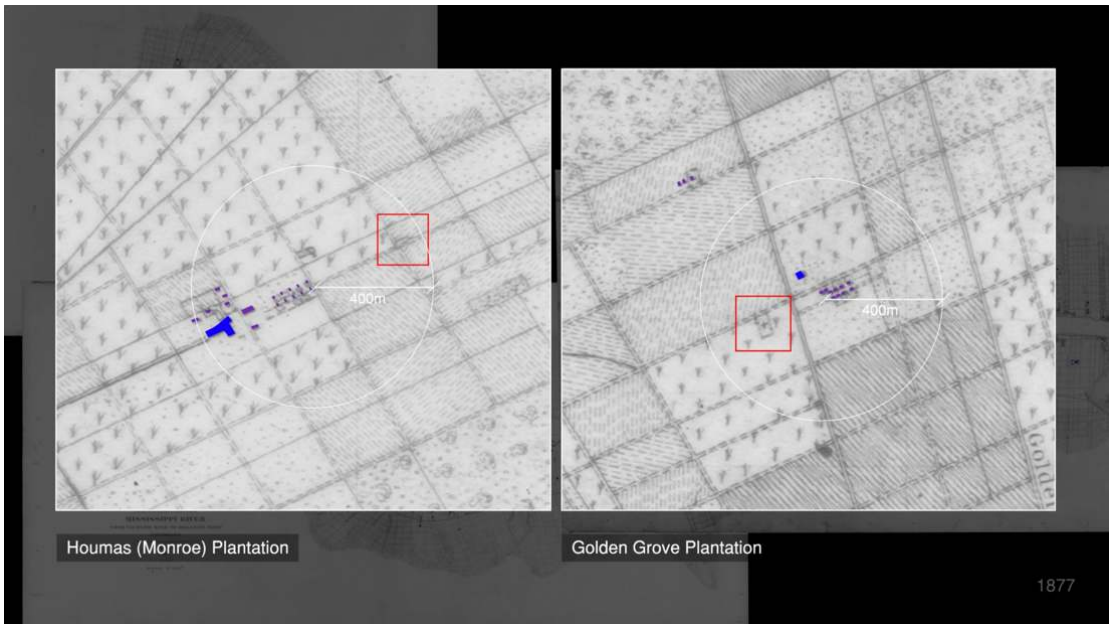
Screenshot from the FA video investigation, the relationship between sugar mills and mapped cemeteries.

[65] Rehder, 'Sugar Plantation Settlements of Southern Louisiana: A Cultural Geography', 86.

The difficulty of producing sugarcane – a tropical monocrop imposed on a subtropical climate – demanded a frenzied, militarised pace, particularly during the autumn harvest season when an early winter frost could destroy the annual crop.[66]

Over time, plantations were increasingly mechanised and outfitted with the latest technologies to maximise efficiency and output. Steam power became economically viable in the mid-1830s, increasing the rate of production, along with the mortal danger posed to the enslaved workforce.

The bodies of enslaved people were treated as mechanical tools, used purely as means to an end and discarded when they had exhausted their use. For the enslaved, each day began with the ringing of a bell to herald roll call at the industrial sugar factory.[67] The factory consisted of a boiling house, a steam-powered sugar mill, and chimneys and vents, which spewed smoke and steam into the humid air. Housing for enslaved people, referred to as 'slave quarters' were located along the central road amid fields of cane, in close vicinity to the sugar mills, which were also situated along the central road. Numerous elements of everyday life, including the time it took for the enslaved to reach the mill from their quarters, were timed and recorded.[68]



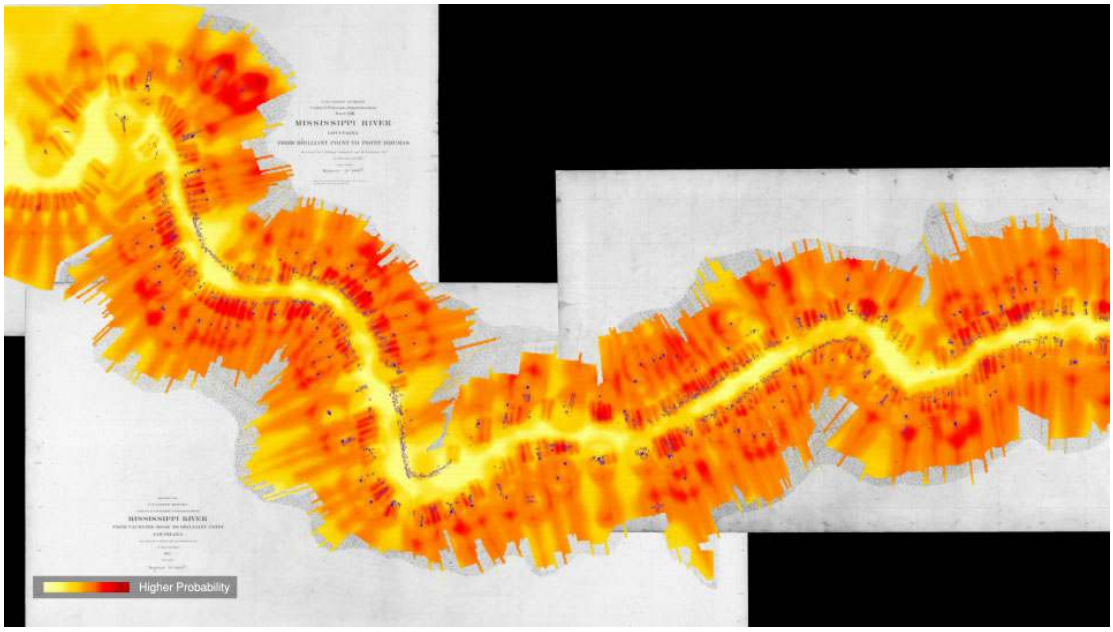
Screenshot from the FA video investigation 'If toxic air is a monument to slavery, how do we take it down?' showing the relationship between back quarters and mapped cemeteries.

Eleven mapped or otherwise known cemeteries located in Bands B or C have a mapped mill in proximity to the quarter complex; the cemeteries are located on average 740m from the mill.[69] There are two mapped cemeteries in Band C, associated with back quarters,[70] situated an average of 280m from the edge of the

[66] Follett, 91.
[67] Follett, 111.
[68] Follett, 120.
[69] Burnside, 507m; Bruslie, 628m; Houmas (Monroe), 772m; Point Houmas, 764m; Lauderdale, 1023m; Elina, 395m; Acadia, 378m; Buena Vista, 723m; La Pice (St. James), 370m; Mialaret, 330m; Horn, 357m
[70] Bruslie, 340m; Golden Grove, 220m

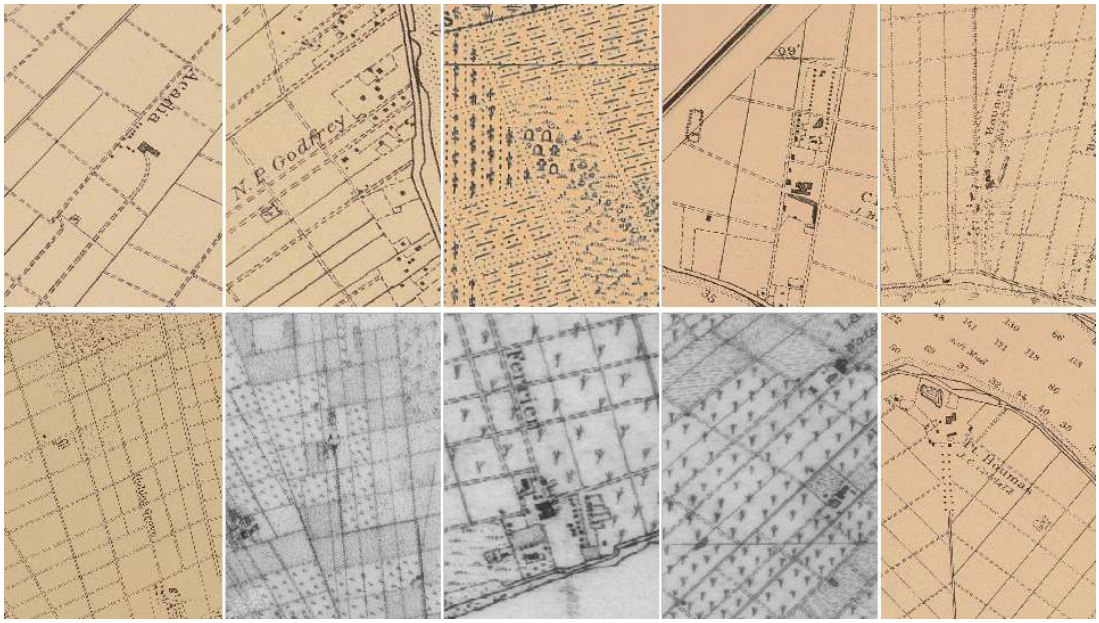
quarter complex. In both cases, the cemetery's orientation aligns with that of the complex.

Cemeteries across Bands A, B, and C are located a short distance from the mill and quarters. On large plantations that extended to or beyond the 40 arpent line, we sometimes find a second set of quarters. Known as 'back quarters' these complexes are sometimes mapped with an accompanying mill, as well as a mapped cemetery.



Screenshot from the FA video investigation, showing probability field parameter 4: structures.

Mapped Cemeteries



Relationships between plantation components and cemeteries from a selection of plantations across our focus area as recorded on the USCS 1877 and 1878 and MRC 1894 charts.

