The Office of Vince Ryan
County Attorney

July 15, 2014

Ms. Anne Foster
United States Environmental Protection Agency
1445 Ross Avenue
Dallas, Texas 75202

Re: San Jacinto Superfund Site

Dear Ms. Foster:

Harris County has recently identified critical information regarding the San Jacinto Superfund Site that it is providing to the Environmental Protection Agency consistent with the Memorandum of Understanding between EPA and Harris County. Because of the seriousness of the issues discovered, Harris County requests that EPA retain an independent third party to conduct a formal investigation into the recent revelation that the site work that formed the basis for the supposedly unbiased "scientific" reports turned into the Government was actually part of the litigation strategy to protect the interest of the responsible parties – not the public's interests.

I. EPA cannot evaluate or select a site remedy based upon the responsible party's litigation strategy.

The attached affidavits signed by the responsible parties' attorneys reveal -- apparently for the first time -- that their consultants Anchor and Integral (who conducted and assisted with what is required to be an unbiased and impartial RI/FS at the Site) were actually retained as part of the responsible parties' legal strategy and to assist with their defense. Documents obtained by Harris County also show that site work, studies and underlying information for key reports submitted by Anchor, Integral, International Paper, Waste Management and MIMC to the government as the basis for evaluating remedial alternatives at the Site were actually prepared as part of the responsible parties' legal defense and litigation strategy. Because the responsible parties have now conceded that their site work underlying these key reports was part of the PRPs' litigation strategy done in anticipation of litigation, then it cannot have been done as part of an independent, unbiased investigation and study that is required by law for the San Jacinto Site. The information also brings to light an insurmountable conflict of interest presented by having the responsible parties' consultants – now identified as having been retained as part of their defense strategy -- also prepare the supposedly independent reports that the EPA and public are being asked to rely on to evaluate site risks and remedies.

1019 Congress, 15th Floor • Houston, Texas 77002 • Phone: 713-755-5101 • Fax: 713-755-8924

9559389

The depth and degree of the now-identified conflict of interest of the responsible parties' litigation consultants have been starkly exposed in recent depositions where those purported authors of key site work and reports refuse to answer basic questions about their impartiality or to identify who actually wrote and contributed to the reports submitted to the government. The PRPs have also refused to reveal to the public more than 45,000 documents underlying and/or forming the basis of the conclusions of the Feasibility Study, claiming in their privilege logs that information related to the site remediation work is part of its litigation strategy and defense.

EPA's third-party investigation should also address the responsible parties' claims that they can somehow withhold from the public the many thousands of documents they seek to conceal that relate to the basis and conclusions of the Feasibility Study. As a matter of law, all of the work undertaken in connection with the RI/FS is public and cannot be hidden from the public. EPA should require this information to be brought out into the open so that the public can see what portion of the site remediation work was done to promote and further the responsible parties' legal strategy as identified in their own privilege log.

II. International Paper and MIMC now admit that the work underlying the Feasibility Study and site reports prepared by Anchor and Integral are actually part of the responsible parties' legal strategy to defend against their liability at the Site.

International Paper and MIMC have recently admitted that work related to the site remediation and Feasibility Study – which it submitted to EPA – was actually prepared as part of the legal strategy of the responsible parties. International Paper makes this admission as part of its efforts to suppress from the public more than 45,000 documents related to the site work that are the basis and underlying backup for the Feasibility Study, as shown in their attached 3,886-page privilege log identifying site-related documents they refuse to make public.[1] To support their efforts to withhold documents, the in-house attorneys for International Paper and MIMC have executed affidavits swearing under oath that consultants Anchor and Integral who conducted and assisted with the RI/FS work at the Site had actually been retained as part of the responsible parties' legal strategy associated with the Site.[2]

---

[1] See attached copy of International Paper's 3,886 page log of the thousands and thousands of site-related work documents it refuses to reveal to the public in connection with the San Jacinto site work and the Feasibility Study. The responsible parties take the position that all of this work was done as part of its joint defense strategy, as part of its communications with its attorneys, and/or is confidential because it is part of the responsible parties' litigation strategy. International Paper's broad attempts to use privilege to withhold many thousands of relevant site documents appears to extend to virtually every document that was authored by a consultant regarding site remediation issues, even including documents from analytical testing labs that they attempt to withhold, despite the fact that underlying facts and test results cannot be withheld from disclosure.

[2] International Paper's in-house attorney Elton L. Parker has provided the attached Affidavit in which he swears under oath that Integral was retained in 2009 to facilitate the rendition of professional legal services to International Paper and that communications with Integral occurred to carry out the instructions of counsel in anticipation of litigation, among other things. MIMC's in-house attorney Francis E. Chin has provided the attached Affidavit in which he swears under oath that from at least 2008 MIMC's communications with Anchor were to facilitate to rendition of professional legal services to MIMC in connection with the San Jacinto Superfund Site and, since 2009, to jointly provide consulting services to attorneys for both MIMC and International Paper. Mr. Chin swears under oath that the engagement of Anchor from October 2008 to the present has been necessary to assist MIMC's attorneys with providing effective representation to MIMC.

Because the PRPs are claiming that the documents that form the basis of and/or relate to reports authored by Anchor and Integral are privileged because they were done to defend the PRPs' position in litigation, their own admission proves that the reports provided to EPA are not independent and unbiased reports that the law requires them to be and cannot be the basis for EPA to utilize to make decisions about public health and welfare.

At this point, EPA and the public now find themselves in an untenable position where they are being asked to rely on a Feasibility Study where the underlying work is admittedly done as part of defending the responsible parties' interests – not the public's interest. Even more concerning, the responsible parties take the position that the public cannot even see the underlying basis for the conclusions of the Feasibility Study, but that they get to keep that information secret as part of their defense strategy. International Paper's withholding of relevant information regarding the motives and underlying basis for the Feasibility Study renders the public comment process invalid at the outset, since the public cannot comment on what it cannot see.

The law does not allow responsible parties to withhold information prepared as part of the RI/FS process from the public or from the government.[3] The work pertaining to the RI/FS cannot be hidden from the public on the basis that the responsible parties did the work as part of their defense strategy; on the contrary, the RI/FS process is not allowed to be biased or undertaken to protect a responsible party's litigation interests. All information regarding the site work must be transparent and is required by law to be made available. EPA's third-party investigation should require this information to be provided to the public.

III. The Consultants who prepared the reports to the government have inherent conflicts of interest because the PRPs have now admitted that Anchor and Integral were actually hired as part of their defense against anticipated litigation and to protect the responsible parties' interests in connection with the Site.

A. Consultants conducting or assisting with RI/FS work cannot have a conflict of interest.

If responsible parties use consultants for conducting or assisting with the RI/FS – such as Anchor and Integral in this case – the consultants cannot have a conflict of interest with respect to the project.[4] In an effort to prevent the public from obtaining documents regarding the site

[3] All of the work undertaken in connection with the RI/FS is public and cannot be hidden from the public as a matter of law. The Unilateral Order requiring the responsible parties to undertake the very work they now seek to hide makes it clear that all records and documents in their possession that relate in any way to the Site shall be preserved, including requiring the responsible parties to acquire and retain all documents relating to the Site in the possession of its attorneys and others. *See* Unilateral Administrative Order, XX. Record Preservation. EPA's third-party investigation should also address the responsible parties' claims that they can withhold this information from the public in contravention of the requirements of the [date] Unilateral Administrative Order.

[4] "Revisions to the Interim Guidance on PRP Participation in Remedial Investigations and Feasibility Studies," (OSWER 9835.2a, February 1989) at A-13 – A-15 ("EPA Guidance").

work that were authored by Anchor and Integral as part of the RI/FS process, the responsible parties' attorneys have now admitted that Anchor and Integral's work was actually done to defend and protect them in connection with litigation. They executed the attached affidavits to support their positions that Anchor and Integral were hired to assist in the responsible parties' defense in connection with the Site, and they claim that Anchor and Integral's work in connection with the RI/FS and site remediation issues can be concealed from the public because it is actually part of their legal defense against liability.

It is an inherent conflict of interest to allow the responsible parties' consultants – whose actual assignment was to assist in the responsible parties' defense from liability at the Site – to undertake the site work and prepare reports that are required to be impartial and independent. Consultants cannot be retained as part of the responsible parties' litigation strategy team and then held out as supposedly independent consultants to prepare critical site reports that impact defendants' liability. Harris County has not been able to locate any evidence that the responsible parties revealed this information to EPA when they chose Anchor and Integral to be their consultants in preparing the supposedly unbiased and independent studies that were to study the site and identify potential alternatives.

The responsible parties have a vested financial interest in whatever remedy is ultimately selected by EPA; accordingly, the consultants undertaking the site investigation, study work and preparation of the reports identifying the potential alternatives to be considered must be independent and unbiased. In this case, the consultants preparing the reports that will impact the responsible parties financially are the very consultants that the responsible parties retained and paid to protect their interests in connection with litigation and liability at the Site. EPA is already in possession of the email evidence showing that as early as 2011 and well before the studies required by law were conducted, Waste Management and International Paper had already begun their "global plan" to influence the community to promote their pre-selected cheapest remedy of leaving the waste in place under rocks, including actively using David Keith -- their consultant at Anchor – to "control" the public's perception and avoid the ultimate selection of a removal remedy.[5] The EPA and the community were not informed of this covert plan, which was only uncovered when emails discussing the responsible parties' plans for their preferred remedy were recently obtained. This most recent information showing that Anchor's work at the site was actually part of the responsible parties' defense strategy raises additional, even more serious questions about the objectivity of the underlying reports and information being provided to EPA and the public by Waste Management, International Paper, MIMC, Anchor and Integral.

---

[5] See attached March 9, 2011 emails from and to Waste Management's Director of Closed Sites to International Paper Company's Senior Environmental Remediation Project Manager and the District Manager of Waste Management's Closed Sites Management Group discussing work on what they called a "global plan" to build consensus with the community action group members "to view the TCRA [temporary rock cap] as part of the permanent remediation action at the site." Those same emails discuss Waste Management's position that "we need to control our message and build consensus [are] we may be facing a dig and haul/burn as part of the final remedy." Their emails also discussed the need to have their consultant from Anchor Environmental – one of the consultants who authored the Feasibility Study report submitted to EPA – present at the community meetings "to control our message," noting that the EPA project manager "will not speak out of turn when the Anchor representative is present because he knows he will be called out immediately."

B. The inherent conflict of interest of consultants Anchor and Integral is illustrated by their refusal to answer questions under oath regarding how the reports were prepared, who authored them, whether they agree with their own reports, and whether they are acting as advocates for the responsible parties when producing such reports.

The public and EPA are being asked to base their decisions regarding the risks to the environment and public health on studies and reports "prepared by" Anchor and Integral. However, Anchor and Integral now refuse to answer even the most basic questions about how they came to the conclusions in the relevant reports, such as who actually wrote, edited, or contributed to their reports, whether they agree with their own reports, whether they were unbiased or were in fact acting as advocates of the responsible parties who paid them, and even whether their reports were written in whole or part by the attorneys for the responsible parties as part of their litigation strategy.

The public is entitled to know who actually wrote the reports they are being asked to comment on and rely upon with regard to risks to themselves and the environment. The public is entitled to know whether the consultants identified as preparing the reports agree with their own conclusions and, if not, which ones they do not agree with. The public is entitled to know if the consultants preparing the report are acting as advocates for the interests of the responsible parties paying them or whether they are impartial. The public is entitled to know if the consultants preparing the report have been retained, as Anchor and Integral admittedly have been, as part of the responsible parties' legal strategy to protect them against liability, as opposed to being impartial consultants. The public is entitled to know that 45,000 Anchor and Integral documents relating to the site and forming the basis of the Feasibility Study have been withheld as secret information that the responsible parties refuse to let the public see.

The depth and degree of Anchor and Integral's conflict of interest has been exposed in recent depositions (excerpts attached), when the purported authors of the key site work and reports admitted the following:

- They do not necessarily agree with all of the information contained in the reports they prepared and submitted to the government.

- They would not answer any questions about any input, edits, changes, or deletions that attorneys for the PRPs made to their reports, providing a privilege log that contains 3,886 pages and over 45,000 documents and communications they claim are privileged and do not have to be revealed to the public.

- They could not identify who wrote portions of the reports and would not reveal the identity and names of all persons who contributed to the reports.

- Integral's project manager went so far as to refuse to answer a question on whether she was an independent scientist or advocate for her clients (International Paper and MIMC) in performing work at the Site.

Anchor and Integral's own testimony under oath highlights the inherent conflict of interest in which they find themselves, as they simply refuse to answer basic questions about their impartiality. The public is entitled to know the truth about the basis for the work at the site and the reports that identify alternatives, and whether or not they are impartial. The fact that Anchor and Integral will not answer – or are instructed not to answer – those basic questions about a public process only highlights the need for an investigation to find out why.

The public is entitled to know why what is supposed to be an impartial and independent Feasibility Study identifying alternatives and potential risks did not and/or does not mention the very components that weigh most heavily against the pre-determined leave-in-place cap remedy that the responsible parties are touting. The most obvious of omissions and deficiencies in the Feasibility Study reports were the failure to take into account the obvious impact of hurricanes, storms, tidal influence, and flooding – just to name a few – that weigh against the remedy that the responsible parties are advocating to the public. The public has nevertheless begun to see beyond the version of the Feasibility Study being promoted by the responsible parties and their litigation consultants to identify these fatal flaws, with the Houston Chronicle newspaper recently publishing the attached June 29, 2014 editorial noting that "[C]ommon sense tells us that moving water poses a threat to any cap no matter how well-constructed" and that "the San Jacinto waste site is an extremely vulnerable site" ... "Our area, as we all know, is prone to hurricanes and heavy flooding."[6]

The responsible parties' omissions and/or minimization of obvious risks and impacts from floods and storms in the Feasibility Study report are also highlighted in a recent 2014 report by the Center for Texas Beaches and Shores – Texas A&M University Galveston, entitled "A Flood Risk Assessment of the San Jacinto River Waste Pit Superfund Site." (copy attached). The Texas A&M Study documents that existing reports only superficially address the flood risk associated with the site and do not consider the impact of previous events, changing risk conditions, or potential wave action from storm surges. The A&M Report notes the vulnerability of the population in the study area near the site, singling out nursing infants and children under 5 in the area as being particularly vulnerable to dioxin left in the environment. Another particular concern of the in-place remedy being promoted by the responsible parties is A&M University's findings regarding the potential dioxin exposure to nearly 600,000 residents from nearby drinking water reservoirs that could be impacted by the dioxin as shown by storm scenarios modeled by A&M scientists.