We located X mapped cemeteries in the 1877, 1878, and 1894 map series (not including cemeteries affiliated with churches) across our focus area (Point Houmas to Hahnville). They are:

Confirmed[71]

Point Houmas, 1877, 1878, 1894 (30.124182, -90.927922)
Clarke (Burnside), 1877, 1878, 1894 (30.144933, -90.929480)
Bruslie (Brulé), 1877 (30.1438531, -90.8815675)
Houmas (Monroe), 1877, 1878 (30.125614, -90.898147)
Union, 1877, 1878 (30.1142626, -90.9068549)
NP Godfrey, 1877, 1878 (30.102455, -90.922423)
Lauderdale, 1877 (30.065365, -90.926337)
Elina, 1877 (30.0634751, -90.9203050)
Acadia, 1878 (30.054678, -90.921259)
Buena Vista, 1878 (30.056802, -90.910872)
St. Michael, 1877, 1878 (30.057973, -90.840052)
Magnolia, 1877, 1878, 1894 (29.997060, -90.713352)
Golden Grove, 1877, 1878 (30.065187, -90.688706)
Ferrier, 1877, 1878 (30.0539223, -90.6716541)

Unconfirmed[72]

Houmas (Monroe), 1877 (30.1241954, -90.9117222)
Bagatelle, 1877 (30.110710, -90.881943)
St. Joseph, 1877 (30.0840276, -90.9158817)
White Hall, 1877 (30.0902130, -90.8857031)
Alta Vela 1, 1877 (30.084328, -90.879103)
Alta Vela 2, 1877, 1878 (30.0730223, -90.8841714)
Pike's Peak, 1878 (29.972759, -90.802215)
Home, 1877, 1878 (30.0052833, -90.7674746)
St. James (Aime), 1877 (29.9772329, -90.7505611)
Duparc, 1877 (29.9941521, -90.7214832)
Le Bougere, 1877 (30.0578761, -90.6491276)
Angelina, 1877 (30.0585739, -90.6411612)
Carroll, 1877, 1878 (30.009817, -90.633960)
Wego (Stephenson), 1877 (30.011976, -90.612471)
Chauff, 1877 (30.055122, -90.612422)
San Francisco (St. Frusquin), 1877 (30.055493, -90.609928)
Welcome, 1877, 1878 (30.0553764, -90.5951965)
St. Martin, 1877, 1878 (30.072062, -90.499794)
Woodland, 1877 (30.064890, -90.471843)
Hahnville, 1877 (29.972787, -90.410552)

[71] Cemeteries are considered 'confirmed' if they are mapped with a cross or other symbology known to mark the presence of a cemetery.
[72] When we encounter indeterminate symbology that is similar to confirmed cemetery symbology and fits within plantation spatial logic yet is neither marked with a clear cross nor confirmed through ground survey or local knowledge, we mark the symbol as an 'unconfirmed' cemetery that necessitates further investigation on the ground.

Why are cemeteries not consistently mapped? According to independent archaeological consultants Don Hunter and Ryan Gray, the symbolic idiosyncrasies between map series likely result from structural circumstances, such the shifting of property ownership and tenure during Reconstruction, local field and meteorological conditions, subjective considerations, such as the independent decisions, agendas, and biases of draftsman, and the temporal gap between published (e.g. USCS 1877) and manuscript (e.g. USCS 1878) editions of maps (over which time the meaning of hasty notes may have been forgotten).

Known Cemeteries

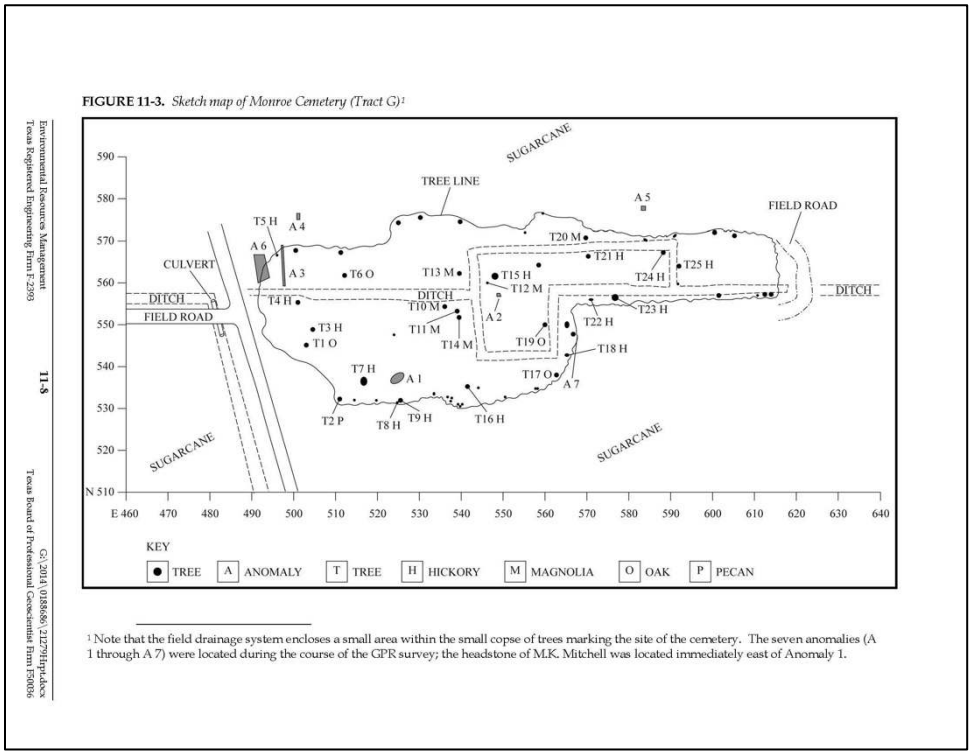
Because not all cemeteries are mapped, we consulted with local informants and conducted research on LACemeteries.com to identify 'known' unmarked cemeteries throughout our focus area. Many of these cemeteries fit within the logics of plantation spatial organisation. Further research, including ground survey, is required to determine whether these cemeteries date to the antebellum period. Known cemeteries are organised according to their present state of activity: cemeteries believed to be abandoned and those that appear to be in recent use. Excluding cemeteries that are also mapped, those 'known' cemeteries are:

Abandoned
Orange Grove (30.136532, -90.910763)
Columbia (Colomb) (30.071000, -90.853113)

Active
White Hall 1 (30.088485, -90.902387)
White Hall 2 (30.0826214, -90.8977191)
St. Alice (30.054888, -90.890109)
V. Webre (30.0696835, -90.8441343)
La Pice (St. James) (30.020509, -90.851977)
College Point (30.011130, -90.823718)
Unknown (29.976066, -90.814943)
Longue Vue (Bourgeois) (30.023192, -90.729114)
Leche (30.029721, -90.713172)
Curtis (Myers et al) (30.049217, -90.708797)
Magnolia (29.997062, -90.713381)
Hymel (30.024960, -90.691501)
Horn (30.035215, -90.667613)
Mialaret (30.0416874, -90.6567616)
White Rose (30.032961, -90.603185)
Union (30.055963, -90.596128)
Hard Times (30.060793, -90.591317)
Webre (30.044358, -90.558975)
Tigerville (30.0413607, -90.5427088)
Unknown (30.0550476, -90.5387840)
La Place (30.0736376, -90.5102850)
Woodland (30.061471, -90.488940)
Mary (29.998914, -90.490316)
New Home (30.0092217, -90.4567853)
Bourgeois et al (29.989004, -90.450828)
Star (29.989681, -90.439242)

Anomalies

Denied stone, the enslaved relied on simple wooden grave markers, which decomposed over time. But sometimes they planted magnolia and willow trees to mark the graves of their loved ones.[73]This practice was likely a form of cultural retention of pan-African traditions of associating specific trees with important spiritual, cultural, and civic functions;[74] we might therefore refer to these clusters of cultivated trees and remnants of primordial cypress forest as 'sacred groves' after the African tradition. Whatever name we give them, these groves of trees are often the only trace of antebellum Black burial grounds.



Map of trees at the Monroe/Houmas Plantation Cemetery as surveyed by ERM and CEI in 2015. ERM hypothesises that the magnolia trees are descendants of original trees planted by historically enslaved people.

5.2.2 Anomaly Interpretation and Analysis

Anomaly Interpretation and Analysis

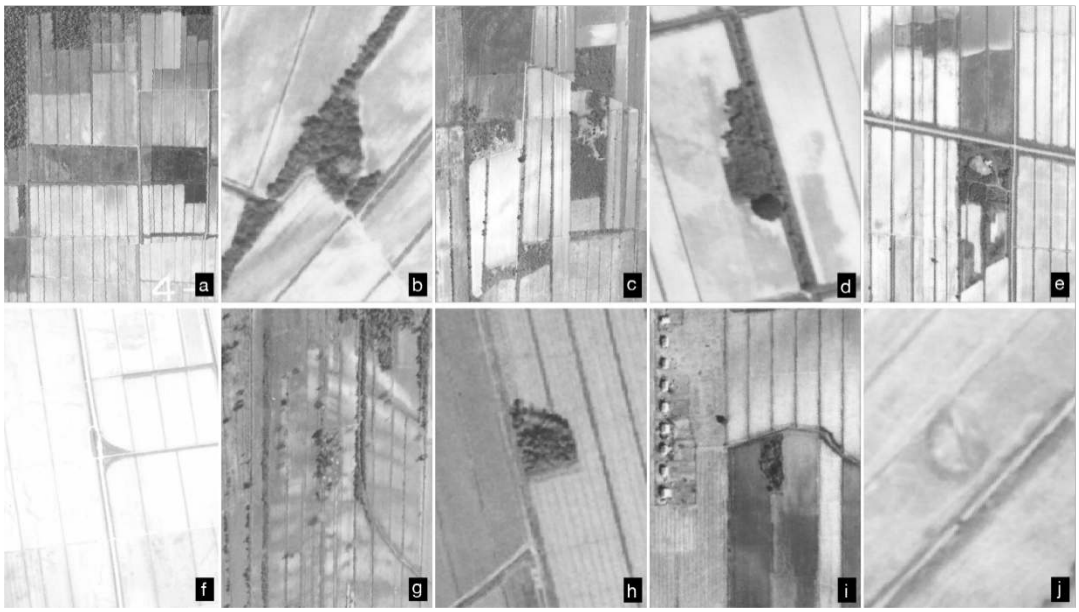
To further hone our search for unmarked burial sites, we needed to fill in the gaps in the mosaiced cartographic record.

Our cartographic picture of this landscape dematerialised in 1894, and did not rematerialise again until 1940, with the aerial photographs captured by the USDA. From here, we could time travel decade by decade to the present day, tracing the region's topographical transformation. In so doing, we discovered a plethora of 'topological anomalies' — isolated clusters of trees or uncultivated patches of

[73] ERM et al., 'Monroe/Houmas (Site 16AN31) and Bruslie/Brulé (Site 16AN32) Plantations Phase I/II Cultural Resources Investigations Ascension and St. James Parishes, Louisiana', 11–55.
[74] See, e.g. Michael J. Sheridan and Celia Nyamweru, *African Sacred Groves* (Oxford: James Currey, 2008).

overgrown vegetation, strange markings on the ground that interrupted the fabric of agricultural fields. Some of these anomalies were the ruins of sugar mills or other outbuildings. And some were sacred groves. According to CEI:

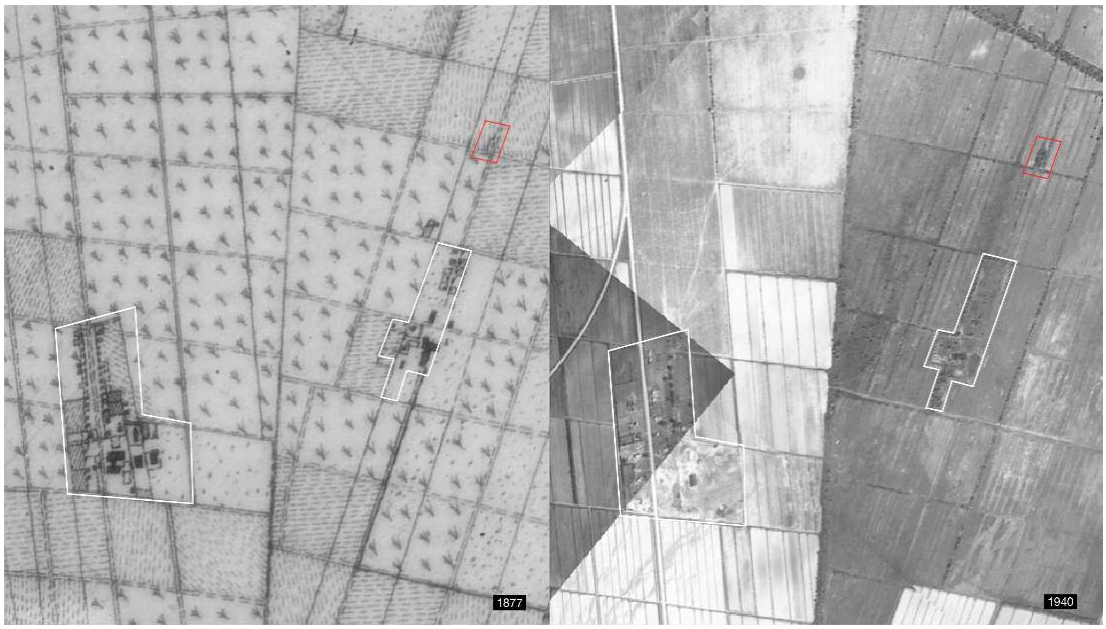
> *Generally speaking, farmers did not plow certain areas for a reason. For example, ground containing the massive brick foundations of a former sugarhouse (not visible on the surface) would be avoided to prevent damage to farm equipment. A low, wet area with willow trees in an otherwise plowed field could be all that remains of a former sugarhouse pond. Likewise, a small stand of trees in a plowed field might be avoided because it contained headstones or was known to have been a cemetery.*[75]



a. *Oneida (Theriot) Plantation anomaly. A flat, "L"-shaped stain with gradient tonality, intersected along the x-axis with a lighter gray rectangle.*
b. *Orange Grove Plantation Cemetery. A dense, irregularly-shaped grove of trees with known internments.*
c. *La Pice (St. James) Plantation anomaly. Patchy and uneven coverage of overgrown vegetation conforming to a quasi-rectangle; a stand of irregularly-shaped trees is a short distance away.*
d. *Armant Plantation anomaly. An irregularly-shaped cluster of vegetative overgrowth with what appears to be a single large tree. The left side of the anomaly appears to have several right angles. It is approx. 0.4 miles from the mapped back quarter compound.*
e. *Legendre Plantation anomaly. A hybrid anomaly divided by the Texas & Pacific Railroad, which was constructed in the 1870s. It is part satin stain, part cluster of trees interspersed with light gray patches and what appear to be pathways.*
f. *St. James (Aime) Plantation. A dark triangular stain against light gray fields at the intersection of two field paths.*
g. *V. Webre Plantation Cemetery. A sparse cluster of individual trees, mostly concentrated around the top left, standing on a dark stain and interspersed with faint white spots.*
h. *Sports Place (Ferrier) Plantation Cemetery. A dense, somewhat geometric grove of trees. Internments have not been confirmed but the grove corresponds with a mapped cemetery.*
i. *Carroll Plantation anomaly. A dense, irregularly-shaped grove of trees located close to a row of slave quarters along what appears to be a path or stream.*
j. *Cabanocey (A. B. Roman) Plantation. A faint white and gray mark on the ground.*

[75] Coastal Environments, Inc., 'Cartographic Regression Analysis of Certain Tracts of Land Located in T.11S and T.12S., R.15E. (Southeastern Land District West of the Mississippi River), St. James Parish, Louisiana'. February 19, 2020: 7.

In black and white aerial photography, anomalies often read as scars, burns, or faint traces on the land. They can appear flat or sometimes offer hints of three-dimensionality. Trees come in and out of focus. The tonal range spans from dark-coloured stains to mottled blacks, greys and whites.



Left: The Orange Grove (left) and Bruslie Plantation (right) quarter-and-mill complexes as mapped in USCS 1877. Right: The ruins of the Orange Grove and Bruslie Plantation complexes.

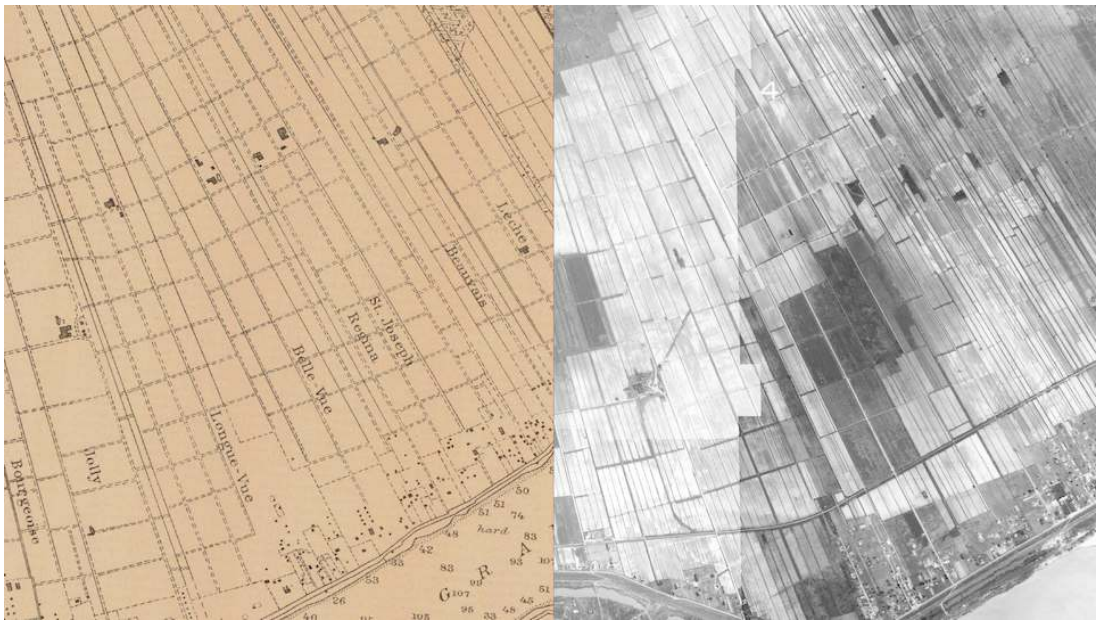
By juxtaposing the USCS 1877 map series with the 1940 USDA aerial photographs, we were able to use two adjacent plantations, Orange Grove (left) and Bruslie (right), as model cases for discerning traces of the past in the earth's surface. Both compounds were mapped in 1877; by 1940, Orange Grove's structures appear relatively intact while at Bruslie, vegetative overgrowth clings delicately to the outlines of the sugar mill and slave quarter compound. The Bruslie cemetery (marked in red) is not far from these structures. There is no cemetery associated with the Orange Grove Plantation complex. Based on the logic of the Bruslie Plantation, could it be one of the nearby anomalies?

The St. Joseph (Home) and Felicite (Murry) Plantations. Left: USCS 1878; right: USDA 1940.

As we learned to recognise the signature shapes left behind by sugar mills and slave quarters, we began to see through the gaps in the cartographic record.