The fact that Harris County, the Houston Chronicle, A&M University and others have to point out the obvious flaws and biases of the RI/FS and the remedy being promoted by the responsible parties is telling and highlights the lack of objectiveness of the submissions from the responsible parties' litigation consultants. The new information identified in this letter, along with what has already been identified about the "global plan" of the responsible parties and their litigation consultants (who together control the data collection, interpretation and conclusions of the Feasibility Study and other relevant site work) to influence the outcome, raises serious questions about the integrity of the Study and the work performed at the Site by those parties that cannot be ignored.

---

[6] See Houston Chronicle, June 29, 2014 Editorial "Solution now – The San Jacinto Waste Pits were named as a Superfund site for a good reason."

IV. The new information further indicates that the Feasibility Study work was done in furtherance of the responsible parties' "global plan" to ensure that a removal remedy is *not* selected.

As EPA is already aware, documents have been identified showing that International Paper and Waste Management acted in concert and entered into a "global plan" at least by 2011 to take steps to ensure that the remedy that they wanted – the cheapest remedy of leaving the waste in place under rocks – would be the end result of the remedy-selection process – and to ensure that a removal remedy was *not* selected.[7] Instead of evaluating objective science, the PRPs and their consultants chose instead to spend their efforts to promote the cheapest remedy that they preferred, discussing their plans to influence the community and avoid having to spend the money to remove the dioxin contamination from the Site. The responsible parties' true motives, as documented in these emails, were not revealed to the public, Harris County, TCEQ, or EPA, even as the responsible parties controlled the Feasibility Study process, interpretation and information. Documents now show that the responsible parties also used those same litigation consultants retained to advance their defense strategy and protect the responsible parties' interests – not the public's – to conduct the Feasibility Study process that the responsible parties controlled. The public is entitled to know this background and the responsible parties' admitted motives so they can judge for themselves whether Anchor and Integral's reports are impartial science or an effort to bias the reports to sell the cheapest remedy that evidence shows they had already pre-selected and planned to sell to the public under the guise of supposedly scientific and impartial reports.

The new information from the responsible parties' attorneys identify that Anchor and Integral have insurmountable conflicts of interest between their roles of being retained to participate in the responsible parties' defense strategy and the public's right to an impartial site investigation and Feasibility Study. An independent third-party investigation regarding the integrity of the process must be undertaken to evaluate the objectivity and integrity of the underlying reports and information being provided to EPA and the public that are the basis for future critical decisions regarding public health and exposure.

V. Conclusion

Based upon the seriousness of these issues and the potential far-reaching effects that the site work will have on generations of the over 4.0 million people of Harris County, Harris County requests that EPA retain an independent third party to conduct a formal investigation into the serious issues and improprieties that have been revealed in the process.

---

[7] See footnote 6.

We look forward to hearing from EPA regarding the implementation of an investigation to ensure the protection of public safety and the environment in connection with the Site.

Very truly yours,

Rock Owens

Cc: Ms. Pamela Phillips (EPA)

Attachments

AFFIDAVIT OF FRANCIS E. CHIN, ESQ.

STATE OF TEXAS §
§
COUNTY OF HARRIS §

Before me, the undersigned authority, on this day personally appeared Francis E. Chin, known to me to be the person whose name is subscribed below, and after being duly sworn, upon his oath, stated as follows:

1. My name is Francis E. Chin. I am an attorney representing McGinnes Industrial Maintenance Corporation ("MIMC"). I am over twenty-one (21) years of age, of sound mind and am fully competent to testify to the matters herein stated. I have personal knowledge of the statements contained herein through my work on these issues and through my review of MIMC's records, and they are true and correct.

2. I am an attorney licensed to practice law in the State of Texas since November 2003. Since October 2008, I have served as an attorney for MIMC. In this role, I am responsible for performing legal services on behalf of MIMC, including legal services in conjunction with the above-captioned litigations and the investigation of the San Jacinto River Waste Pits Superfund Site ("Site") by the U.S. Environmental Protection Agency ("EPA"), the Texas Commission on Environmental Quality ("TCEQ"), Harris County, and others. Since October 2008, I have had primary responsibility within MIMC's legal team for issues relating to the Site.

3. Pursuant to a letter dated July 28, 2006, TCEQ informed MIMC in writing that the Site was being evaluated for possible inclusion on the National Priorities List ("NPL"). In November 2007, MIMC retained outside counsel, Winstead PC, to assist it with legal services surrounding the investigation of the Site. At all times since 2007, Winstead PC has served as MIMC's outside counsel for the legal services concerning the Site. The Site was proposed for listing on the NPL on September 19, 2007 and added to the NPL on March 19, 2008. On December 9, 2008, EPA issued a Combination General Notice and 104(e) Information Request Letter to MIMC, identifying MIMC as a Potentially Responsible Party ("PRP") at the Site. Based on the listing of the Site on the NPL in March 2008 and the receipt of the PRP letter in December 2008, MIMC reasonably anticipated that litigation would occur. On May 9, 2009, after International Paper Company ("International Paper") had also been identified as a PRP at the Site and in anticipation of a meeting between the two companies, International Paper and MIMC entered into a Joint Defense Agreement ("JDA").

4. In September 2008, MIMC began discussions with Anchor QEA, LLC ("Anchor") due to the need for technical assistance on contaminated sediment management and transport issues at the Site and assistance in preparation for future meetings with EPA about the Site. Anchor is a national expert in these issues and very familiar with EPA's policies for addressing sediment sites such as

EXHIBIT
A

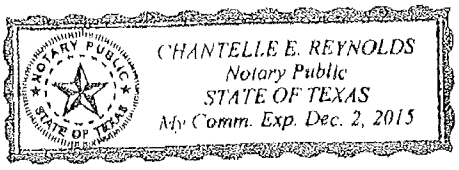
the Site. Anchor assisted Winstead and MIMC's internal team in preparing for the initial meeting with EPA Region 6 regarding the Site on October 16, 2008 and continued to assist MIMC and Winstead on discrete issues subsequent to that time. Since October 2008, Anchor has assisted MIMC's attorneys in evaluating the Site, liaising with EPA, TCEQ, Harris County, and other governmental entities, and in otherwise providing technical assistance and consulting services to MIMC and its attorneys, all in anticipation of future litigation inasmuch as a MIMC was identified as a PRP at the Site soon after MIMC's initial meeting with EPA in October 2008. Among other things, following the receipt of EPA's Special Notice Letter dated July 17, 2009, Anchor and MIMC's attorneys worked hand-in-hand preparing for a meeting with EPA in August 2009. Further, in the fall of 2009, Anchor and MIMC's attorneys worked hand-in-hand developing a Good Faith Offer to EPA to perform a Remedial Investigation/Feasibility Study ("RI/FS") in September 2009 and preparing for a meeting with Harris County in October 2009. On November 20, 2009, EPA issued a Unilateral Administrative Order directing International Paper and MIMC to undertake a RI/FS at the Site. As a result of EPA's Order, International Paper and MIMC at that time jointly retained Anchor and another environmental company, Integral Consulting, Inc., on December 1, 2009 in order for them to jointly provide consulting services to attorneys for both MIMC and International Paper. Prior to that date, Anchor had been providing consulting services to only MIMC attorneys. To the best of my knowledge, MIMC has not designated representatives from Anchor as testifying experts in any matters involving the Site, nor have their mental impressions or opinions been reviewed by any testifying expert.

5. In connection with Anchor's retention as MIMC's consultant, I, along with other members of MIMC's legal representation, including other in-house and outside counsel, engaged in communications with Anchor that MIMC and MIMC's attorneys believed were privileged and confidential communications protected from discovery under the attorney-client privilege, work product privilege, and consulting expert privilege. These communications include, in part, Anchor's opinions and mental impressions, as well as the opinions and mental impressions of both inside and outside counsel for MIMC. These communications also include documents that were created because of MIMC being identified as a PRP at the Site. The purpose of these communications was to facilitate the rendition of professional legal services to MIMC. The engagement of Anchor from October 2008 to the present has been necessary to assist MIMC's attorneys with providing effective representation to MIMC.

FURTHER AFFIANT SAYETH NOT.

Francis E. Chin, Esq.

SUBSCRIBED AND SWORN TO BEFORE ME, the undersigned authority, on this 9th day of May, 2013.



Chantelle E. Reynolds
[signature]

Chantelle E. Reynolds
[printed name]

Notary Public in and for the
State of Texas

AFFIDAVIT OF ELTON L. PARKER

STATE OF TENNESSEE §
§
COUNTY OF SHELBY §

Before me, the undersigned authority, on this day personally appeared Elton L. Parker, known to me to be the person whose name is subscribed below, and after being duly sworn, upon his oath, stated as follows:

1. My name is Elton L. Parker. I am an attorney employed by International Paper Company ("International Paper"). I am over twenty-one (21) years of age, of sound mind and am fully competent to testify to the matters herein stated. I have personal knowledge of the statements contained herein, and they are true and correct.

2. I am currently licensed to practice law in the States of Tennessee and New York. I have been employed as an attorney for International Paper since July 2007. I currently hold the position of Senior Counsel – Environmental Litigation, a position I have held since September 2009.

3. Between September 2007 and October 2009, I had primary responsibility within International Paper's legal department for issues relating to the San Jacinto River Waste Pits Superfund Site ("Site").

4. On December 9, 2008, EPA issued a Combination General Notice and 104(e) Information Request Letter to International Paper pursuant to which International Paper was identified as a Potentially Responsible Party ("PRP") at the Site. Based on the receipt of this letter, International Paper reasonably anticipated that litigation would occur.

5. In connection with International Paper's naming as a PRP at the Site, I was involved in engaging Integral Consulting, Inc. ("Integral") to assist International Paper in assessing its potential liability and legal responsibilities in connection with the Site. Beginning in April 2009, at my direction, representatives of International Paper, including myself, participated in communications with Integral to discuss their retention. Integral was formally engaged by International Paper at my direction on or about October 1, 2009.

6. To the best of my knowledge, International Paper has not designated representatives from Integral as testifying experts in any matters involving the Site, nor have their mental impressions or opinions been reviewed by any testifying expert.

7. In connection with Integral's retention as International Paper's consultant, I, along with other members of the legal department at International Paper, and our outside counsel, engaged in communications with Integral that the company

believed were privileged and confidential. The purpose of those communications was to facilitate the rendition of professional legal services to International Paper. These communications contained documents, reports, communications, memoranda, mental impressions, conclusions, opinions, or legal theories, prepared and assembled in actual anticipation of litigation.

8. With respect to communications between representatives of Integral, those communications occurred to carry out the instructions of counsel in order to assist International Paper's attorneys in the rendition of professional legal services to International Paper. These communications contained documents, reports, communications, memoranda, mental impressions, conclusions, opinions, or legal theories, prepared and assembled in actual anticipation of litigation.

FURTHER AFFIANT SAYETH NOT.

Elton L. Parker

SUBSCRIBED AND SWORN TO BEFORE ME, the undersigned authority, on this 9 day of May, 2013.

[signature]

Jenny L. Bullard
[printed name]

Notary Public in and for the
State of Tennessee

3-1-16

From: Shafer, Andrew
To: Smith, March; Philip J Slowiak
Sent: 3/9/2011 8:49:16 AM
Subject: RE: Please mark your calendars: next CAC meeting and other informational items.

From experience we know how Valmichael addresses the crowd. When we don't have someone present he will say anything.

Andrew L. Shafer, P.E.
District Manager, WM Closed Sites Management Group
9590 Clay Road
Houston, TX 77080

Office No.: 713-772-9100 Ext. 109
Fax No: 832-668-3188
Cell No. 832-724-3802
Did you know? "Waste Management's landfills provide over 24,000 acres of protected land for wildlife habitats and 73 of the sites are certified by the Wildlife Habitat Council."

Be Safe!!

THIS ELECTRONIC MAIL MAY CONTAIN INFORMATION THAT IS PRIVILEGED, CONFIDENTIAL, AND OR OTHERWISE PROTECTED FROM DISCLOSURE TO ANYONE OTHER THAN ITS INTENDED RECIPIENT(S). ANY DISSEMINATION OR USE OF THIS ELECTRONIC MAIL OR ITS CONTENTS BY PERSONS OTHER THAN THE INTENDED RECIPIENT(S) IS STRICTLY PROHIBITED. IF YOU HAVE RECEIVED THIS MESSAGE IN ERROR, PLEASE NOTIFY THE SENDER IMMEDIATELY BY REPLY EMAIL SO THAT INTERNAL RECORDS CAN BE CORRECTED. PLEASE THEN DELETE THE ORIGINAL MESSAGE. THANK YOU

From: Smith, March
Sent: Wednesday, March 09, 2011 8:47 AM
To: Philip J Slowiak
Cc: Shafer, Andrew
Subject: RE: Please mark your calendars: next CAC meeting and other informational items.

Good point, however, David is the lead dog when it comes to building a consensus with the CAC members to view the TCRA as part of the permanent remedial action at the site. I am working on a global plan to build this consensus with all stakeholders and David is the best spokesman to address this group and control our message. ValMichael will not speak out of turn when David is present because he know s he will be called out immediately. We need to control our message and build consensus are we may be facing a dig and haul/burn as part of the final remedy.

March Smith
Director of Closed Sites

From: Philip J Slowiak [mailto:Philip.Slowiak@ipaper.com]
Sent: Wednesday, March 09, 2011 9:41 AM
To: Smith, March
Cc: Shafer, Andrew
Subject: RE: Please mark your calendars: next CAC meeting and other informational items.

Let's talk about this. I'm not so sure it's in our best interest to have Dave become too familiar a face at these meetings. It might be better to let Valmichael report all the progress. We need to keep Dave in reserve for bigger issues. The CAC won't move on to other big picture issues if Dave is the center of attention.

Philip J Slowiak, Sr., CSP
Senior Project Manager
Environmental Remediation
INTERNATIONAL PAPER COMPANY
6400 Poplar Avenue
Memphis, TN 38197
Office: 901-419-3845
Cell: 901-604-1952
Fax: 901-214-9550
philip.slowiak@ipaper.com

From: Smith, March [mailto:msmith4@wm.com]
Sent: Wednesday, March 09, 2011 6:08 AM
To: Philip J Slowiak
Cc: Shafer, Andrew
Subject: FW: Please mark your calendars: next CAC meeting and other informational items.