After the Civil War, many newly emancipated Black people remained connected to the sites of their former enslavement. Some continued to work as tenant famers on the same plantations. In some cases, slave quarters were moved from the centre and back of the plantation toward the river and many Black 'freetown' communities grew out of these former slave quarters.

In the above USDA 1940 aerial image (right), the structural ruins of the St. Joseph Plantation mill are evident; the former location of the Felicite Plantation mill appears as a dark mark. Could the other marks be imprints of the missing slave quarter complex?



A series of plantations mapped with mills without slave quarters. Left: USCS 1878; right: USDA 1940.

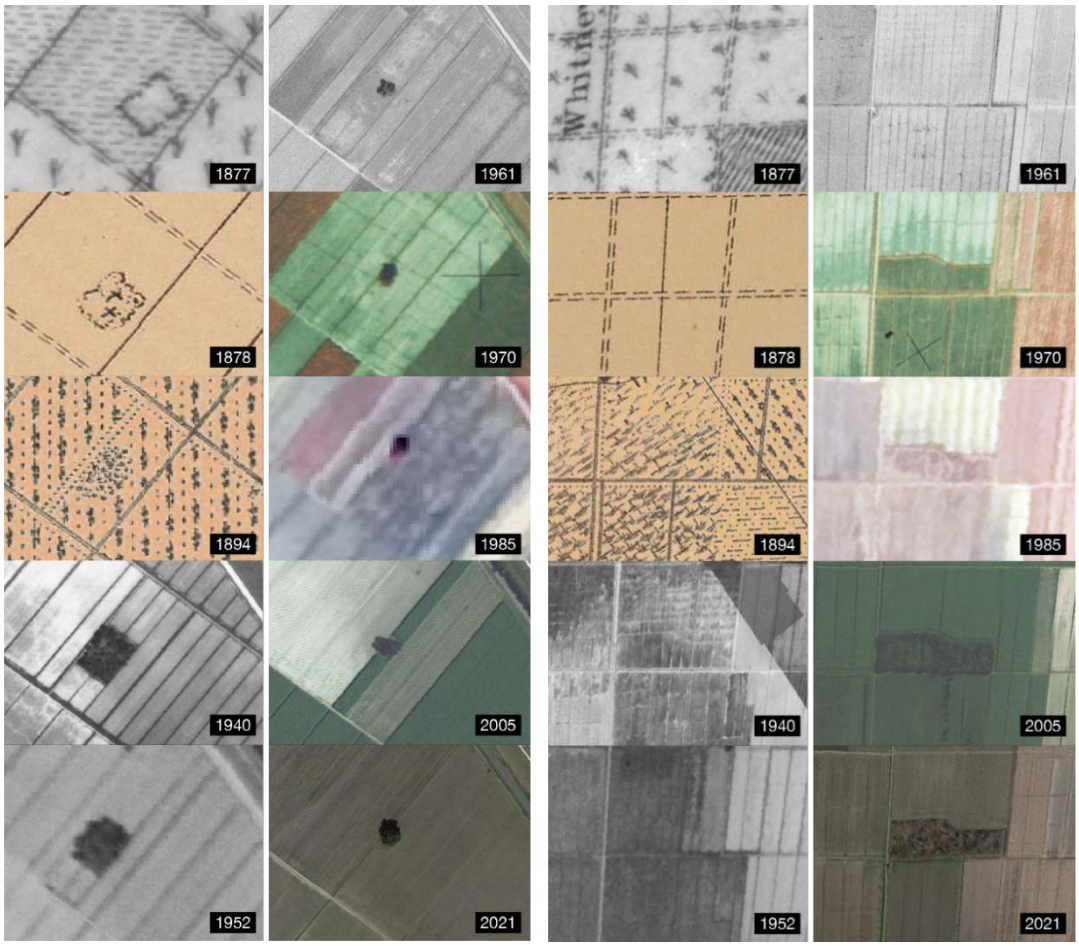
In the above images, a series of mills mapped in USCS 1878 without accompanying rows of slave quarters likely indicate a postbellum relocation of quarters close to the river. Could some of the rectangular dark patches in the USDA 1940 aerial photograph indicate the former presence of a housing complex?

On the Whitney Plantation, the slave quarters were gradually moved toward the river. We see sixteen quarters in their original location in 1878, ten in 1894, and only six fronting the river in 1940. We were told by Ashley Rogers, Director of the Whitney Plantation Museum, that the quarters remained occupied until the 1970s.

Buena Vista and Arcadia Plantation sugar mills and cemeteries. Note the absence of slave quarters on the Buena Vista Plantation. Left: USCS 1878; Right: USDA 1940.

When we see a sugar mill, we know based on precedent that slave quarters should be nearby, but on many plantations mapped in 1878, such as the Buena Vista Plantation, the mills stand alone. In this case, there are no quarters to anchor the mapped burial ground. Looking to the 1940s aerial image at right, we see the remains of the mill, along with a long rectangular dark mark. Could this mark indicate the traces of the relocated slave quarters? If so, it would be the missing spine of the industrial mill-quarters-cemetery complex.

Anomaly Survival



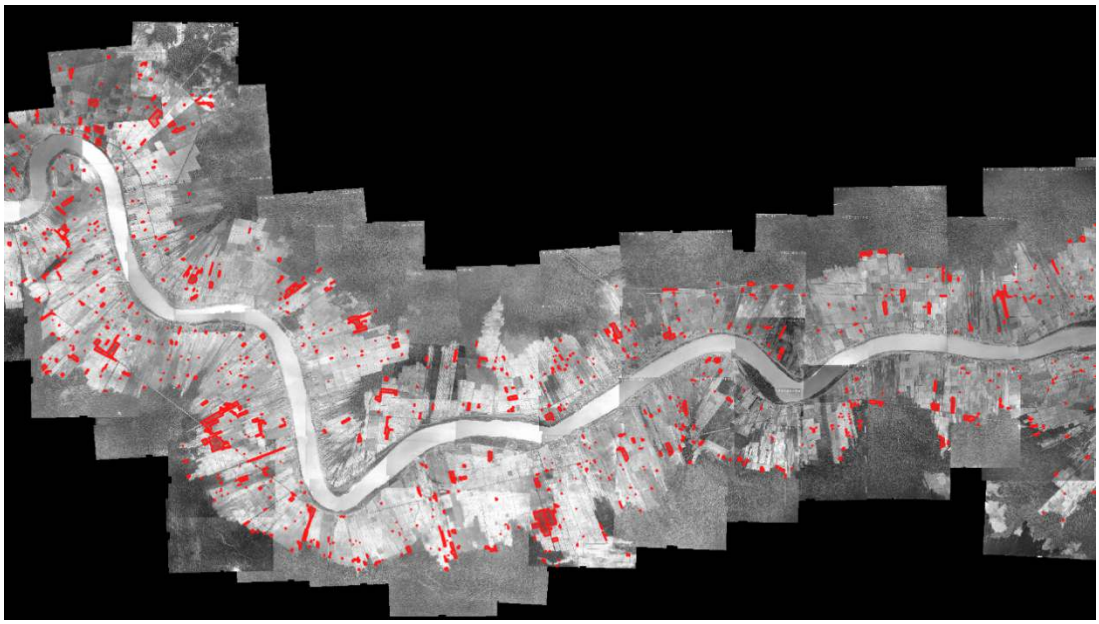
a. Point Houmas Plantation Cemetery *b. Whitney Plantation anomaly of interest*

Over the decades, changes in land use have resulted in a transformation of anomalies, which we can track across the decades using our mosaic portal.

With the passage of time, anomalies can shrink. In the case of the Point Houmas Plantation Cemetery(left), which was mapped in 1878, we can see in the above sequence how the grove of trees in question was slowly whittled down as cultivated fields expanded. Today, only a single tree remains of what was once the sacred grove of an antebellum Black cemetery. The cemetery, which was not known by our local partners, is on Louisiana Economic Development's list of 'development-ready' sites, putting the cemetery, and its solidary tree, at risk of destruction.

Or, if users of land stumble upon ruins, remains, or artifacts, anomalies can grow. On the Whitney Plantation, in the above sequence (right), we can already see a faint anomalous trace marking the earth in 1940. By 1952 and 1961, the trace is almost imperceptible. The grove of trees grows from 1971 to its present state. Perhaps trees were cleared from this land at some point between 1894 and 1940 and was cultivated in the 1950s and 60s until something was discovered. From then on,

perhaps the land users cut a clear path around the site, allowing vegetative growth to take over.



We inched across the mosaiced landscape decade by decade. We identified close to 1200 anomalies in the USDA 1940 aerial photography mosaic.

The National Trust for Historic Preservation determines cultural or historical value by 'site integrity', but Black communities, culture, and history are systemically fragmented and erased. Their erasure is the result of a persistent racist imaginary that regards Black cultural sites as unworthy of preservation, or worse, as a threat to development.

These anomalies require further analysis before we come to definitive conclusions. We have documented anomalies from various typologies, recognising that not all of them are likely to be cemeteries. A critical step in the search for erased cemeteries is to piece the plantation back together, and anomalies representing ruined structures can help us with this process.

Archaeological consultants Don Hunter and Ryan Gray agree with this approach. No anomaly is too large or too small. Many large patches of forest are maintained as hunting grounds; there is nothing to suggest there is not a cemetery hidden somewhere within those woods.

We must also keep in mind that our five-decade anomaly mapping is not comprehensive. As we have seen, not all structures and cemeteries leave anomalies behind, and many anomalies may have been erased from the land prior to the capture of the 1940 aerials.

5.2.3 Probability Fields

The probability field, overlayed on 2021 Google Earth satellite imagery. Redder portions of the field indicate higher probability for antebellum Black burial grounds.

As previously discussed, the oldest set of aerial photographs we studied was taken in 1940 by USDA. While in these photographs we could identify traces of some cemeteries, cemeteries that were razed before 1940 have no record in aerial images. In the absence of earlier photographic traces, we have conceived of a mapping tool we refer to as a 'probability field.' This field is meant to estimate the level of likelihood that a Black cemetery exists with a given area.

The probability map is created in the computer-aided design application Rhinoceros 3D. The algorithm is created by Grasshopper, a visual programming language and environment that runs within Rhinoceros 3D, along with cartographic vector data from the 1878 and 1894 maps, exported from QGIS. The field itself is comprised of a mesh of pixels, each the size of a single tree.

Anomalies that fall within this field must urgently be protected and investigated through careful and respectful archaeological survey. Moreover, the entire landscape is revealed as holding historical and cultural value that we can still recover.

5.2.4 Archaeology Reports Analysis

The Louisiana Division of Archaeology 'Report Standards' is a 26-page document that instructs contract archaeology firms in the proper drafting of an archaeological report. The Phase I report, for example, must include an introduction, a discussion of the land use history of the site, previous archaeological investigations of the same site, methodology (including field survey methods and laboratory methods), results (including archaeological findings, National Register of Historic Places (NRHP) eligibility), references, and appendices.

These minimum standards are not sufficient to protect unmarked burial grounds of enslaved people. We need more than the minimum to overcome centuries of structural racism.

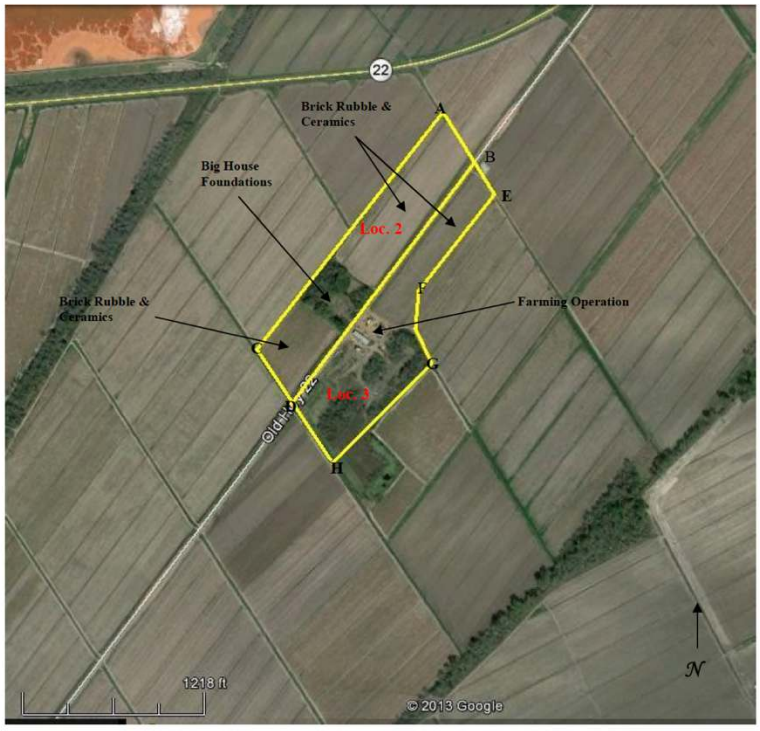


Figure 44. Locations 2 and 3, 16AN89, from Google Earth.

Excerpt from SURA, Inc., 2014, showing the location that has been identified as the 'Big House.'

Orange Grove Plantation Back Quarters. Left: USCS 1877; right: Google Earth 2021.

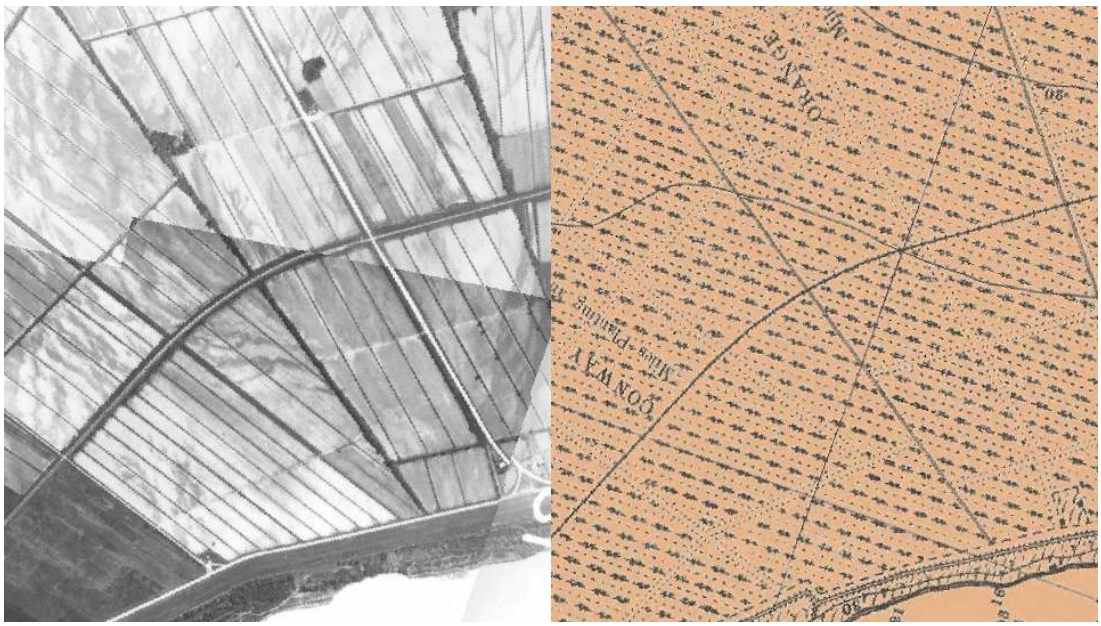
The inadequacy of these minimum standards are clearly illustrated in the example of the for-profit, contract archaeology firm SURA, Inc.'s 2014 Phase I Cultural Resources Survey on the Burnside and Orange Grove Plantations. In their report, SURA, Inc. arrived at the conclusion that the slave master's 'big house' was located deep within the plantation property, adjacent to the 'farming operation'.

A simple understanding of plantation spatial logics immediately challenges this conclusion. Moreover, through simple cartographic regression, we can see the former slave quarters clearly mapped in 1877 at the site of the alleged Big House. How could the authors have failed to verify their conclusions with these widely available cartographic resources?

According to our archaeological consultants, Louisiana's Division of Archaeology, unlike other state divisions of archaeology, does not set minimum professional qualifications for archaeological firms; nor do they set standards for the types of materials firms should consult as part of their historic background research on a site they are surveying. The Division's standards say only that firms must:

> ...provide a detail of a 7.5' USGS topographic quadrangle map showing the location of the area being investigated with a state inset map showing the project location within the state of Louisiana. ('Report Standards', LA Division of Archaeology)

These regulatory lacunae enable the proliferation of negative findings reports, which start from the assumption that nothing of value will be found. Such presumptive studies tend to be light on historical research and ignore historically probable conclusions while supporting more convenient, implausible ones. Any good faith effort to locate cultural and historic resources should consult such readily available primary source materials as the 1877, 1878 and 1894 survey series, crop records, family papers, conveyance and court records, and federal mortality, slave, and non-population schedules.

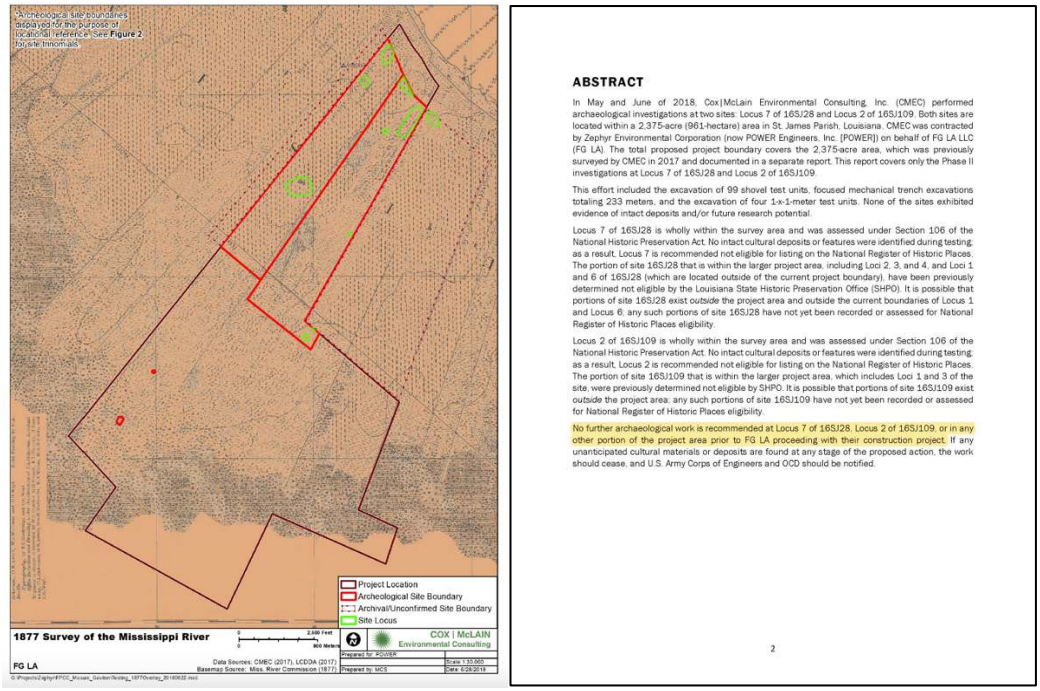


The Orange Grove Plantation Cemetery. Left: USDA 1940; right: MRC 1894.