Phil, I think we should have David present the current status in person at the meeting on April 20 as it is designated as a "big picture" meeting. Let me know if you agree and I will forward this information to him.
Regards,

March Smith
Director of Closed Sites

From: Gordon, Leah (CAO) [mailto:Leah.Gordon@cao.hctx.net]
Sent: Tuesday, March 08, 2011 4:41 PM
To: 'walters.donn@epa.gov'; 'ctaylor@tceq.state.tx.us'; Obey, Rita (PHES); Seegers, Mark (Commissioner Precinct 2); Haldin, Kenneth; 'bstokes@galvbay.org'; 'kristi.corse@h-gac.com'; 'Nann.Barbara@epamail.epa.gov'; 'tzhone.stephen@epa.gov'; 'sanchez.carlos@epa.gov'; 'Leos.Valmichael@epamail.epa.gov'; 'lvoskov@tceq.state.tx.us'; Miller, Gail (Commissioner Precinct 2); Schaffer, Michael (PHES); Cron, Catarina (County Judge's Office); 'Axe, Al'; Smith, March; Shafer, Andrew; 'Steve.Ginski@IPaper.com'; 'jcermak@bakerlaw.com'; 'philip.slowiak@ipaper.com'; 'wpetit@jgdpc.com'; 'Powers, Rachel D.'; 'gmcmahan@poha.com'; 'nhausler@poha.com'; 'lhenry@poha.com'; 'Rich O'Connell'; 'Patricia.Radloff@tpwd.state.tx.us'; 'don.pitts@tpwd.state.tx.us'; O'Rourke, Terence (CAO); Sanders, Herman (HCPID); Hamilton, Dimetra (HCPID); 'Leonard Polk'; 'coats.janetta@epa.gov'; 'Scott Jones'; 'Tina.walker@dshs.state.tx.us'; 'David.Rivera@dshs.state.tx.us'; 'Will Graham'; 'Mary.Risner@tceq.texas.gov'
Cc: Patel, Snehal (CAO); Majors, Curtrina (CAO)
Subject: Please mark your calendars: next CAC meeting and other informational items.

1. The next Community Awareness Committee will be on Wednesday, March 23, 2011 at 9:30 AM. If you would like to request specific agenda items, please email Snehal and Donn.

2. We are also sending the following helpful EPA websites on San Jacinto River Waste Pits that were launched recently:

Information about the site generally (S. Tzhone):

http://www.epa.gov/region6/6sf/texas/san_jacinto/

Information specific to the TCRA (V. Leos):

www.epaosc.org/sanjacwpremoval

Please review these websites and we will be discussing/sharing comments with EPA at the next meeting.

3. Every two months, a big picture status report will be provided. The next one is scheduled

on April 20, 2011 at the regularly scheduled CAC meeting.

Best wishes,
Snehal R. Patel

Leah A. Gordon
Environmental Paralegal
Environmental Regulatory Section
Office of Vince Ryan
Harris County Attorney
1019 Congress
Houston, Texas 77002
Phone: (713) 755-1277
Fax: (713) 755-2680
Email: leah.gordon@cao.hctx.net

CAUSE NO. 2011-76724
HARRIS COUNTY, TX, ET AL., } IN THE DISTRICT COURT OF
Plaintiff, }
v. } HARRIS COUNTY, TEXAS
INTERNATIONAL PAPER COMPANY, ET AL., }
Defendants. } 295th JUDICIAL DISTRICT

CAUSE NO. 2012-58016
DAO VAN PHO, ET AL., } IN THE DISTRICT COURT OF
Plaintiffs, }
v. } HARRIS COUNTY, TEXAS
INTERNATIONAL PAPER COMPANY, ET AL., }
Defendants. } 125th JUDICIAL DISTRICT

CAUSE NO. 2012-66308
JIM HARPSTER AND JENNIFER HARPSTER, ET AL., } IN THE DISTRICT COURT OF
Plaintiffs, }
v. } HARRIS COUNTY, TEXAS
INTERNATIONAL PAPER COMPANY, ET AL., }
Defendants. } 11th JUDICIAL DISTRICT

****

ORAL AND VIDEOTAPED DEPOSITION OF

DAVID KEITH

April 23, 2014

****

ORAL AND VIDEOTAPED DEPOSITION OF DAVID KEITH, produced as a witness at the instance of the Plaintiff, and duly sworn, was taken in the above-styled and numbered cause on the 23rd of April, 2014, from 9:30 a.m. to 5:21 p.m., before Janet G. Hoffman, CSR in and for the State of Texas, reported by machine shorthand, at the office of Winstead, P.C., 600 Travis, Suite 1100, Houston, Texas, pursuant to the Texas Rules of Civil Procedure and any provisions stated on the record or attached hereto.

APPEARANCES

FOR PLAINTIFF HARRIS COUNTY, TEXAS:
MR. JOHN MUIR
CONNELLY BAKER WOTRING LLP
700 JPMorgan Chase Tower
600 Travis Street
Houston, Texas 77002
713.980.1700
713.980.1701 fax
jmuir@connellybaker.com

MR. ROCK W.A. OWENS
SPECIAL ASSISTANT HARRIS COUNTY ATTORNEY
1019 Congress, 15th Floor
Houston, Texas 77002
713.274.5121
713.437.4211 fax

FOR DEFENDANT MCGINNES INDUSTRIAL MAINTENANCE CORPORATION:
MR. BRUCE WILKIN
WINSTEAD, PC
1100 JPMorgan Chase Tower
600 Travis Street
Houston, Texas 77002
713.650.8400
713.650.2400 fax
bwilkin@winstead.com

MR. ALBERT R. AXE, JR.
WINSTEAD, PC
401 Congress Avenue, Suite 2100
Austin, Texas 78701
512.370.2806
512.370.2850 fax
aaxe@winstead.com

FOR DEFENDANTS WASTE MANAGEMENT, INC. And WASTE MANAGEMENT OF TEXAS, INC.:

MR. GLENN A. BALLARD, JR.
MR. K. KNOX "LIGHTHORSE" NUNNALLY

711 Louisiana Street, Suite 2300
Houston, Texas 77002
713.221.1454
713.222.3000 fax
glenn.ballard@bgllp.com
knox.nunnally@bgllp.com

MR. JOHN A. RILEY
BRACEWELL & GIULIANI
111 Congress Avenue, Suite 2300
Austin, Texas 78701
512.542.2108
800.404.3970 fax
john.riley@bgllp.com

FOR DEFENDANT INTERNATIONAL PAPER COMPANY:
MR. CRAIG A. STANFIELD
MORGAN, LEWIS & BOCKIUS LLP
1000 Louisiana Street, Suite 4000
Houston, Texas 77002
713.890.5114
713.890.5001 fax
cstanfield@morganlewis.com

ALSO PRESENT:

MICHAEL CAMMACK, videographer

1 International Paper and MIMC at the San Jacinto site,
2 does that mean that reports that are provided to EPA --
3 that you're kind of the last word on what goes into
4 those reports?
5 MR. WILKIN: Objection. Form.
6 A. Repeat the question.
7 Q. Sure. As the project coordinator for the
8 PRPs, does -- do you have kind of final say, on behalf
9 of the PRPs, as to what goes into the reports that
10 are -- that are turned in to the EPA?
11 MR. WILKIN: Objection. Form.
12 A. Yeah. Again, it's a very collaborative
13 process. I would say it's the Anchor team, the Integral
14 team, the MIMC and IP team and EPA and TCEQ and others
15 participate in preparation of these reports. So I don't
16 think anyone necessarily has the final say.
17 Q. Within Anchor, for instance, would you be the
18 person that has the final say as to what's contributed
19 by Anchor to a report that goes to EPA?
20 MR. WILKIN: Objection. Form.
21 A. Yeah. Again, it's a collaborative process
22 within Anchor, outside of Anchor working with everyone.
23 And I don't -- I'm the person that may transmit the
24 reports, but I would not say I have any kind of final
25 authority on the reports.

1 Q. Is there -- is there anyone within -- within
2 your organization that, if there's a disagreement about
3 what should be put into a report, kind of has the final
4 say of veto power, or anything like that, at the site?
5 MR. WILKIN: Form.
6 A. Again, it's a collaborative process. We may
7 have disagreements, but there's no final arbitrator.
8 Q. Okay. Let's talk about kind of your -- this
9 collaborative process that you mentioned. The Superfund
10 site, the San Jacinto site, has involved a whole number
11 of different reports and studies that have been
12 submitted to EPA by Anchor and Integral. Correct?
13 A. That's correct.
14 Q. And with regard to -- well, is there one --
15 one of the companies or one of the people within Anchor
16 or Integral who does, for instance, the first draft of a
17 report that's going in, or does that vary by report?
18 A. Again, it's a very, very collaborative
19 process; and I would not say anyone has -- any one
20 person has responsibility for drafting any complete
21 report. It's very much of a team effort.
22 Q. Okay. If you've got a report that is going to
23 be submitted to the EPA, someone or someones put
24 together a first draft of the report, I assume?
25 A. A group of people would, yes.

1 Q. Okay. And once you get that group of people
2 that have put together a first draft, how is that
3 circulated for comments to others?
4 MR. WILKIN: I'm going to instruct the
5 witness not to answer to the extent it involves
6 communications with MIMC.
7 MR. BALLARD: Or lawyers or other
8 consultants. I mean, we're asserting all those
9 privileges.
10 MR. MUIR: Just so I can be sure where --
11 I've got a couple of follow-up questions, then, to be
12 sure exactly what you're instructing him not to answer.
13 Q. After a draft -- first draft is created, is
14 that draft then circulated to other people at Anchor to
15 -- to review and make comment on?
16 A. Yes.
17 Q. Is it circulated to people at Integral to
18 review and make comment on?
19 A. In some cases.
20 Q. Are reports submitted to people within MIMC
21 and IP for review and comment?
22 A. Yes.
23 Q. Are reports submitted to counsel for MIMC and
24 IP to review and comment on?
25 A. Yes.

1 Q. And is there someone in particular within
2 Anchor or Integral that circulates those documents for
3 comment?
4 A. It really varies by document. Now, I have no
5 idea what Integral does internally; but for us, it
6 varies internally.
7 Q. Okay. But -- but the documents are -- I've
8 seen a number of documents that have both the Anchor and
9 Integral name on them?
10 A. That's correct.
11 Q. If there -- if something is submitted to EPA
12 with the names of both of those companies on it, is it
13 safe to assume that Integral has gotten to see that
14 before it's submitted?
15 A. Yes.
16 Q. That it circulated to them?
17 A. Yes.
18 Q. Okay. And these -- the reports that are
19 submitted are submitted by your companies, these
20 consulting companies, on behalf of MIMC and
21 International Paper. Correct?
22 MR. BALLARD: Object to the form.
23 A. They're submitted in response to the
24 unilateral order.
25 Q. Well, the companies that are subject to the

1 unilateral order -- and there also was an agreed order
2 related to the TCRA, the Time Critical Removal Action.
3 Correct?
4 A. Yes.
5 Q. Okay. The companies that are -- that are
6 subject to or parties to those agreements are MIMC and
7 International Paper. Correct?
8 A. Yes.
9 Q. Okay. So to the extent something is being
10 submitted to EPA, you're doing that on behalf of the
11 people that -- that employ you to create those reports?
12 MR. BALLARD: Object to the form.
13 Q. Correct?
14 MR. WILKIN: Object to the form.
15 A. We submit those reports on behalf of our
16 clients and to fulfill the requirements of the statement
17 of work.
18 Q. Okay. Well, let me show you just -- this is
19 all I'm talking about here. This is the document called
20 Final Removal Action Work Plan. It was previously
21 Exhibit 4 to the Slowiak deposition. It says prepared
22 for U.S. Environmental Protection Agency, Region 6, on
23 behalf of McGinnes Industrial Maintenance Corporation
24 and International Paper Company. Correct?
25 A. Right.

1 Q. This particular one says it was prepared by
2 Anchor QEA. That's your company, Anchor?
3 A. That's right.
4 Q. Now, before submitting documents on behalf
5 of -- these reports we're taking about on behalf of MIMC
6 and International Paper, do you circulate and receive
7 comments back from all the various groups that we've
8 just talked about -- Integral, Waste -- or MIMC,
9 International Paper, and counsel for those parties?
10 Correct?
11 MR. BALLARD: Object to the form.
12 MR. STANFIELD: Objection. Form.
13 MR. WILKIN: Form.
14 A. We -- we get comments from a variety of people
15 and incorporate those comments as best we can.
16 Q. When you get comments back on reports that are
17 later submitted to the EPA, do you retain those
18 comments? Do you have, either electronically or in
19 paper form somewhere -- for instance, to the extent that
20 you received comments back from any of those parties on
21 this Final Removal Action Work Plan, would you have
22 retained those comments somewhere?
23 MR. RILEY: Objection to form.
24 A. Possibly.
25 Q. Within your company or within your work

1 personally, do you have a procedure or a policy with
2 regard to retaining comments that you receive, drafts of
3 work that is done?
4 A. Do we have a procedure or a policy? No.
5 Q. Okay. Do you personally have some procedure
6 that you follow with regard to keeping comments? For
7 instance, we talked to other people that have said once
8 a document is finalized, you know, I throw away all the
9 drafts and comments. Do you have a similar type
10 procedure that you use?
11 MR. BALLARD: Objection to form.
12 MR. WILKIN: Objection. Form.
13 A. I would say that I don't have a strict
14 procedure that I use. Generally, you know, I'm working
15 towards a final document.
16 Q. Okay. Was there any particular procedure that
17 you followed in the San Jacinto case, as far as
18 retaining drafts or comments that were received?
19 A. Not in particular.
20 Q. Have you been instructed by anyone in this
21 case not to retain drafts or comments that you've
22 received?
23 MR. WILKIN: I'll instruct the witness
24 not to answer that question.
25 Q. Is there any way that -- and again, let's just

1 use the Final Removal Action Work Plan. Is there a way
2 for you, if we sat down and went through that document,
3 to tell me who contributed which parts of any particular
4 report that were submitted in this collaborative effort?
5 MR. WILKIN: Objection. Form.
6 A. No.
7 Q. And whatever drafts or comments or things that
8 you have retained, to the extent you have, do you
9 believe that those would allow you to go back and kind
10 of re-create who contributed what parts to any given
11 report?
12 MR. RILEY: Object to form.
13 A. No.
14 Q. To the extent that you received comments on
15 reports that were going to the EPA from people outside
16 of your company, outside of Anchor, did you do anything
17 to look into those people's credentials or expertise in
18 providing those comments?
19 A. No.
20 MR. WILKIN: I'm going to instruct the
21 witness not to answer that.
22 THE WITNESS: Sorry.
23 MR. WILKIN: Give me a second in between
24 the questions, if you can.
25 Q. Are you familiar with the people at Integral

CAUSE NO. 2011-76724
Harris County, Texas, et al., Plaintiffs,) IN THE DISTRICT COURT OF
vs.) HARRIS COUNTY, TEXAS
International Paper Company, et al., Defendants.) 295TH JUDICIAL DISTRICT

CAUSE NO. 2012-58016
Dao Van Pho, et al., Plaintiffs,) IN THE DISTRICT COURT OF
vs.) HARRIS COUNTY, TEXAS
International Paper Company, et al., Defendants.) 125TH JUDICIAL DISTRICT

CAUSE NO. 2012-66308
Jim Harpster and Jennifer Harpster, et al., Plaintiffs,) IN THE DISTRICT COURT OF
vs.) HARRIS COUNTY, TEXAS
International Paper Company, et al., Defendants.) 11TH JUDICIAL DISTRICT

ORAL AND VIDEOTAPED DEPOSITION
JENNIFER SAMPSON WHITE
April 17, 2014
Volume 1 of 1

ORAL AND VIDEOTAPED DEPOSITION OF JENNIFER SAMPSON WHITE, produced as a witness at the instance of the Plaintiff Harris County, Texas, and duly sworn, was taken in the above-styled and numbered cause on April 17, 2014, from 9:36 a.m. to 5.33 p.m., before Jan Johnston, CSR in and for the State of Texas, reported by machine shorthand, at the offices of Morgan, Lewis & Bockius LLP, 1000 Louisiana Street, Suite 4000, Houston, Texas 77002, pursuant to the Texas Rules of Civil Procedure and the provisions stated on the record or attached hereto.