SURA, Inc. 2014 goes on to discuss its findings from the firm's survey of the Orange Grove Plantation Cemetery, which is not marked on any of the 19th century maps we have located. 'It would take additional research', the report begins, 'to determine the names of the unknown persons buried in the Orange Grove Cemetery, and even then the effort might not be entirely productive'. The report goes on to conclude, without offering any corroborating evidence, that, 'it is almost certain the persons interred in the cemetery were the owners of Orange Grove Plantation and their managerial employees and relatives'.[76]

Our own research brings us to a very different – indeed the opposite – conclusion. The location of the cemetery within Band B of the property makes it highly *improbable* that it would hold the remains of the slave master and managerial class. It is interesting, however, to take note of their observations, if not their conclusions. Only six crushed grave markers remain among a grove of trees, an interesting finding (or lack thereof) that begs the question of whether unmarked burial sites are also present onsite.

Another report worthy of counter-investigation is Cox McLain's 2018 report for Formosa Plastics. Their report erroneously identifies the MRC 1894 chart as the '1877 Survey of the Mississippi River'. As previously discussed, the MRC 1894 chart omits many cemeteries located on the USCS 1877 and 1878 maps. Because Cox McLain did not use the USCS maps, which identify cemeteries on the Elina, Acadia, and Buena Vista Plantations, the firm came to the conclusion that there were no cultural resources on site that should impede Formosa's development.



Cox McLain 2018 Phase I and II Survey with erroneously labelled MRC chart. And abstract of findings suggesting no further archaeological work prior to Formosa proceeding with construction.

[76] SURA, Inc., 158.

5.2.5 Margin of Error

Our probability field is only meant to provide a means for general estimation. Our determination of the likelihood of the presence of a cemetery is based only on the available evidence, which is limited, as has been discussed earlier in this report.

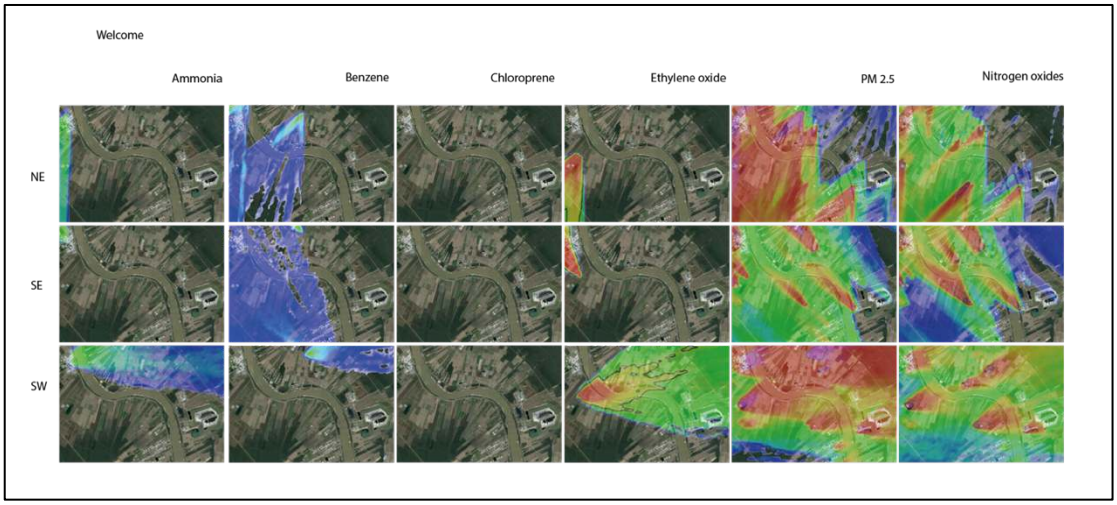
The historic charts and surveys that we have located were drawn in the Reconstruction era following the Civil War. Given the transitional and transformational nature of this historical period, these documents might be read more practically as including information from three sub-eras: some plantations exhibit antebellum spatial organisation (e.g., with slave quarters organised in one or two rows and situated near the industrial sugar mill), others exhibit postbellum organisation (e.g., with slave quarters relocated away from the mill, close to the river),[77] and still others linger somewhere in between (e.g., with some quarters having moved toward the river and others remaining in their original locations).[78]

The 1877 and 1878 Coast Surveys stop at Point Houmas, creating the upriver limit of our field of study. Due to limitations of time and labour, we chose St. John the Baptist Parish as the downriver limit of this field. The probability field does not determine any land as 'improbable' for holding antebellum Black cemeteries. It is designed to help local residents, along with their allies in the fields of advocacy, archaeology, and law, to narrow down their search for cemeteries.

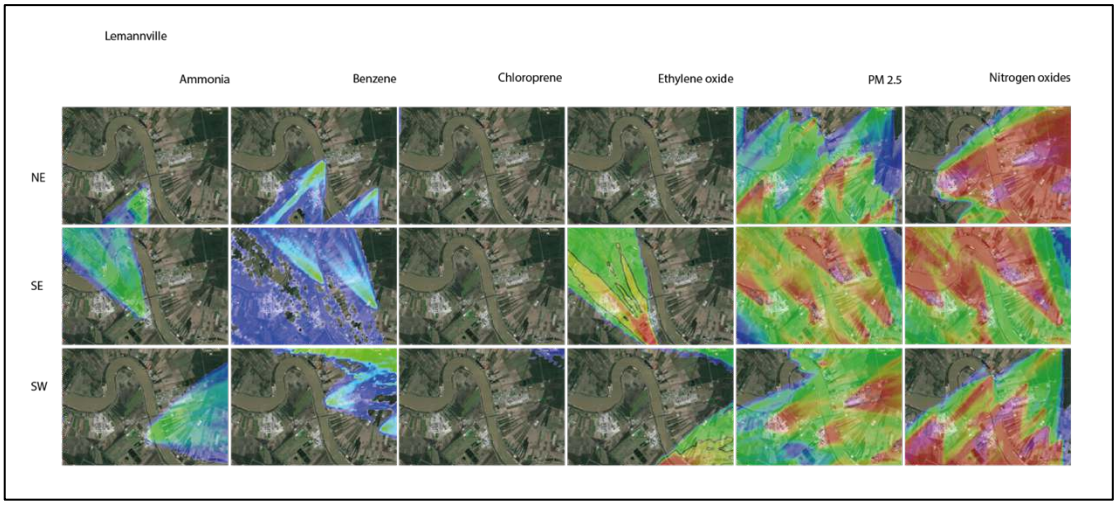
6. Conclusions

6.1 Air

Health Risks from Existing and Permitted Industry



[77] See, e.g. Buena Vista Plantation in the 1878 USCS where the mill stands alone, compared to the 1894 MRC chart when the mill is removed altogether.
[78] See, e.g. the Whitney and Acadia Plantations in the 1878 USCS charts, compared to the 1894 MRC charts.



Studies of average concentration of six pollutants under three different prevailing wind conditions in the towns of Lemannville and Welcome.

When the wind blows from the southeast, the majority-Black town of Reserve is smothered with high concentrations of PM 2.5 and chloroprene. When it blows from the southwest, the suburbs of Laplace are caught in those same toxic clouds. The southwest wind also carries thick plumes of pollutants downriver, over majority-white towns that have successfully blocked corporations from constructing industrial plants in their own backyards. Our simulation thus illustrates the dictum that toxic air does not obey borders, be they social, political, or proprietary.

It also illustrates a future scenario in which local residents are unable to stop the construction of two new facilities on either side of Welcome. According to our simulation, Formosa Plastics would saturate Welcome with high concentrations of ethylene oxide, well above the standards set by the EPA's acceptable threshold for cancer risk. If a permitted, yet contested, facility South Louisiana Methanol is approved, Welcome will be hit with equally high concentrations of particulate matter. The majority-Black community of Lemannville, which members of RISE call home, already breathes in high concentrations of PM 2.5, nitrogen oxides, and ammonia.

Close to the ground, gas concentrations above or close to health limits increase the probability of the development of respiratory diseases or cancer. Long-term exposure to PM 2.5 is associated with an increase in the long-term risk of cardiopulmonary mortality. Studying our concentration maps, we can discern that residents of these areas are clearly at higher risk of developing serious health conditions, particularly those with pre-existing respiratory problems, older adults and children.

The deposition (settling) of particles on the ground can also have adverse effects. According to the EPA, these effects may include: acidification of lakes and streams, disruption of the nutrient balance of coastal waters and large river basins, and the depletion of nutrients in soil. This investigation does not, however, simulate this absorption by the ground. PM 2.5. particles in this model fall and stay there. Absorption may be very different depending on the type of soil (or if is water), local buildings, the absorption may be very different.

6.2 Ground

6.2.1 Threat of Existing and Future Industry to Communities and Cemeteries

The Lions Community in St. John the Baptist Parish in 1894 (Top) and 2021 (Bottom).