APPEARANCES

FOR PLAINTIFF HARRIS COUNTY, TEXAS:
Mr. Earnest W. Wotring
Connelly•Baker•Wotring L.L.P.
700 JPMorgan Chase Tower, 600 Travis Street
Houston, Texas 77002
Tel: (713) 980-1700 Fax: (713)980-1701
Ewotring@connellybaker.com

Time Used: 05.35:23

Ms. Debra Tsuchiyama Baker
Connelly•Baker•Wotring L.L.P.
700 JPMorgan Chase Tower, 600 Travis Street
Houston, Texas 77002
Tel: (713) 980-1700 Fax: (713)980-1701
Dbaker@connellybaker.com
Time Used: 00:00:00
Mr. Rock W.A. Owens
Office of Harris County Attorney, Vince Ryan
1019 Congress, Room 1547
Houston, Texas 77002
Tel: 713.755.5908 Fax: 713.755.8924
Rock.owens@cao.hctx.net

Time Used: 00:00:00

FOR DEFENDANT INTERNATIONAL PAPER COMPANY:
Mr. Craig A. Stanfield
Morgan, Lewis & Bockius LLP
1000 Louisiana Street, Suite 4000
Houston, Texas 77002
Tel: 713 890.5114 Fax: 713.890.5001
Cstanfield@morganlewis.com

Time Used: 00:00:00

FOR DEFENDANT WASTE MANAGEMENT, INC., AND WASTE MANAGEMENT OF TEXAS, INC.:

Mr. Glenn A. Ballard, Jr.
Bracewell & Giuliani
711 Louisiana, Suite 2300
Houston, Texas 77002
Tel: 713.221.1454 Fax: 713.222.3000
Glenn.ballard@bgllp.com
Time Used: 00:00:00
Mr. Christopher L. Dodson
Bracewell & Giuliani
711 Louisiana, Suite 2300
Houston, Texas 77002
Tel: 713.221.1454 Fax: 713.222.3000
Chris.dodson@bgllp.com

Time Used: 00:00:00

FOR DEFENDANT MCGINNES INDUSTRIAL MAINTENANCE CORPORATION:

Mr. Albert R. Axe, Jr.
Winstead PC
1100 JPMorgan Chase Tower
600 Travis Street
Houston, Texas 77002
Tel: 713.650.8400 Fax: 713.650.2400
Aaxe@winstead.com

Time Used: 00:00:00

VIDEOGRAPHER:
Mr. Steve Schuller
Legal Media Incorporated
1602 Washington Avenue
Houston, Texas 77007
Tel: (713) 861-4700
Fax: (713) 861-2951
Toll Free. (888) 318-6473
Www.legalmediainc.com.

Electronically signed by Jan Johnston (101-171-086-0494)
1377b47e-a809-43ce-82b6-e1f2aa2488c8

1 support a variety of different things. So that was my
2 role was to help others put those things together.
3 Q. You say that your project experience also
4 includes technical leadership of Natural Resource Damage
5 Assessments, or NRDAs. Have you done any of that work
6 on the San Jacinto River waste pits site?
7 A. No.
8 Q. Have you been asked to do any of that type of
9 work on the site?
10 A. No.
11 Q. Okay. Moving on to Page 2 of Exhibit No. 1,
12 you state that "The site is a closed facility for
13 storage of bleached kraft pulp mill waste deposited in
14 this estuarine marsh environment." Have I said that
15 right? Estuarine? E-S-T-U --
16 MR. BALLARD: Estuary.
17 MR. WOTRING: It's got I-N-E.
18 Q. (BY MR. WOTRING) Anyway, it's spelled
19 E-S-T-U-A-R-I-N-E. What is that?
20 MR. STANFIELD: I think the first question
21 on the table is how do you pronounce the word.
22 A. EST-ur-een.
23 Q. (BY MR. WOTRING) Yeah, I'm not sure I'm going
24 to get that right. What does it mean?
25 A. It's descriptive of an estuary.

1 Q. And what is an estuary?
2 A. An estuary is an environment in which
3 freshwater from a river mixes with marine water from the
4 ocean.
5 Q. And is that where the pits in the northern
6 impoundment are located?
7 A. They are located in an estuary.
8 Q. Actually, you say they are located in an
9 estuarine marsh environment.
10 A. That would be another way of saying it.
11 Q. Okay. And you also state in your Exhibit No. 1
12 that "The wastes are contaminated with dioxins and
13 furans," correct?
14 A. That is correct.
15 Q. And that "The environmental setting," I assume
16 does the environmental setting mean for the waste?
17 MR. STANFIELD: Objection, form.
18 A. I'm sorry, could you please repeat your
19 question?
20 Q. (BY MR. WOTRING) Uh-huh (affirmative). The
21 next line there says, "The environmental setting." Is
22 the environmental setting, is that phrase referring to
23 where the waste is deposited?
24 MR. STANFIELD: Objection, form.
25 A. That terminology is, I think it tended to be

1 more broad than a specific location. It's an
2 environmental setting, or a broad area.
3 Q. (BY MR. WOTRING) Okay. The next sentence says
4 you develop and execute technical strategies in
5 consultation with clients, correct?
6 A. Yes.
7 Q. What was the technical strategy that you were
8 developing and executing in consultation with the
9 clients for the San Jacinto River waste pits?
10 A. Responding to and working with EPA on
11 conducting the RI/FS.
12 Q. And you did that in consultation with the
13 clients.
14 A. Yes.
15 Q. And you're aware that your clients have claimed
16 privilege with your communications about the RI/FS?
17 MR. STANFIELD: Objection, form.
18 Q. (BY MR. WOTRING) Do you know that or not know?
19 A. I honestly don't understand the question.
20 Q. Okay. Tell me your first communication with
21 anybody at International Paper about the San Jacinto
22 River waste pits site.
23 MR. STANFIELD: Objection, form. Jan,
24 would you read the question back?
25 (The record was read as requested.).

1 A. I don't understand the question.
2 Q. (BY MR. WOTRING) I assume at some point you
3 found out there was something called the San Jacinto
4 River waste pits site, correct?
5 A. Yes.
6 Q. Okay. Approximately what time did you, or what
7 year did you find out that there was something called
8 the San Jacinto River waste pits site?
9 A. 2009.
10 Q. And how did you learn about the site?
11 A. I looked on the internet.
12 Q. And what prompted you to look on the internet
13 about the site?
14 A. Conversations with International Paper.
15 Q. Okay. And who did you speak with at
16 International Paper about the site?
17 MR. STANFIELD: Objection, form. You can
18 give the name, but no details about it.
19 A. Phil Slowiak.
20 Q. (BY MR. WOTRING) And tell me what you talked
21 about with Mr. Slowiak about the site.
22 MR. STANFIELD: Objection, form. I'm
23 going to instruct the witness not to answer and assert
24 privilege.
25 Q. (BY MR. WOTRING) Okay. And that's going to be

Electronically signed by Jan Johnston (101-171-086-0494) 1377b47e-a809-43ce-82b6-e1f2aa2488c8

one of those things you're going to follow his advice on?

A. Yes, sir.

MR. WOTRING: If I ask her any questions about the communications that she had with Mr. Slowiak or anybody else at International Paper about the site, are you going to assert the privilege?

MR. STANFIELD: Yes.

MR. WOTRING: And we'll note for the record my disagreement and then move on to other issues.

Q. (BY MR. WOTRING) Did you ever speak with anybody at Waste Management about the San Jacinto River waste pits?

MR. DODSON: Objection, form.

A. No.

Q. (BY MR. WOTRING) Did you ever speak with anybody that you understood worked for a company called McGinnes Industrial Maintenance Corporation about the pits?

A. Yes.

Q. And who did you speak with about the pits at, for somebody -- let me start that all over. Who at MIMC did you speak with about the San Jacinto River waste pits site?

A. March Smith.

Q. And what kind of commun -- What did you talk about with Mr. Smith about the pits?

MR. DODSON: Instruct the witness not to answer.

Q. (BY MR. WOTRING) And likewise, you're going to follow the instruction from Mr. Dodson not to answer questions about your communications with Mr. Smith about the pits?

A. Yes, sir.

MR. WOTRING: And if I ask her further communications about that she had with anybody at MIMC about the site, are you going to instruct her not to answer?

MR. DODSON: If you ask about the substance of the communications, yes.

MR. WOTRING: I will note my disagreement with that as well.

Q. (BY MR. WOTRING) When did you first start communications with Anchor about the site?

A. November or December of 2009.

Q. You state then, I'm going back to Page 2 of Exhibit No. 1 that you develop and execute technical strategies in consultation with clients, and coordinates and directs Integral's multidisciplinary technical team, and then the rest of the sentence is what the rest of

the sentence is.

What did you mean when you said coordinate and direct Integral's multidisciplinary team in that context?

A. Well, as you probably know, Integral and Anchor QEA presented about 50 documents in three years. The manager coordinates the activities within their company. And in my case, I directed and coordinated the activities within Integral that were necessary to produce that information. And I also interacted with Anchor QEA and facilitated communication between Integral and Anchor QEA folks as needed to conduct all that work in such a short time.

Q. Okay. And I think that you may have used a term that will be useful. Are things like the Baseline Human Health and Risk Assessment, are those documents that go into the RI/FS or lead up to the RI/FS as opposed to a report?

A. The risk assessments are part of the remedial investigation.

Q. Okay.

A. When you say RI/FS, I think of a process.

Q. I see. What do you think of the end result report? A report?

A. Excuse me?

Q. What do you call the giant document that comes out of the RI/FS process? A report?

A. After conducting the risk assessments and other studies and reporting on those --

Q. Yes.

A. -- efforts, we generate a remedial investigation report.

Q. And we'll have to do some remedial Superfund with me because I'm not sure I understand it.

Basically what you're doing is going out and conducting investigation into the San Jacinto River waste pits site to come up with alternatives about how in the Superfund process they should be cleaned up and remediated, if at all, correct?

MR. STANFIELD: Objection, form.

A. That's a broad description of the process.

Q. (BY MR. WOTRING) Is it a generally accurate broad description of the process?

MR. STANFIELD: Objection, form.

A. It sounded generally accurate when you said it.

Q. (BY MR. WOTRING) Okay. What you're not supposed to be doing as a coordinator or a project manager in your position, you're not supposed to have an idea about what alternatives that you want to have for cleanup and remediation, and then work towards that

Electronically signed by Jan Johnston (101-171-086-0494) 1377b47e-a809-43ce-82b6-e1f2aa2488c8

1 through all of your investigation and analysis, are you?
2 MR. STANFIELD: Objection, form.
3 Q. (BY MR. WOTRING) Do you want me to try that
4 again?
5 A. Please repeat the question.
6 Q. Okay. When you're working as a project
7 manager, or an even better question is when Integral and
8 the people at Integral are working on the site in this
9 context, in the context you're describing on Page 2 of
10 Exhibit No. 1, they are supposed to be objective,
11 correct?
12 A. Yes.
13 Q. Do you view yourselves as being advocates for
14 the client's position when you --
15 A. No.
16 Q. All right.
17 MR. STANFIELD: Objection, form. And
18 you're only speaking for Jennifer Sampson, of course.
19 But you can answer his question.
20 Q. (BY MR. WOTRING) Does Jennifer Sampson, as the
21 project manager for Integral, working on the San Jacinto
22 River waste pits site as described on Page 2 of Exhibit
23 No. 1 to your deposition, do you view yourself as an
24 advocate for International Paper or MIMC's positions
25 with regard to the work you're doing?

1 A. I do not.
2 Q. Okay. And do you view that the documents and
3 other reports you're submitting to the EPA should be
4 based upon your objective view of the evidence and data
5 that you're collecting?
6 A. Yes, there is interpretation of the data.
7 Q. Okay. In interpreting the data that you're
8 collecting, do you believe that it is your role to be an
9 objective interpreter of that data?
10 A. Yes.
11 Q. And if you were, as project manager for
12 Integral on the pits, and for the work described on
13 Page 2 of Exhibit No. 1 to your deposition, if you were
14 attempting to skew the science or the data or interpret
15 the data in some form or fashion to advocate your
16 client's position, would that be consistent with your
17 understanding of what you're supposed to doing as a
18 project manager?
19 MR. STANFIELD: Objection, form.
20 Hypothetical.
21 MR. DODSON: An objection for one is good
22 for all, Earnest?
23 MR. WOTRING: It is. It is.
24 A. I'd like to not answer that question.
25 Q. (BY MR. WOTRING) You are declining to answer

1 that question.
2 A. As it was phrased, I didn't understand it.
3 Q. Okay. Is it you don't want to answer it or you
4 don't understand it?
5 A. I don't understand it.
6 Q. All right. Well, we'll try that again. The
7 question is, for your role as a project manager, and I'm
8 going to, as a definition -- let's try this. When I say
9 for your role as a project manager, I am referring to
10 the paragraph that you have in your Exhibit No. 1 on
11 Page 2.
12 In your role as a project manager for the
13 site that we're here about today, do you view it as your
14 role to be an objective interpreter of the data that
15 you're collecting, or do you view that it is your role
16 to be an advocate on behalf of your client, which in
17 this case, I think, is International Paper?
18 MR. STANFIELD: Objection, form.
19 A. Part of my role is to interpret the data, and I
20 do so objectively. I have other roles as project
21 manager.
22 Q. (BY MR. WOTRING) I see. And those other roles
23 that don't involve interpreting the data objectively, do
24 they involve advocating your client's position to the
25 EPA?

1 MR. STANFIELD: Objection, form.
2 A. My other roles include, as we discussed
3 earlier, this coordination and communication roles
4 described here in my resume on Exhibit 1 on Page 2. My
5 other roles also include a process of communication and
6 collaboration with EPA to get the project completed.
7 Q. (BY MR. WOTRING) And when you're communicating
8 and coordinating with the EPA, do you view it as your
9 role as the project manner to advocate your client's
10 position?
11 MR. STANFIELD: Objection, form.
12 A. Could you please define "advocate"?
13 Q. (BY MR. WOTRING) Well, let's try execute.
14 Let's look at Page 2 on Exhibit No. 1. You describe in
15 your professional profile that you develop and execute
16 the technical strategies in consultation with the
17 clients for your work on the San Jacinto River waste
18 pits site. When you communicate with the EPA about your
19 work on this site, are you executing your client's
20 strategies?
21 MR. DODSON: Objection, form.
22 A. Technical strategies are developed to ensure
23 that the maximum information can be developed under the
24 timelines available and in collaboration with the EPA.
25 And in conversations with EPA, it was quite typical in

Electronically signed by Jan Johnston (101-171-086-0494)
1377b47e-a809-43ce-82b6-e1f2aa2488c8

1 this process for Integral and Anchor QEA to come to the
2 meeting with a specific proposal.
3 To the extent that Integral and Anchor QEA
4 on behalf of MIMC and International Paper initiated a
5 technical discussion with EPA, for example a study
6 design or an analysis plan, by advancing that proposal,
7 that perhaps could be considered advocating a technical
8 strategy.
9 Q. (BY MR. WOTRING) Okay. And those proposals
10 that you created that you were advancing to the EPA,
11 were those technical proposals created in consultation
12 with your clients?
13 MR. STANFIELD: Objection, form. I'm on
14 the verge of instructing you not to answer. If you can
15 understand the question and give a specific answer to
16 it, though, I'll allow you to give a yes or no answer.
17 MR. DODSON: Let's have it read back,
18 please.
19 MR. WOTRING: It's been an hour. Let's
20 take a break. I want to check with Mary, unless anybody
21 is going to object.
22 THE VIDEOGRAPHER: It's now 10:32. We're
23 off the record.
24 (Recess from 10:32 to 10:45)
25 THE VIDEOGRAPHER: It's now 10:45. We're

1 back on the record.
2 (The record was read as requested.)
3 MR. STANFIELD: Objection, form.
4 A. Yes.
5 Q. (BY MR. WOTRING) Okay. And will you tell me
6 what your client's input was into those technical
7 requirements?
8 MR. STANFIELD: Objection, form. I'll
9 instruct you not to answer.
10 Q. (BY MR. WOTRING) The clients in this context
11 on Page 2 of Exhibit No. 1, when you say clients, does
12 that refer to International Paper?
13 A. International Paper and MIMC.
14 Q. You view them both as your clients.
15 A. Yes.
16 Q. Correct me if I'm wrong, but I didn't see in
17 any other site listed in your relevant experience to
18 this document where you discussed doing Human Health
19 Risk Assessments.
20 A. That's right.
21 Q. Okay. And if you'd look on Page 4 of Exhibit
22 No. 1, you describe what the term project management
23 means? Do you see the paragraph I'm looking at?
24 A. Yes.
25 Q. And is that, are those the types of job duties

1 and responsibilities as project manager that you're
2 handling on the San Jacinto River waste pits site?
3 MR. STANFIELD: Objection, form.
4 A. I would like to take a minute to read it.
5 Q. (BY MR. WOTRING) Certainly.
6 A. Could you please repeat the question?
7 Q. Yeah, the question is the description of
8 project management on Page 4 of Exhibit No. 1 to your
9 deposition, does that contain the types of duties and
10 responsibilities you're handling as project manager on
11 the site?
12 MR. STANFIELD: Objection, form.
13 A. As we discussed, there's no NRDA I'm currently
14 working on for this site.
15 Q. (BY MR. WOTRING) Okay. With that exclusion,
16 is there -- do the rest of the duties and
17 responsibilities you're describing on this paragraph
18 following "Project Management" describe the duties and
19 responsibilities you're handling on the site?
20 A. Yes.
21 Q. The publications that you have, you have a --
22 the first one there at the bottom of Page 4, you did
23 a -- is that a paper?
24 A. A presentation.
25 Q. It's a presentation? And what generally was

1 the conclusion of that presentation?
2 MR. STANFIELD: Objection, form.
3 A. I would have to see it to speak specifically
4 about that.
5 Q. (BY MR. WOTRING) The title of that
6 presentation was "Limits to predicting bioaccumulation
7 of polychlorinated dibenzo-p-dioxins and dibenzofurans
8 in fish and crab tissue"?
9 A. Yes.
10 Q. Did I say that correctly?
11 A. You read it correctly.
12 Q. Do you still have a copy of that presentation?
13 A. I may.
14 Q. And Nielsen is the same Nielsen who also worked
15 on the site?
16 A. That's right.
17 Q. Do you remember what limits there were to
18 predicting the bioaccumulation of the polychlorinated
19 dibenzo-p-dioxins and dibenzofurans in fish and crab
20 tissue?
21 MR. STANFIELD: Objection, form.
22 A. I would have to review the presentation to
23 answer that.
24 Q. (BY MR. WOTRING) As you sit here today, you
25 don't have a memory of that?

Electronically signed by Jan Johnston (101-171-086-0494)
1377b47e-a809-43ce-82b6-e1f2aa2488c8

1 MR. STANFIELD: Objection, form.
2 A. I neither agree nor disagree. I don't have any
3 way to verify these statements either way.
4 Q. (BY MR. WOTRING) Were the statements contained
5 in Paragraph No. 7 that we reviewed, Paragraph 10 that
6 we reviewed, and Paragraph 11 that we reviewed, were
7 those statements important to you in your work as the
8 project manager for Integral on the site?
9 MR. STANFIELD: Objection, form.
10 A. Those particular statements were not important
11 to me.
12 Q. (BY MR. WOTRING) How about moving down -- and
13 if you would look at Paragraphs 12, 13, 14, and 15, and
14 take a minute to review those, I will ask you the same
15 question about whether you agree or disagree.
16 A. Okay, I've reviewed Paragraphs 13 through 16.
17 Could you please repeat your question?
18 Q. Yes. Let me -- I think my question was, but if
19 it wasn't, I want to make it Paragraphs 12 through 15.
20 A. Sorry.
21 Q. That's all right. And on Paragraphs 12 through
22 15, my question is do you have an opinion about whether
23 those are true and accurate statements?
24 MR. STANFIELD: Objection, form.
25 A. I do not have an opinion on these statements.

1 Q. (BY MR. WOTRING) Okay. And then Paragraph 16
2 says, "Currently, the Tract is inactive and
3 approximately half the Tract's surface area, including
4 the abandoned waste pit --" I'm sorry. Let me try that
5 again.
6 Paragraph 16 says, "Currently, the Tract
7 is inactive and approximately half of the Tract's
8 surface area, including the abandoned waste disposal
9 ponds, is now submerged below the adjacent San Jacinto
10 River's water's surface." And the same question, do you
11 agree or disagree with that statement?
12 MR. STANFIELD: Objection, form.
13 A. I neither agree nor disagree with the
14 statement.
15 Q. (BY MR. WOTRING) Do you believe that the
16 statement contained in Paragraph No. 16 was significant
17 for the work that Integral was asked to do on the site?
18 A. The statement was not significant.
19 Q. So whether or not the waste disposal ponds were
20 submerged below the adjacent San Jacinto River's water's
21 surface was not significant to Integral in, let's say,
22 the November/December time period when it first became
23 aware of the site.
24 MR. STANFIELD: Objection, form. You are
25 Jennifer Sampson and you can only answer for yourself.

1 A. The statement was not significant for me at
2 that time.
3 Q. (BY MR. WOTRING) Did it ever become a
4 statement that was significant to you as the project
5 manager for Integral in your work on the site?
6 MR. STANFIELD: Objection, form.
7 A. The statement is not significant to me and was
8 not significant to me at that time.
9 Q. (BY MR. WOTRING) Okay. Did there ever become
10 a time when, as the project manager for Integral, it was
11 significant to you in carrying out those job duties and
12 responsibilities that you learned or formed an opinion
13 on the matters contained in Paragraph 16?
14 MR. STANFIELD: Objection, form.
15 A. No.
16 Q. (BY MR. WOTRING) If you would move over to
17 Paragraph 19 and look at Paragraph 19 and let me know
18 when you're done. I have a question about one of the
19 sentences in that one.
20 A. I've finished reading Paragraph 19.
21 Q. Okay. Let me direct your attention to the
22 sentence that says, "The data collected indicated the
23 continued presence of dioxin contamination in the
24 San Jacinto River surrounding the Tract." Do you see
25 where I'm reading from?

1 A. Uh-huh (affirmative).
2 Q. That would be one where you need to say yes or
3 no.
4 A. Oh, yes, I see it.
5 Q. That's the uh-huh, huh-uh portion of every
6 deposition, I can say.
7 Okay. Do you agree or disagree or have an
8 opinion at all on that sentence contained in
9 Paragraph 19?
10 MR. STANFIELD: Objection, form.
11 A. No, I don't.
12 Q. (BY MR. WOTRING) I asked a very poor question
13 there. Do you have an opinion about whether that
14 sentence is correct?
15 A. I do not have an opinion about it.
16 Q. Okay. And you don't believe that the
17 information in that sentence was significant to your
18 work as the project manager for Integral on the site?
19 A. That's correct.
20 Q. Moving over to Paragraph No. 19 -- well, let me
21 go to Paragraph No. 20, and let me know when you have
22 had a chance to review that one. I'm going to be asking
23 you a question about the sentence that says the TPWD
24 submitted a 1982 topographical map.
25 A. I've finished reading Paragraph 20.

Electronically signed by Jan Johnston (101-171-086-0494) 1377b47e-a809-43ce-82b6-e1f2aa2488c8

A. That's correct.
Q. Let's turn to the next paragraph and let me explore that issue with you a little bit more. The next paragraph starts out with "USEPA (1988b) and NCASI (1999) confirm that dioxins and furans were generated historically by bleached kraft pulp mills." Okay, do you see that sentence?
A. I do.
Q. Now, do you agree with that sentence?
MR. STANFIELD: Objection, form.
A. I would have to see the citations to make a determination about what they say and whether I agree with this sentence.
Q. (BY MR. WOTRING) Okay. So the fact that it's in the report in this way doesn't necessarily mean that you as the project manager agree with it.
A. That's correct.
Q. And is that because it could have come from different places?
A. Yes, that's partly the reason.
Q. Okay. For example, if -- did you draft portions of this document, Exhibit --
A. I did.
Q. All right. And if I knew which portions you drafted, would I be safe in assuming that you agreed

with those portions?
MR. STANFIELD: Objection, form.
A. That sounds like a hypothetical question. I can't answer without speculating.
Q. (BY MR. WOTRING) Okay. So the question of whether if you drafted a portion of Exhibit No. 389, the Sampling and Analysis Plan and Sediment Study, you would agree with those portions you drafted, that's a hypothetical that you don't feel comfortable answering.
A. Yes.
Q. Section 1.5.2 down at the bottom of the page, I want to ask you about that last sentence. It says that "Dioxins and furans were detected in all samples from the impoundments."
A. The last sentence, I see it.
Q. Do you see that? Now, do you agree with that sentence?
A. I need to read it for a moment to see what samples are being referenced in this sentence.
Q. Okay.
A. This is similar to your last question. I would need to look at this reference to determine whether I could agree or disagree with this sentence.
Q. So if I can turn your attention to the first page of Exhibit No. 389 again, it has prepared by

Integral Consulting and Anchor QEA, LLC, correct?
A. Yes.
Q. And "prepared by" in this context doesn't mean agreed to, or does it?
A. That's correct, it does not mean that.
Q. I asked a poor question on that. Just because Exhibit No. 389 reflects that it was prepared by Integral Consulting and Anchor QEA does not mean that Integral Consulting agrees with or adopts all the statements contained in Exhibit No. 389.
A. That is correct.
Q. And that's because, if I'm understanding what you told me earlier, it's a collaborative process, and this document reflects the comments of many different people.
A. That's right.
Q. So to determine whether any statement contained in a document like Exhibit No. 389 is a statement that Integral Consulting agrees with, I would need to sit down with somebody from Integral and review that statement and get their opinion on it.
A. It depends on the statement. The statement you were just asking me about references a certain document.
Q. Okay. So some statements you might be able to agree to just because you know what they are, and some

statements you might not be able to.
A. It depends, that's right.
Q. And generally, what kind of statements do you think you could agree to in Exhibit No. 389, or is there any way of describing without going through each one?
MR. STANFIELD: Objection, form.
A. I think you'd have to identify a specific statement and then I could address your question.
Q. (BY MR. WOTRING) Well, for example, let me ask you about something like Exhibit -- or Section 1.2.
I think it's fair to say that there is a similar statement like Exhibit No. 1.2 in a number of the studies or other documents that I have reviewed created by Anchor, "prepared by" I guess is the term, Anchor and Integral. Do you think that's a fair generalization?
MR. DODSON: Objection, form.
A. If I understood you correctly, you were speaking of your own experience and I can't speak to that.
Q. (BY MR. WOTRING) Do you know if there's a similar statement to the Paragraph 1.2 in other documents, studies, and reports prepared by Anchor and Integral?
MR. DODSON: Objection, form.

Electronically signed by Jan Johnston (101-171-086-0494) 1377b47e-a809-43ce-82b6-e1f2aa2488c8

A. Uh-huh (affirmative).
Q. It says, "Overall, there was a decrease in dioxin and furan concentrations consistent across all congeners, as evidenced by the comparison of the SWAC values for each congener for the 2005 and 2010 surface sediment data," right?
A. That's what this statement says, yes.
Q. And the next statement says, "Concentrations of the various congeners decreased by a factor of 2 to 10 between 2005 and 2010," correct?
A. That's what the statement says, yes.
Q. Do you agree with those two sentences?
A. I would need to examine Table 3.
Q. Do you have it in front of you?
A. I do. I agree with the first sentence. As for calculating a factor of 2 to 10 for each of those comparisons, I'm not able to do that with the tools I have at hand.
Q. Okay. And to be clear, the fact that the sentence stating, "Concentrations of the various congeners decreased by a factor of 2 to 10 between 2005 and 2010," the fact that sentence is contained in this report, which lists Integral is preparing it, does not mean that you necessarily agree with that statement, correct?

A. I don't understand the question.
Q. The fact that the sentence that we're looking at is contained in a report that says it was prepared by Integral does not mean that you, as the project manager for Integral, necessarily agree with the sentence.
A. The fact of a sentence being present in an Integral report does not mean that I agree with it?
Q. That's the question, specifically for this sentence.
MR. STANFIELD: Objection, form.
A. I don't understand the question.
Q. (BY MR. WOTRING) Just because a sentence is contained in a report that Integral prepared doesn't mean that you as the project manager agree with that sentence. We'd have to know more, right?
A. We would. However, I just independently verified the statement by reviewing Table 3, and I agree with the sentence.
Q. And then if you look at the bottom of that paragraph, it says, "All congeners and their total show lower values for 2010 than for 2005 across the entire range of concentrations." That sentence is in this report, correct?
A. Yes.
Q. Now, do you agree with that sentence?