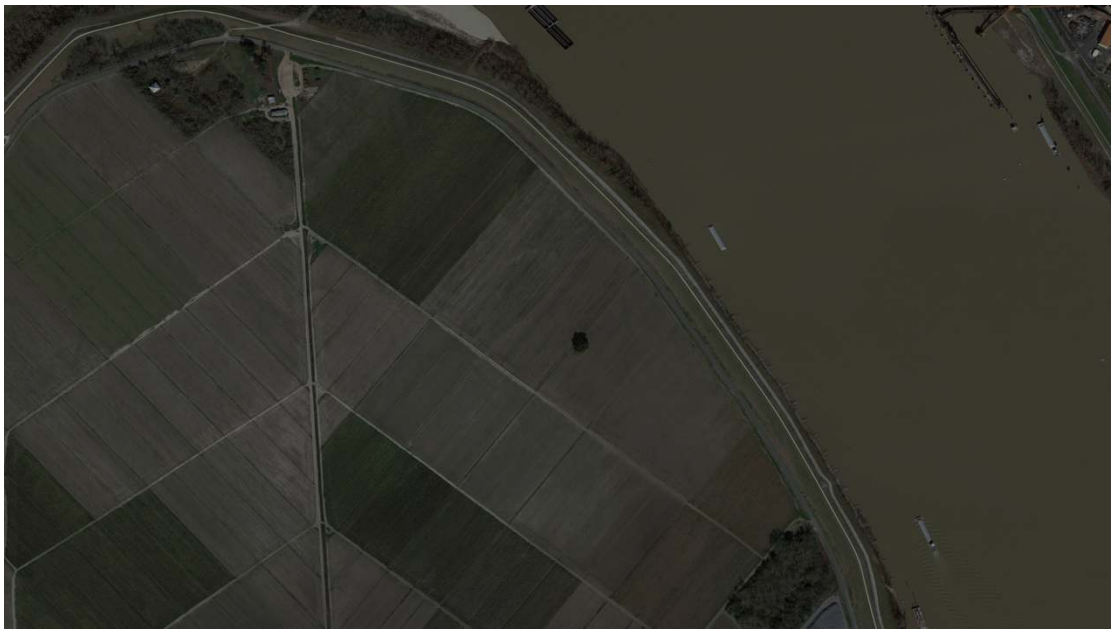
Two historic Black cemeteries in Lions. Yellow indicates the portion of the Zion Travelers Cemetery said by the Parish Tax Assessor to be owned by Marathon.

The Lions Community in St. John the Baptist Parish presents a key example of the impact of modern industry on Louisiana's Black communities. Lions was a quiet, rural freetown until the intrusion of Marathon Petroleum Company and Cargill, Inc. Today, these corporations own all of Lions, save for five homes. Two historic cemeteries are surrounded by industrial complexes. According to the St. John the Baptist Parish Tax Assessor's records, Marathon even owns a portion of one historic cemetery.

Existing and future industrial development overlaid on GE 2019 satellite imagery. Yellow and Orange: Existing industry; Red: LED-designated 'development-ready sites.'

Across Death Alley, nearly 200 properties have been designated by Louisiana Economic Development as 'development-ready' sites, yet our local partners were

unaware, when we began our investigation, that their homeland was on the auction block. They have raised key questions about the continuity of rights to land and the decision-making process for land use and allocation. The erasure and enclosure of Lions represents the threat faced by Welcome, Wallace, and other majority-Black descendant communities in Death Alley. How might this investigation contribute to the fight to prevent the repetition of this atrocity?



A single tree remains to mark the Point Houmas Cemetery, which is mapped in the USCS 1877, 1878, and MRC 1894 charts.

As stated in the introduction, there are several lacunae in Louisiana state law that offer opportunities to demand greater protection for Black cemeteries. Among them are the following points:

1. Currently, NHPA, Section 106, is the only trigger for the archaeological survey. We hope that our probability field and anomalies mapping will support local efforts to push LA cemetery law to address the uniquely precarious position of Black cemeteries in the Petrochemical Corridor.
2. According to the Louisiana Public Records Doctrine, if a matter of land use is recorded in a public form, it is considered a matter of public record and must be considered in real estate transactions. According to Ryan Gray, this doctrine on its own does not connect the Public Records Doctrine to the NHPA. However, Section 106 incorporates the idea that a ‘reasonable and good faith effort’ that should be made to identify historic properties that could be affected by a federal undertaking. Recording past cemetery usage could become a way of closing legal gaps, so that agencies or developers can't claim ignorance. Gray notes that there are still many things that developers can do under the existing laws (i.e., a private developer could try to 'remove' the dedication by ensuring that all bodies are moved). This is why, ultimately, legal redress that formalizes the closing of these gaps between state and federal laws and that gives communities more voice in outcomes is urgently needed.
3. According to the Division of Archaeology, ‘any activity that alters, modifies, damages, or changes tombs, headstones, human remains, and other grave

markers must obtain an Unmarked Burial sites permit before beginning work'.[79] The Division further states that:

> [A]n Unmarked Burials Permit is not required for a Phase I survey or Monitoring project, **unless documentary research has shown the project area may have human remains present, or the project area is located immediately adjacent to a property known to contain human remains** (for example, monitoring utility placement along the edge of a known cemetery).[80] (emphasis ours.)

Given what we know about the use of trees as grave markers, we would suggest that groves of trees, or even single trees within higher probability areas or shown to have once been part of a grove through cartographic regression (as with the Point Houmas Plantation Cemetery; see page 67) also be considered potential grave markers until proven otherwise.

6.2.2 Ecological Justice

Forensic Architecture has been involved in a series of discussions with the descendant community of Louisiana's river parishes, among them members of RISE St. James and The Descendants Project. A number of open questions – as well as bold visions for the future – emerged:

How might stakeholders prevent companies from simply cordoning off a cemetery? If we don't know its boundaries, could we preclude the sandwiching of cemeteries within industrial sites as exemplified by the historic cemeteries in Lions Community?

How might stakeholders organize against the 'lawful' removal of enslaved bodies from their place of rest by private landowners?

How might stakeholders push back against the narrow legal interpretation of 'rights of access' to antebellum cemeteries on private property?

How might stakeholders break the continuum of power that leaves a white landowning elite in control of land use decision-making, resulting in the repeated sacrifice of Black life for economic growth?

How might residents imagine land-based reparations, guided by the understanding that sacred groves are liberated spaces intentionally created by the enslaved and gifted to future generations?

How might a recognition of the intentionality behind the planting of trees in sacred groves lead to an expended notion of 'historic property' and 'cultural resources'? How might it transform and expand the notion of historic preservation?

[79] 'Permits', LA Division of Archaeology. Last accessed: June 25, 2021. Available at: https://www.crt.state.la.us/cultural-development/archaeology/CRM/permits/index/.
[80] 'Cemeteries and Burials', LA Division of Archaeology. Last accessed: 25 June 2021. Available at: https://www.crt.state.la.us/cultural-development/archaeology/CRM/cemeteries-burials/index/.

How does industrial desecration impact the legal notion of cemetery dedication? If a cemetery is scattered by industry, becoming even more a part of the land, could residents argue that the dedication extends across the land at large?

The ecology of the cemetery – the land, the trees, the air – creates a significant and valuable psychological space for the living. What might these groves teach society-at-large about how we should treat our land and each other? Instead of succumbing to settler rules regarding the ownership of the earth, how might we reclaim the right to steward?

How can residents push back against the bordering, parcelling, and segregation of space? What could this land become?

The Descendants Project concluded that land-based reparations require a process of collective visioning. This process, in and of itself, will be reparative. These questions and visions will guide the second phase of our investigation, which will look to mobilise our findings in support of radical legislative overhaul led by local descendant communities.

This report is the culmination of Phase I of our investigation. Phase II will involve the dissemination and mobilisation of this research in support of local residents' ongoing search for ancestral sites and demands for the right to life, agency, health, and justice.

Through the lens of the petrochemical plantation burial ground, Death Alley is revealed as a 300-year continuum of environmental racism.

To put an end to the continuity of violence, the whole ecology must be considered of utmost cultural value: from the fields where the enslaved were born, worked to death, and buried, to the surviving forests, which under the cover of night became sites of ritual, mourning, and liminal freedom, to Black descendant communities who deserve to inherit far more than a legacy of violence, discrimination, and erasure.

For decades, the Black descendent communities of Louisiana have voiced powerful demands for environmental justice and accountability for past and ongoing atrocities. Today, this demand continues to grow into a sweeping vision of ecological justice. Ecological justice would incorporate: reparations for past and ongoing racist atrocities, ecological repair, jobs that sustain local communities and their health, a moratorium on industrial development, and agency over how the land they rely on to live is stewarded. Moreover, residents demand a fundamental revisioning of the concept of historic preservation so that it moves toward a recognition of Black communities, ancestral sites, and our wider ecologies as intrinsically valuable, indivisible, and worthy of protection.

All of our research will be made open source and available to local descendant communities in support of the struggles and visions of ecological justice.

7. References

Baurick, Tristan. 'Welcome to 'Cancer Alley,' Where Toxic Air Is About to Get Worse'. *ProPublica*, 30 Oct. 2019. Available at: https://www.propublica.org/article/welcome-to-cancer-alley-where-toxic-air-is-about-to-get-worse/.

Bonnet, Auguste. 'Manuscript 25 June 1821 Survey of the Property of Robert Conway, Folder 13, RJC, E.L.25.1988'. The Historic New Orleans Collection, New Orleans, Louisiana, 1821.

Bouchereau, A. *Statement of the Sugar and Rice Crops Made in Louisiana in 1878-79*. New Orleans: Pelican Steam Book and Job Printing Office, 1879.

———. *Statement of the Sugar and Rice Crops Made in Louisiana in 1893-94*. New Orleans: Young, Bright & Co., 1894.

Bouchereau, L. *Statement of the Sugar and Rice Crops Made in Louisiana in 1868-69*. New Orleans: Young, Bright & Co., 1869.

———. *Louisiana Sugar Report, 1871-72*. New Orleans: Pelican Book and Job Printing Office, 1872.

———. *Statement of the Sugar and Rice Crops Made in Louisiana in 1876-77*. New Orleans: Pelican Book and Job Printing Office, 1877.

———. *Statement of the Sugar and Rice Crops Made in Louisiana in 1875-76*. New Orleans: Pelican Book and Job Printing Office, 1876.