A. Insofar as that sentence refers to Table 3, yes.
Q. And were you or anybody at -- anybody, as far as you're aware, able to determine when the change in conditions took place that we talked about earlier between 2005 and 2010?
MR. STANFIELD: Objection, form.
A. We did not pursue that question. We did not analyze that question.
Q. (BY MR. WOTRING) And why didn't you analyze that question? Because the historic cause of a change in sediment concentrations of dioxin was not necessary for your work on the site?
MR. STANFIELD: Objection, form.
A. The task being executed in this section pertains to selection of the baseline dataset for the purposes of the RI. We didn't expand the range of questions beyond that question in this analysis.
Q. (BY MR. WOTRING) Well, let me ask you this. For example, did Integral or Anchor, as far as you know, examine whether there had been a significant storm event that took place in or around the site that could have caused the change in conditions?
A. I do not know of any such examination.
Q. And so -- all right. If you would have used

the data prior to 2005 in the unmixing analysis, would you have expected the results to be different than the results that you achieved?
MR. DODSON: Objection, form.
MR. STANFIELD: Objection, form.
A. That's a hypothetical question, and I would not like to speculate.
Q. (BY MR. WOTRING) Okay. So knowing that the 2005 data reflected concentrations of the various congeners decreased -- dioxin congeners decreasing by a factor of 2 to 10 between 2005 and 2010, knowing that fact and the other facts contained in Section 3.2, "Results and Discussions," you can't formulate an answer on whether the results of your unmixing analysis would have been different if that data had been included?
MR. STANFIELD: Objection, form.
A. Although that is hypothetical, I would speculate that it wouldn't change the results of the unmixing.
Q. (BY MR. WOTRING) And why would you suspect that?
A. The data that were collected 2005 and prior don't differ substantially from the data that were collected in 2010 and later, to my knowledge. They reflect similar conditions.

Electronically signed by Jan Johnston (101-171-086-0494) 1377b47e-a809-43ce-82b6-e1f2aa2488c8

HOUSTON CHRONICLE
FOUNDED 1901 • A HEARST NEWSPAPER

JOHN T. O'LOUGHLIN, *President*
PAUL BARRETTA, *Executive VP and COO*
JACK SWEENEY, *Chairman*

NANCY C. BARNES
Executive VP / Editor
VERNON F. LOEB
Managing Editor

JEFF COHEN
Executive VP / Executive Editor
Editorial pages
VERONICA FLORES-PANIAGUA
Outlook Editor

JOHN PERDIGAO
Chief Financial Officer
WARREN KAY
Chief Revenue Officer

Solution now

The San Jacinto Waste Pits were named as a Superfund site for a good reason.

A July 4, 1837, advertisement for a settlement along the banks of the San Jacinto River praises a "high, beautiful and undulating district of country, distinguished for health, good water and soil." Almost two centuries have passed since that ad. With the growth in population, Texans should expect our rivers to be used for such activities as recreation, fishing and transportation. We should not expect our rivers to be poisoned.

In the mid-1960s, Champion Paper (now merged with International Paper) contracted with a company (now owned by the Waste Management family of companies) to dispose of toxic waste from a paper mill. As Chronicle editorial cartoonist Nick Anderson explained in his two-part series, "The San Jacinto River: In Peril" (Page B12, June 8 and Page B12, June 15) someone had a terrible idea and stored the waste, contaminated with dioxin, in three shallow pits adjacent to the San Jacinto River.

Fast forward: In 2008, the San Jacinto Waste Pits were placed on the National Priorities List of Superfund Sites due to the high level of dioxin contamination detected nearby.

According to the U.S. Environmental Protection Agency, studies have shown that exposure to dioxins at high enough levels may cause a number of adverse health effects, including cancer. Harris County and, separately, a group of fishermen in Galveston County have filed suit against the originating companies and their successors. "Dioxin has already spread to Galveston Bay. It's pervasive. It's everywhere," according to Special Assistant Harris Country Attorney Terry O'Rourke.

In 2011, a temporary cap was installed on the waste pits using U.S. Army Corps of Engineer and EPA standards. This "armored cap" has three layers of protective geotextile and geomembrane and is covered by 59,000 tons of stone. The EPA, in a fact sheet recently distributed to neighborhood groups, states that wastes are not leaking from the cap and that the cap is intact and stable.

The EPA is evaluating a final cleanup plan, which includes remedial alternatives such as treating or removing the waste and contaminated sediment or enhancing the effectiveness and reliability of the cap. Each of the alternatives proposed presents potential risks. The agency expects to announce its decision as to the long-term solution this summer. We favor the most enduring solution that science offers.

The San Jacinto waste site is an extremely vulnerable site. The San Jacinto River opens up into Galveston Bay, a heavily fished region. The waste site is now partially submerged due to subsidence and erosion. Our area, as we all know, is prone to hurricanes and heavy flooding. The neighborhoods around the sites are growing. Some Superfund sites that are capped are restricted in use. You cannot effectively restrict the use of a river.

Common sense tells us that moving water poses a threat to any cap no matter how well-constructed. Indeed, in 2012, a relatively minor storm resulted in a loss of some armor. The cap was subsequently upgraded.

It would be a disaster if the cap were damaged and the dioxins contained at the site were released. Engineers build bridges that will last for a century. That's not good enough.

Native Americans and other early Texans settled along the state's life-giving rivers and bays. The rivers were here before they arrived, and they'll continue flowing long after those living today depart.

Executive Summary of *A Flood Risk Assessment of the San Jacinto River Waste Pit Superfund Site*

SAMUEL D. BRODY, PHD
WITH: RUSSELL BLESSING, KAYODE ATOBA, WILL MOBLEY, MORGAN WILSON
June 2014

The San Jacinto River Waste Pits site, located in Channelview, Texas, consists of a series of impoundments (pits) that were constructed on the west bank of the San Jacinto River near the Interstate-10 Bridge between October 8, 1964 and February 15, 1973. Paper mill wastes containing polychlorinated dibenzodioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) were dispensed into these pits during the 1960s and 1970s. Since their construction, groundwater extraction, dredging, sand mining, river currents, and surge have eroded the containment berm, which has allowed a portion of the impoundments to be submerged under water (Anchor, 2013). No studies have explicitly examined the exposure of these waste pits to riverine and surge-based flood events, which are likely the primary driver of the deterioration and subsequent release of pollutants from the superfund site. Existing reports only superficially address the flood risk associated with the site and do not consider the impact of previous events, changing risk conditions, or potential wave action from storm surge. Moreover, a thorough socioeconomic profile and consideration of future growth is absent (Anchor QEA, LLC., 2013)

This report addresses this lack of research by examining three major issues associated with the superfund site: (1) the physical and environmental context; (2) the socio-economic context; and (3) the level of flood risk. The major findings of the risk assessment include the following:

- The waste pits are extremely vulnerable to repeated inundation from hurricane storm surge, storm-induced velocity wave action, and high volume river flows from rainfall events.
- The waste pits are surrounded by high and very high levels of socially-vulnerable populations. Of particular concern is the above average number of children under five years of age living in close proximity to the site.
- Residences surrounding the waste pits have already been inundated by flood waters stemming from the waste pit site. Future development patterns will increase the risk of homes being flooded with potentially contaminated water.
- The threat of human exposure when the waste site was constructed during the 1960's was much lower than it is today. Historical development has significantly increased the amount of people that live within a few miles of the site and this trend is projected to continue well into the future.

More serious attention needs to be given to the local socioeconomic and built environment characteristics of this hazardous site. The threat of future surge and riverine flood events coupled with a changing climate and increasing development all have a ratcheting effect on the amount of impact this superfund site could inflict on surrounding communities. As risk of failure increases so too does the risk of exposure from flood-induced water vectors. Bioaccumulation is already occurring, exposing local fisherman and residents to harmful chemicals consumed by the fish and crab. Sediment contaminated with dioxins could potentially be scoured from the site and transported into neighboring residential areas, school, wastewater management facilities, and a reservoir that provides drinking water. That said, the installation of the temporary geomembrane by the EPA is a first attempt to prevent leaking and exposure, but this is likely the first of many repairs that are likely to occur due the vulnerable location of this site.

The findings of this flood risk assessment clearly indicate that the waste pits should be fully removed as outlined by Alternative 6 in the Feasibility Study conducted for CIMC and International Paper, Inc. (Anchor QEU, 2013). The site is in an extremely vulnerable location susceptible to repeated inundation, which will only increase in the future. There is insufficient evidence that any proposed on-site remediation alternative can effectively stabilize the pits over the long term and prevent the leakage of contaminants to surrounding areas. The information contained in the full report provides a more complete understanding of the flood risks associated with the site and can offer guidance to decision makers as they contemplate future mitigation actions.

2014

A Flood Risk Assessment of the San Jacinto River Waste Pit Superfund Site

CENTER FOR TEXAS BEACHES AND SHORES – TEXAS A&M UNIVERSITY GALVESTON

WITH: SAMUEL D. BRODY, PHD

RUSSELL BLESSING, KAYODE ATOBA, WILL MOBLEY, MORGAN WILSON

CONTENTS

FIGURES 2
INTRODUCTION 3
Purpose of the Study 3
BACKGROUND 4
Dioxins 0
STUDY AREA 1
FLOOD RISK ASSESSMENT 3
Physical Risk 4
Socio-Economic Risk 5
Flood Impacts 12
CONCLUSION 18
WORKS CITED 20
APPENDIX 24
A. Social Vulnerability Index Variable Maps 24
B. Flood Impact Analyses 29

FIGURES

Figure 1. Timeline of Events. 0
Figure 2. Large-Scale Study Area 1
Figure 3. Study Area for Flood Risk Assessment. 2
Figure 4. Small-Scale Study Area. 3
Figure 5. Historical Imagery Illustrating Erosion of the Waste Pit Site. 5
Figure 6. New Development from 1996 to 2011. 7
Figure 7. 2014 Land Use (HGAC, 2013) 8
Figure 8. Projected 2040 Land Use (HGAC, 2013) 9
Figure 9. Social Vulnerability Index. 11
Figure 10. Percentage of Population Below 5 Years of Age by Block Group. 12
Figure 11. Surge Inundation Zones Produced by NOAA Models. 14
Figure 12. Insured Losses from Hurricane Ike by Census Block Group. 15
Figure 13. Surge Inundation for Hurricane Ike (using SLOSH) and a Category 5 Hurricane (using NOAA). 16
Figure 14. Number of Residential Parcels Inundated by Hurricane Ike and Category 5 scenarios. 17
Figure 15. Insured Losses for Freshwater Flooding, 1999-2009. 18

INTRODUCTION

The San Jacinto River Waste Pits site, located in Channelview, Texas, consists of a series of impoundments (pits) that were constructed on the west bank of the San Jacinto River near the Interstate-10 Bridge between October 8, 1964 and February 15, 1973. Paper mill wastes containing polychlorinated dibenzodioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) were dispensed into these pits during the 1960s and 1970s. Since their construction, groundwater extraction, dredging, sand mining, and river currents and surge have eroded the containment berm, which has allowed a portion of the impoundments to be submerged under water (Anchor, 2013).

Recent studies have indicated that high-flow events (e.g. hurricanes and tropical storms) have undermined the ability of the waste pits to retain their chemicals and may have transported dioxin-contaminated sediments into the surrounded areas along the Houston Ship Channel and the Galveston Bay (Bedient, 2013; Integral and Anchor, 2013). Although it is uncertain how much of these dioxins are leaking into the river, studies have corroborated the idea that the chemicals are leaching from the pits (Rifai, 2006). Rifai (2006) found elevated levels of dioxins in fish and crabs near the site as a result of bioaccumulation. Before Rifai's study the Texas Department of State Health Services issued a public notice in 1990 urging consumers to limit their consumption of fish caught from the San Jacinto River. In a broader context, the San Jacinto does not meet the health standards for several toxic chemicals and is nationally recognized by the EPA as being severely impaired.

In 2008, the San Jacinto Waste Pits were placed on the National Priorities List of Superfund Sites due to the high level of dioxin contamination detected near the site. These chemicals pose a severe risk to humans and the environment as dioxins are a known Group 1 carcinogen that can impose deleterious health effects. As a result, there has been much concern regarding human exposure with the primary pathways being: oral ingestion through hand contact and subsequent hand-to-mouth activities, dermal absorption of site contaminants through skin contact with sediments, and ingestion of fish or crabs caught near the site.

Purpose of the Study

Based on existing data, it is becoming increasingly evident that the waste pits are likely leaking dioxins into the San Jacinto River (Rifai, 2006). Despite this evidence, it remains unclear which human communities could be potentially impacted by these carcinogenic materials. Moreover, no studies have explicitly examined the exposure of these waste pits to riverine and surge-based flood events, which are likely the primary driver of the deterioration and subsequent release of pollutants from the superfund site. Existing reports only superficially address the flood risk associated with the site and do not consider the impact of previous events, changing risk conditions, or potential wave action from storm surge. Moreover, a thorough socioeconomic profile and consideration of future growth is absent (Anchor QEA, LLC., 2013)

This report will address this lack of research by examining three major issues associated with the superfund site: (1) the physical and environmental context; (2) the socio-economic context; and (3) the level of flood risk. The physical context addresses the dynamic nature of where the site is located by

discussing changing climatic patterns, tidal influences, subsidence, and erosion. Understanding the socio-economic characteristics of the surrounding neighborhoods offers critical insight regarding the vulnerability of the potentially-affected population as well as their ability to recover from a disturbance. Because the socio-economic information examines only one snapshot in time, we augment the analysis with both historical land use and land cover (LULC) change to illustrate that the surrounding area falls within a rapidly developing region that will continue to grow well into the future. Lastly, combining the above information with a risk assessment of the superfund site to catastrophic floods provides an accurate, contextually relevant, and dynamic description of the potential adverse effects of the pits on the surrounding human and natural environments.

BACKGROUND

In 1965 and 1966, the San Jacinto River Waste Pits were created for disposal of paper mill waste. Solid and liquid waste contaminated with polychlorinated dibenzo-p-dioxins, polychlorinated furans, and some metals from Champion Paper, Inc. in Pasadena, Texas were disposed of in the impoundments north of Interstate-10, west of the main channel of the San Jacinto River, and east of the City of Houston, between Channelview and Highlands. Dioxins and furans are classified as "hazardous substances" by Section 101 (14) of CERCLA, 42 U.S.C §9601 (14), which are defined as:

> "Hazardous substances are defined as products that are toxic, corrosive, flammable, irritant, or radioactive. They are any substances that could cause or significantly increase mortality or seriously irreversible or incapacitating illness. Hazardous substances pose substantial threats to human health and the environment when improperly treated, stored, transported, or disposed of."

Throughout the 1970s and 1980s, there were physical changes at the site, including subsidence that resulted in partial submergence of the impoundments into the San Jacinto River (ATSDR, 2012). When subsidence occurred, dioxin-laden wastes were exposed to the river. Dioxins are insoluble in water, so they tend to bind to the soil and sediments, as well as pulp from paper mill waste, which are ingested in small animals and concentrate up the food web. It was not until April 2005 that Texas Parks and Wildlife (TPWD) were notified that there were partially submerged waste pits in the river, and TPWD subsequently notified the Texas Commission of Environmental Quality (TCEQ). On March 19, 2008 the site was placed on the U.S. Environmental Protection Agency's (EPA) National Priority List (NPL). The NPL is a list of uncontrolled or abandoned hazardous waste sites identified for long-term cleanup under the Federal Superfund program. From April 2010 to July 2011, short-term stabilization caps were constructed to temporarily address the leakage of dioxins into the San Jacinto River. Currently, the debate regarding this site is whether or not the site should be moved, or if the caps should become a permanent fixture to prevent further leakage.

According to *The Pasadena Citizen*, Harris County Attorney Vince Ryan is suing International Paper, Inc., McGinnes Industrial Maintenance Corporation, and Waste Management for polluting the San Jacinto River. Ryan states, "the Waste Pits are located in an area of the San Jacinto River that is the locale of boating, swimming, camping, commercial and recreational fishing. Removal of the source material from the Waste Pits and the river sediment is the only way" to end exposure to toxic chemicals. The case is currently pending in state district court and is set for trial in September, 2014.

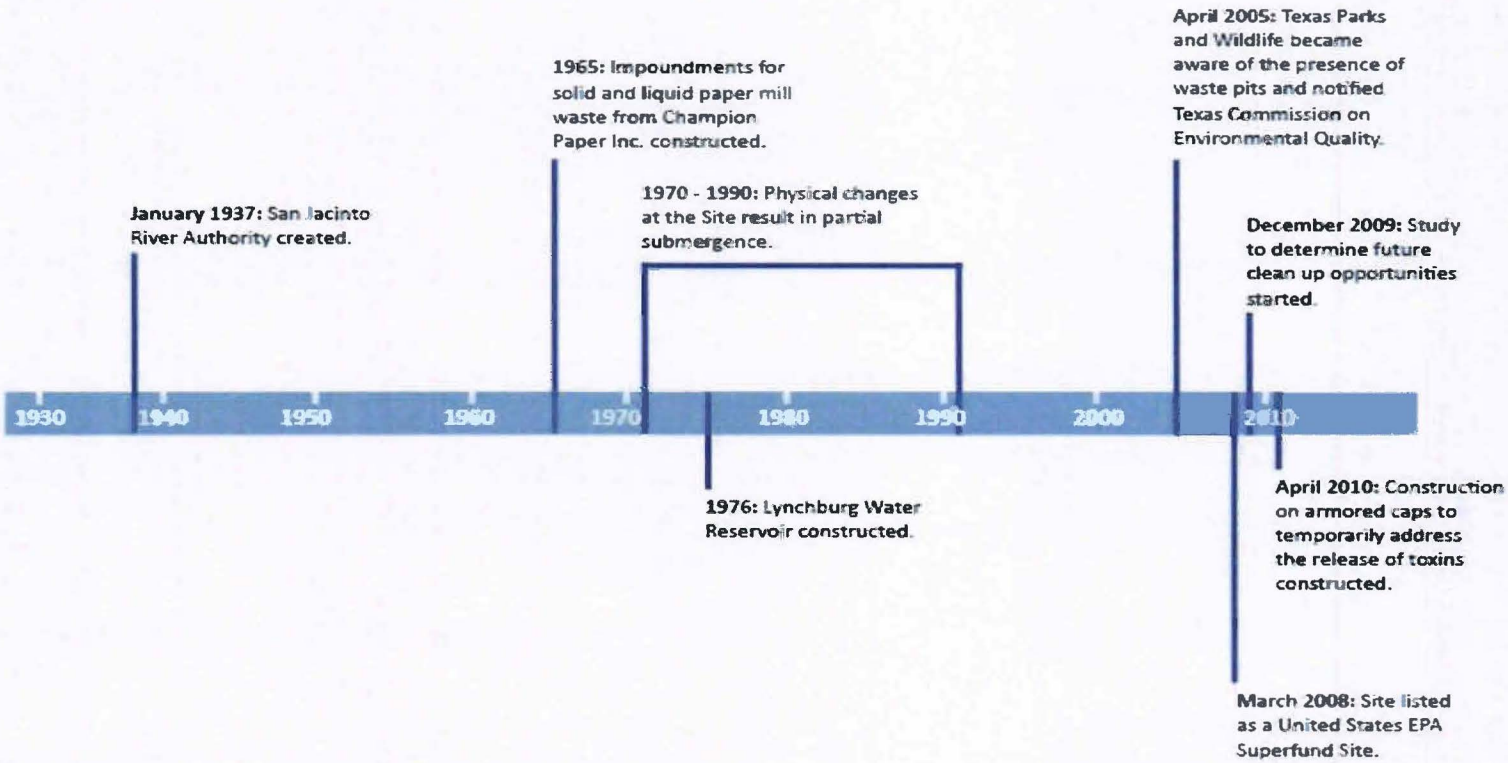


Figure 1. Timeline of Events.

Dioxins

Dioxins and furans are compounds that are known to cause cancer in humans (Bertazzi et al., 2001; Akhtar et al., 2004). Non-cancer effects of dioxins include adverse female reproductive effects, subtle changes in immune system components and developmental effects (Stephen et al., 1998; Venna et al., 1996; Kansler et al., 2007). The location of the San Jacinto Superfund Site at the mouth of the river is a major concern, due to bioaccumulation in marine ecosystems (Ronk & Guven, 2013).

Dioxins and furans are referred to as persistent organic pollutants (POPs) or hydrophobic organic compounds (HOCs) that are introduced into the environment via agricultural and industrial activities (Haynes & Johnson, 2000; Torres et. al., 2008). The Baseline Ecological Risk Assessment performed by Houston Advanced Research Center in 2013 sampled sediment, marine animal tissue, and surface water from areas near the south impoundment (Ronk & Guven, 2013). The major threat that POPs and HOCs have on marine and human ecosystems is the bioaccumulation effect (Micheletti et. al, 2007; Haynes & Johnson, 2000; Ronk & Guven, 2013; Torres et al, 2008). Bioaccumulation is the process of chemicals or compounds accumulating as it travels up the food web (EPA, 1999). The ecological risk affects humans when recreational fishermen consume locally caught contaminated fish; however, the Texas Department of State Health Services has issued a fish and shellfish consumption advisory. The notice, issued 26 June 2013, advises people near the Galveston Bay Estuary to limit their consumption of blue crab, catfish, and spotted sea trout to one meal per month from this area (Texas Department of State Health Services, 2013). Dioxins have very low solubility, meaning they do not readily dissolve in water. The only groundwater with significant dioxin levels was shallow and directly under the Superfund Site (Beauchamp, 2013). A report for the Texas Department of State Health Services and the Agency for Toxic Substances and Disease Registry suggested that there are very few ways that the toxic compounds could enter a person's body. ATSDR (2012) outlines three pathways that could potentially expose humans to toxic contaminants:

1. Oral Ingestions of sediments
2. Dermal absorption of site contaminants
3. Ingestion of fish or crabs caught near the site

It should also be noted that the San Jacinto River Waste Pits Superfund Site Bioaccumulation Modeling report published by Integral Consulting (2010) for McGinnes Industrial Maintenance Corporation suggested that the dioxin and furan concentrations in fish and crab tissues collected from the Site are similar to concentrations in specimens tested in other areas. This finding suggests that POP compounds in tissues may be more dependent on biological factors than environmental or exposure factors (Integral Consulting, 2010).

Despite varying opinions, it is important to understand there is a very real risk that dioxin-contaminated sediment could be scoured from the site due to surge or overland flow and dispersed into surrounding areas. Moreover, subsidence, flooding and hurricane surge will continue to happen and will likely continue to degrade the structural integrity and viability of these waste pits leaving more potential for dioxins to make their way into the natural environment. Due to these risks it is imperative that future decisions regarding the waste pits take into account the physical, social, and flood related contexts of the site.

STUDY AREA

The San Jacinto Waste Pits are located at the mouth of the San Jacinto River, north of the Galveston Bay, and approximately 20 miles east of downtown Houston, Texas (Figure 2). The San Jacinto River Watershed drains approximately 4,500 square miles of eastern Harris County, which carries approximately 2 million acre-feet of run-off per year (Bedient, 2013). The river originates in Huntsville, Texas and flows southeast towards Houston where it joins the Houston Ship Channel before emptying into the Galveston Bay. The Galveston Bay is roughly 600 square miles in size and is the second most productive fishery in the United States and hosts one of the most diverse bird populations in the world (Martin, 2006). Critical to the health of the Galveston Bay ecosystems are the freshwater inflows from the Trinity and San Jacinto Rivers (TE&S, 2007).

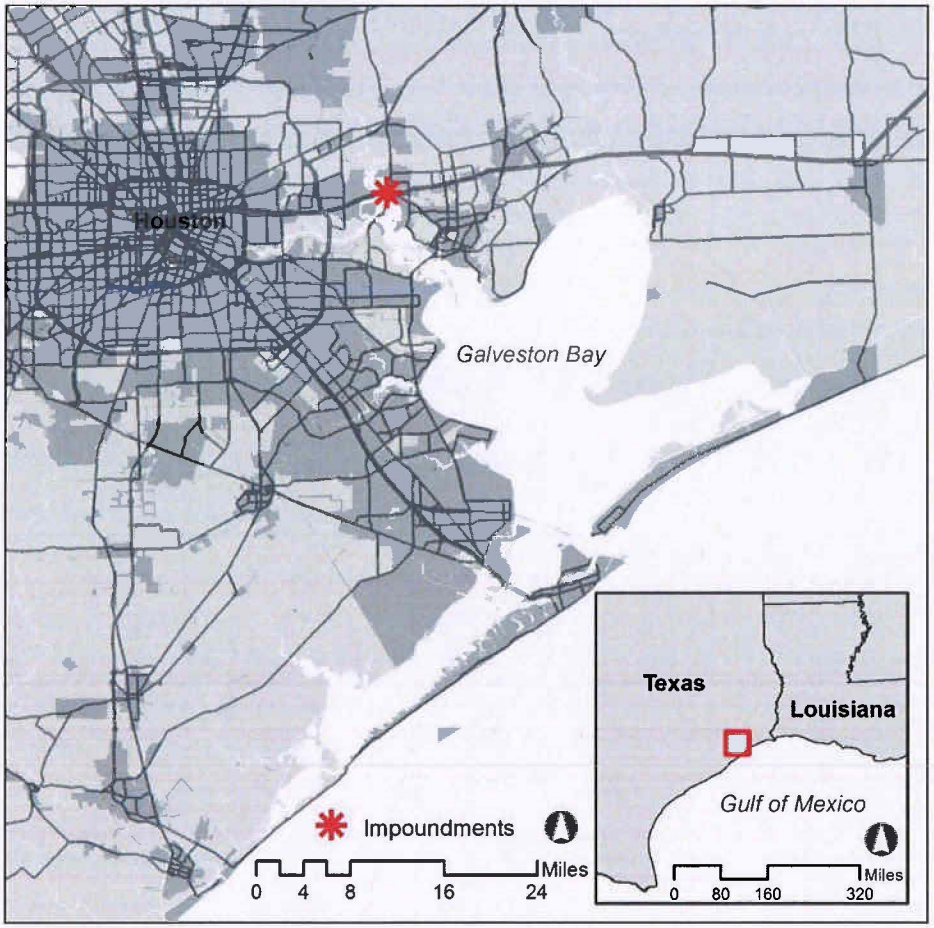


Figure 2. Large-Scale Study Area.

The San Jacinto River does not meet national standards for several toxic chemical and bacteria Total Maximum Daily Loads (TMDLs) and has not met these standards since 2002 as noted in each edition of the Texas Water Quality Integrated Report for Clean Water. In 2001, the Texas Department of State Health Services (DSHS) issued a public notice advising consumers to limit their consumption of fish caught in the San Jacinto River. The advisory was issued because the DSHS had determined that the

concentrations of organochlorine pesticides, PCBs, and dioxins in fish tissues posed an unacceptable risk to human health (TCEQ, 2014).

The study area for the flood risk assessment includes the area within approximately a 5 mile radius directly surrounding the Superfund site, including the U.S. Census designated places of Channelview, Highlands, Baytown, and Pasadena (Figure 3). This area includes an entrance into the Houston Ship Channel which is located southwest of the waste pits with the Upper San Jacinto Bay to the south.

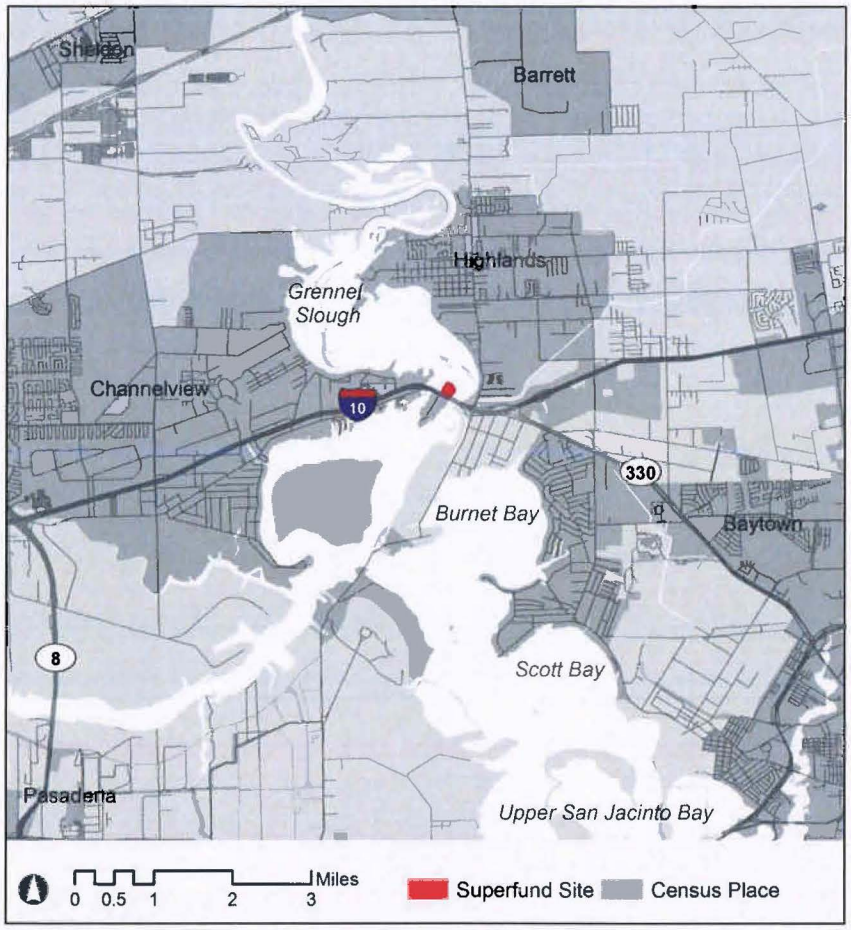


Figure 3. Study Area for Flood Risk Assessment.