Center for Constitutional Rights. 'Letter to St. James Parish Council re: Request to Rescind Decision Set out in Resolution 19-07 Granting Formosa's Land Use Application in Light of Previously Undisclosed Information Revealing the Existence of Burial Sites of Enslaved People on Property Proposed for a Formosa Plastics Plant'. 23 December 2019. Available at: https://ccrjustice.org/sites/default/files/attach/2019/12/RISE%20Letter%20to%20St.%20James%20Parish%20Council%20Burial%20Sites%2012.23.2019.pdf.

Diouf, Sylviane A. *Slavery's Exiles: The Story of the American Maroons*. New York and London: New York University Press, 2014.

Google Earth. 'Satellite Imagery of Ascension, St. James, and St. John Baptist Parishes, Louisiana'. Google Earth/NOAA/TerraMetrics, 2021.

Harms, F., Leitl, B., Schatzmann, M and Patnaik, G. 'Validating LES-based flow and dispersion models'. *Journal Wind Engineering and Industrial Aerodynamics*. Vol 99 (2011): 289-295.

Hite, Elizabeth Ross, 'Interview with Elizabeth Ross Hite', in *WPA Ex-Slave Narrative Project*. Louisiana State University, Mss. 2858. ca. 1940.

Feng, Y., Miranda-Fuentes, J., Guo, S., Jacob, J., and Sagaut, P. 'ProLB: A lattice

Boltzmann solver of large-eddy simulation for atmospheric boundary layer flows'. *Journal of Advances in Modeling Earth Systems* (2021).

Follett, Richard. *The Sugar Masters: Planters and Slaves in Louisiana's Cane World, 1820-1860* (Baton Rouge: LSU Press, 2005).

Johnson, Walter. *Soul by Soul: Life Inside the Antebellum Slave Market*. Cambridge, MA, and London: Harvard University Press, 1999.

Louisiana Department of Environmental Quality. '2019 Permitted/Actual Emissions by Radius Report'. Emissions Reporting and Inventory Center (ERIC) Reports. Last Accessed: 25 June 2021.

Louisiana Department of Environmental Quality, 'Limitations of the Actual and Permitted Emissions Reports'. Updated Mar 2021.

Louisiana Department of Natural Resources. 'Coastal Management Permits'. Strategic Online Natural Resources Information System (SONRIS). Available at: http://www.sonris.com/

Louisiana Division of Archaeology. 'Cemeteries and Burials'. Last accessed: 25 June 2021. Available at: https://www.crt.state.la.us/cultural-development/archaeology/CRM/cemeteries-burials/index/.

Louisiana Division of Archaeology. 'Permits'. Last accessed June 25, 2021. Available at: https://www.crt.state.la.us/cultural-development/archaeology/CRM/permits/index/.

Midlo Hall, Gwendolyn. *Africans in Colonial Louisiana: The Development of Afro Creole Culture in the Eighteenth Century*. Baton Rouge and London: Louisiana State University Press, 1992.

Mississippi River Commission (MRC). 'Survey of the Mississippi River (Series)'. 1:20,000. Charts No. 66-75. Vicksburg, Mississippi, 1894.

New South Associates, Inc., 'Hold Your Light on Canaan's Shore: A Historical and Archaeological Investigation of the Avondale Burial Place (9BI164). Volume I: Report of Investigation Bibb County, Georgia'. Project No. STP-0000-00(566), P.I. No. 0000566, Contract No. TOOELENV060077, Task Order 25. 30 June 2012.

Persac, A. 'Norman's Chart of the Lower Mississippi River'. New Orleans, Louisiana: B. M. Norman, 1858. Library of Congress, Washington, D.C.

Poplin, Eric C., Armstrong, Paul C., Poplin, Carol J., and Goodwin, R. Christopher. 'Phase 2 of the Cultural Resources Inventory of the Bonnet Carre Spillway, St. Charles Parish, Louisiana'. COELMN/PD-88/04, Final Report. New Orleans: R. Christopher Goodwin and Associates, 15 April 1988.

Raboteau, Albert J. *Slave Religion: The 'Invisible Institution' in the Antebellum South*. Oxford and New York: Oxford University Press, 2004.

Rehder, John Burkhardt. 'Sugar Plantation Settlements of Southern Louisiana: A Cultural Geography.' Unpublished Ph.D., Department of Geography and Anthropology, Louisiana State University, 1971.

Rodrigue, John C. *Reconstruction in the Cane Fields: From Slavery to Free Labor in Louisiana's Sugar Parishes, 1862 – 1880.* Baton Rouge: Louisiana State University Press, 2001.

Rush, Haley, Sandrock, David, Stettler, Heather, Stotts, Matthew C., Moore, Scotty, Reed, Emily, Rogers, Robert, and Cote, Al. Phase I Archaeological Survey of the Proposed FG LA LLC Project Site with Phase II Testing at 16SJ109, St. James Parish, Louisiana. Cox McLain Environmental Consulting, March 7, 2019.

Russell, William Howard. *My Diary North and South*. Boston: T.O.H.P. Burnham, 1863.

Seck, Ibrahima. *Bouki fait Gombo: A History of the Slave Community of Habitation Haydel (Whitney Plantation), Louisiana, 1750-1860.* New Orleans: University of New Orleans Press, 2015.

Sharpe, Christina. *In the Wake: On Blackness and Being*. Croydon: Duke University Press, 2016.

Sheridan, Michael J. and Nyamweru, Cecilia. *African Sacred Groves*. Oxford: James Currey, 2008.

Thompson, Robert Farris. *Flash of the Spirit: African and Afro-American Art and Philosophy*. New York: Vintage Books, 1984.

U.S. Coast Survey. 'Mississippi River Louisiana Bonnet Carré Crevasse'. 1:20,000. Silver Spring, Maryland, 1876.

———. 'Mississippi River Louisiana from Belle Point to Vacherie Road'. 1:20,000. Silver Spring, Maryland, 1877 1876.

———. 'Mississippi River Louisiana from Boutté Station to Bonnet Carré'. 1:20,000. Silver Spring, Maryland, 1876.

———. 'Mississippi River Louisiana from Brilliant Point to Point Houmas'. 1:20,000. Silver Spring, Maryland, 1877.

———. 'Mississippi River Louisiana from Carrollton to Boutte Station'. 1:20,000. Silver Spring, Maryland, 1876.

———. 'Mississippi River Louisiana from Vacherie Road to Brilliant Point'. 1:20,000. Silver Spring, Maryland, 1877.

———. 'Mississippi River Louisiana (Sheet No.9) from Soniat Plantation to Myrtle Land Plantation'. 1:20,000. Silver Spring, Maryland, 1878.

———. 'Mississippi River Louisiana (Sheet No.10) from Myrtle Land Plantation to Reserve Plantation'. 1:20,000. Silver Spring, Maryland, 1878.

———. 'Mississippi River Louisiana (Sheet No.11) from Bonnet Carré to Grandview Reach'. 1:20,000. Silver Spring, Maryland, 1878.

———. 'Mississippi River Louisiana (Sheet No.12) from Chapman Plantation to Brilliant Point'. 1:20,000. Silver Spring, Maryland, 1878.

———. 'Mississippi River Louisiana (Sheet No.13) from St. James Estate to Point Houmas'. 1:20,000. Silver Spring, Maryland, 1878.

U.S. Department of Agriculture. 'Aerial Imagery of Ascension, St. James, and St. John Baptist Parishes, Louisiana'. 1:20,000. Baton Rouge: Cartographic Information Center, Louisiana State University, 1940.

U.S. Department of Agriculture, Farm Service Agency. 'Aerial Imagery of Ascension, St. James, and St. John Baptist Parishes, Louisiana (NAIP)'. Washington, D.C.: U.S. Department of Agriculture, 2005.

U.S. Geological Survey. 'Aerial Imagery of Ascension, St. James, and St. John Baptist Parishes, Louisiana'. 1:69,000. Washington, D.C.: U.S. Geological Survey, 1952.

———. 'Aerial Imagery of Ascension, St. James, and St. John Baptist Parishes, Louisiana'. 1:22,000. Washington, D.C.: U.S. Geological Survey, 1961.

———. 'Aerial Imagery of Ascension, St. James, and St. John Baptist Parishes, Louisiana'. 1:62,405. Washington, D.C.: U.S. Geological Survey, 1970.

———. 'Aerial Imagery of Ascension, St. James, and St. John Baptist Parishes, Louisiana'. 1:67,000. Washington, D.C.: U.S. Geological Survey, 1985.

U.S. General Land Office Records, 'T.11 S - R.5 E. South Eastern District' (1890), https://glorecords.blm.gov/.

United States of America, Bureau of the Census. *Seventh Census of the United States, 1850*. Washington, D.C.: National Archives and Records Administration, 1850. M432, 1,009 rolls. Available at:

United States of America, Bureau of the Census. Eighth Census of the United States, 1860. Washington, D.C.: National Archives and Records Administration, 1860. M653, 1,438 rolls.

United States of America, Bureau of the Census. "Nonpopulation Census Schedules for Louisiana, 1850-1880." National Archives and Records Administration, Washington, D.C., 1988. Available at: https://www.familysearch.org/search/catalog/589491?availability=Family%20History%20Library.

Whitney Plantation Museum. 'Slavery in Louisiana'. Available at: https://www.whitneyplantation.org/history/slavery-in-louisiana/. Last accessed: 25 June 2021.

Yakubik, Jill-Karen, Franks, Herschel A., Goodwin, R. Christopher, and Poplin, Carol J. 'Cultural Resources Inventory of the Bonnet Carre Spillway, St. Charles Parish, Louisiana'. COELMN/PD-86/15, Final Report. New Orleans: R. Christopher Goodwin and Associates, 30 September 1986.

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