The waste pits site consists of three major impoundments that are located on a sand bar in the San Jacinto River just north of I-10 (Figure 4). The waste pits were originally constructed from earthen dikes to separate them from the river. Since construction, the waste pits have considerably shrank in size due to erosion and subsidence and were recently structurally reinforced with an armored cap and a geomembrane due to concerns regarding the leakage of dioxins. These impoundments are approximately 14 acres in size, and are partially submerged in the San Jacinto River.

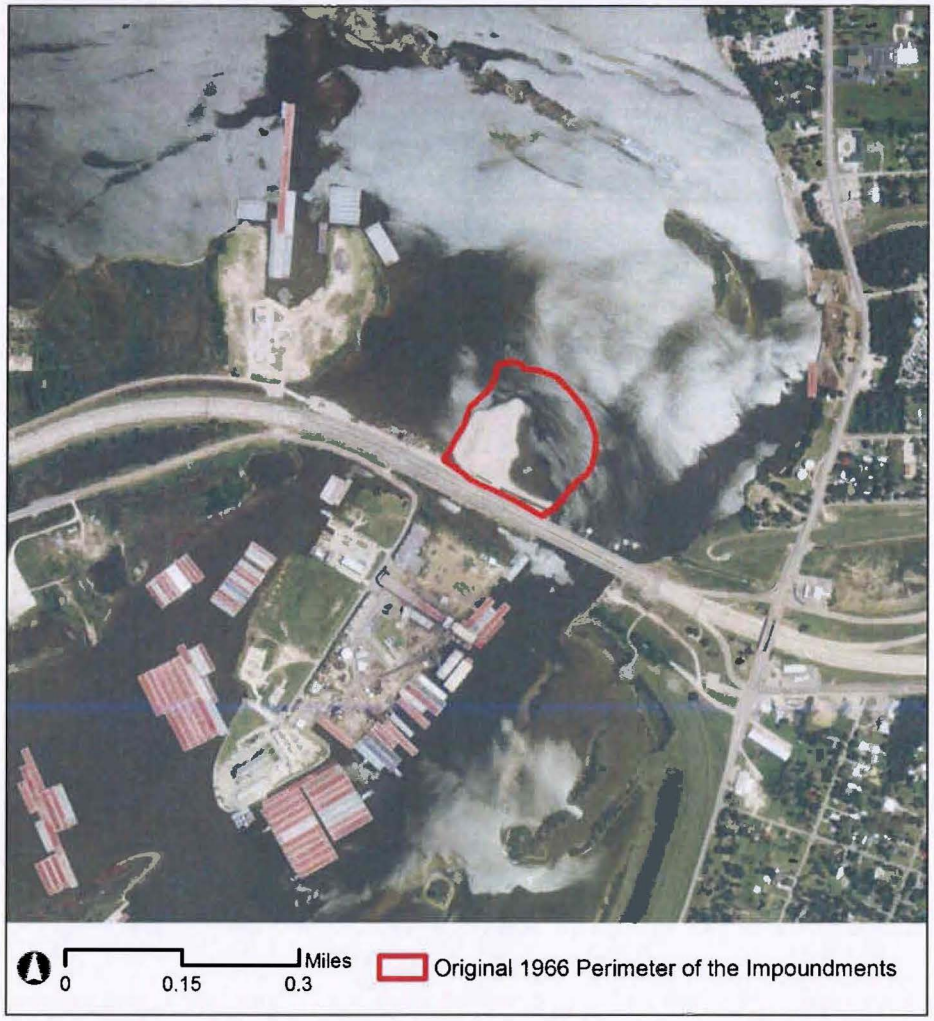


Figure 4. Small-Scale Study Area.

FLOOD RISK ASSESSMENT

Flood risk is inherently difficult to predict, as it requires the integration of three dynamic factors: (1) hazard, (2) exposure, and (3) vulnerability. Each of these factors are not static, but, rather, are constantly changing due to human development, storms, and climate change. As each of these factors change, so too does the level of risk. In this conceptualization of risk, *hazard* is defined as the occurrence of a hydrologic flood event with a given probability (i.e. return period). *Exposure* is driven by human actions and decisions and is typically represented by the amount of exposed assets within hazardous zones (e.g. the 100-year floodplain). *Vulnerability* represents the degree to which an asset is impacted when exposed to a hazardous event.

The San Jacinto Waste Pits are located in an area where all three of these factors have been continuously changing since construction. As a result, what may have initially been perceived as a low- risk situation has significantly increased over time. This assessment of flood risk focuses on the area within approximately 5 miles of the waste pits that could potentially be affected by the release of hazardous

chemicals. The report integrates and discusses the following three risk factors associated with flood impacts in proximity to the site: (1) physical risk; (2) socio-economic risk; and (3) flood impacts.

Physical Risk

The San Jacinto Waste Pits are located in an area that is susceptible to multiple physical threats associated with flooding. First, the waste pits are located in a recently FEMA-designated VE Floodway Zone, which is subject to inundation by the 1-percent-annual-chance flood event (one percent chance of flooding in any year) with additional hazards due to storm-induced velocity wave action. Properties in this zone also have 26 percent chance of flooding over the life of a 30-year mortgage. Moreover, the Base Flood Elevation (BFE) for the waste pit location - the elevation of surface water resulting from a flood that has a 1 percent chance of equaling or exceeding that level in any given year - has been recently measured at 19 feet. Given the low-lying condition of the waste pit (the site is actually partially submerged), the risk of inundation coinciding with significant wave action is very high.

Second, the position of the site close to the mouth of Galveston Bay is especially problematic from a storm surge standpoint, further exacerbating the physical risk profile. Tropical and extra-tropical storm events can push water from the Gulf of Mexico into Galveston Bay where the highest tidal depths occur at the mouths of major rivers and freshwater inflows (TE&S, 2007). National Oceanic and Atmospheric Administration (NOAA) surge models for a category 3 storm striking Galveston Bay during high tide show surge levels at the waste pit site reaching 23 feet. A category 5 storm hitting the Bay during similar conditions would produce a storm tide of up to 33 feet. Keim, Muller & Stone, (2007) also derived an average return period of 3 years for tropical storms, 8 years for all Hurricanes, and 26 years for hurricanes category 3-5 for Galveston, Texas. Researchers at NOAAs National Hurricane Center corroborate this estimate, predicting the return period for a major hurricane (category 3) striking Galveston Bay at 25 years (http://www.nhc.noaa.gov/climo/).

Third, the extent and potential impact of storm surge will be exacerbated by both eustatic sea level rise and relative sea level rise in which ocean level increased relative to subsidence. The instrumental record for Galveston's Pier 21 "has recorded a 0.60 meter increase in relative sea level over the last 100 years" (Yoskowitz, Gibeaut, & McKenzie, 2009). In their study of the effect of sea level rise on flooding, Warner & Tissot (2012), computed storm probabilities for every 25-year interval, starting from year 2025. The researchers observed that exceedance probabilities for storm surge are increasing, especially for small-scale events. For example, the annual probability of an event comparable in size to hurricane Rita occurring in 2025 increases from 16% to 26%, and to 62% in 2050 due to sea level rise. The study also revealed that by the end of the century, the current return period of 6.6 years for hurricane Rita would increase to an annual event based on a conservative scenario of seal level rise, and by 2100 exceedance probabilities for large events such as hurricane Ike would double. Thus, these historic storm events impacting Galveston Bay in the past will have a higher occurrence rate in the future given the changing climatological conditions.

Fourth, sea level rise and associated increase in tidal levels is often attributed to climate change. However, subsidence and erosion also plays a vital role in the physical vulnerability around the waste pit site. Erosion was particularly evident as the site was originally constructed using river sand to separate the impoundments from the river. This river sand is highly permeable and extremely susceptible to erosion resulting in the leakage of contaminants into the San Jacinto River, especially when inundated (Bedient, 2013). Bawden, Sneed, Stork, & Galloway (2003) categorized the Houston-Galveston Bay area as having

been adversely affected by subsidence more than any other metropolitan area in the United States (U.S.), in large part due to ground water and oil and gas extraction. According to the Harris-Galveston Subsidence District (HGSD), the critical land areas around the Galveston Bay had a subsidence of about 10ft since 1906, with areas that have a heavy presence of industrial and petrochemical uses experiencing the highest level of subsidence since the Second World War (HGSD, 2014). The HGSD report also indicated that the subsidence has increased the frequency and severity of flooding- in fact, the Brownwood subdivision in Baytown, just about 3 miles south-east of the superfund site was totally abandoned due to subsidence and continual flooding (HGSD, 2014). An examination of historic aerial imagery indicates that the entirety of the superfund site was once above the height of the river, but is now partially inundated (Figure 5). The areas directly around the site have also subsided by 6ft from 1906-1978 and by 0.5ft from 1973-2010 (Bedient, 2013). When combined with other physical risk factors, subsidence in this area increases vulnerability of the superfund site to inundation from floods and potential exposure of residents living in the surrounding area.

Finally, the San Jacinto waste pits are also vulnerable to inundation from precipitation events where runoff, exacerbated by development overflows the banks of the river. High-peak flows from regional runoff frequently occur in the region of the San Jacinto River. In extreme circumstances, the amount of rainfall can exceed 12 inches within 24 hours. Severe tropical storms can cause large amounts of surface runoff that can produce high volume and velocity flows at the waste site. For example, a major flood in 1994 caused the San Jacinto River to rise by nearly 27 feet resulting in rapidly moving water with scouring flows. These large rainfall events can easily submerge the waste pits, causing them to overtop their levees and possibly spill contaminants into the San Jacinto River.

When taken together hurricane frequency, storm surge, sea level rise, and subsidence make the low-lying San Jacinto Waste Pits extremely vulnerable to inundation and erosive events.

Figure 5. Historical Imagery Illustrating Erosion of the Waste Pit Site.

Socio-Economic Risk

A large amount of work has been done on the presence of Dioxin-based pollutants within the San Jacinto River waste pits, but little if any analysis has been conducted on the socioeconomic conditions surrounding the site, despite the fact that development has significantly increased the number of people at risk from potential contamination during a flooding event. This section examines land use and socio-

demographic trends near the waste site to provide a greater contextual understanding of the potential for human exposure and associated adverse effects.

Land Use & Land Cover Change

Residential development was somewhat limited when the San Jacinto River waste pits were constructed in the 1960's and 70's. However, unanticipated development over the last 50 years has significantly increased the number of residents in close proximity to the site, raising the potential for negative health impacts.

High population growth (125,185 people from 2011-2012) (Pulsinelli 2013) and a reliance on private transportation has forced development in Houston outwards from the central urban core. Our assessment of land cover change using data from the Coastal Change Analysis Program (CCAP) reveals that a significant amount of development occurred within approximately 5 miles of the waste pits between 1996 and 2011 (Figure 6). Three development classes were assessed surrounding the site based on percentage of impervious surface cover: low (21%-49%), medium (50%-79%), and high (80%-100%). In total, there was roughly 7.2 square miles of development within the study area. Most of this additional development was residential, identified as new neighborhood clusters in Channelview, Baytown, The Highlands, and Sheldon. The remaining new development consisted was a mixture of industrial development around the ship channel and new transportation corridors (e.g. Spur 330).

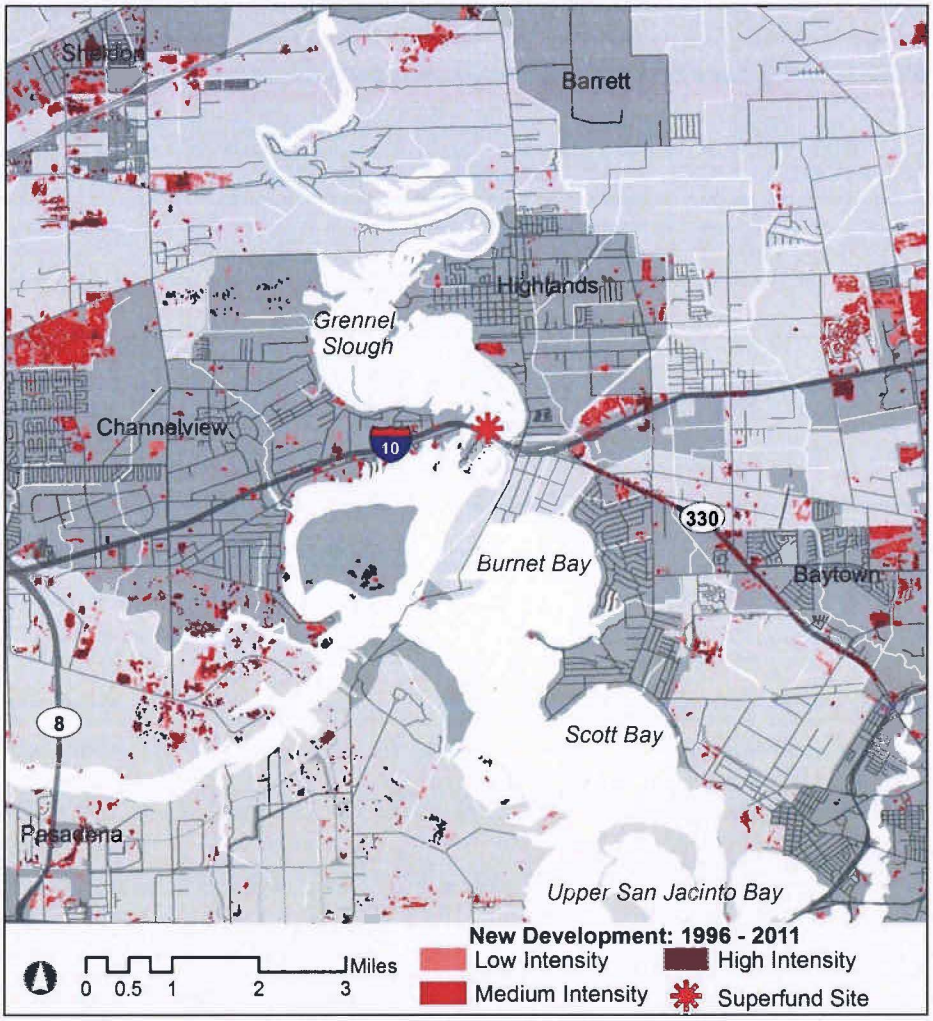


Figure 6. New Development from 1996 to 2011.

As shown in Figure 7, the current developed area surrounding the San Jacinto River site is primarily a mixture of industrial and residential land use. South of the site is dominated by industrial parcels because of the close proximity to the Houston Ship Channel. Residential areas follow along I-10, north of the industrial properties. The area north of the residential corridor is currently open space and undeveloped land with pockets of residential and industrial land uses.

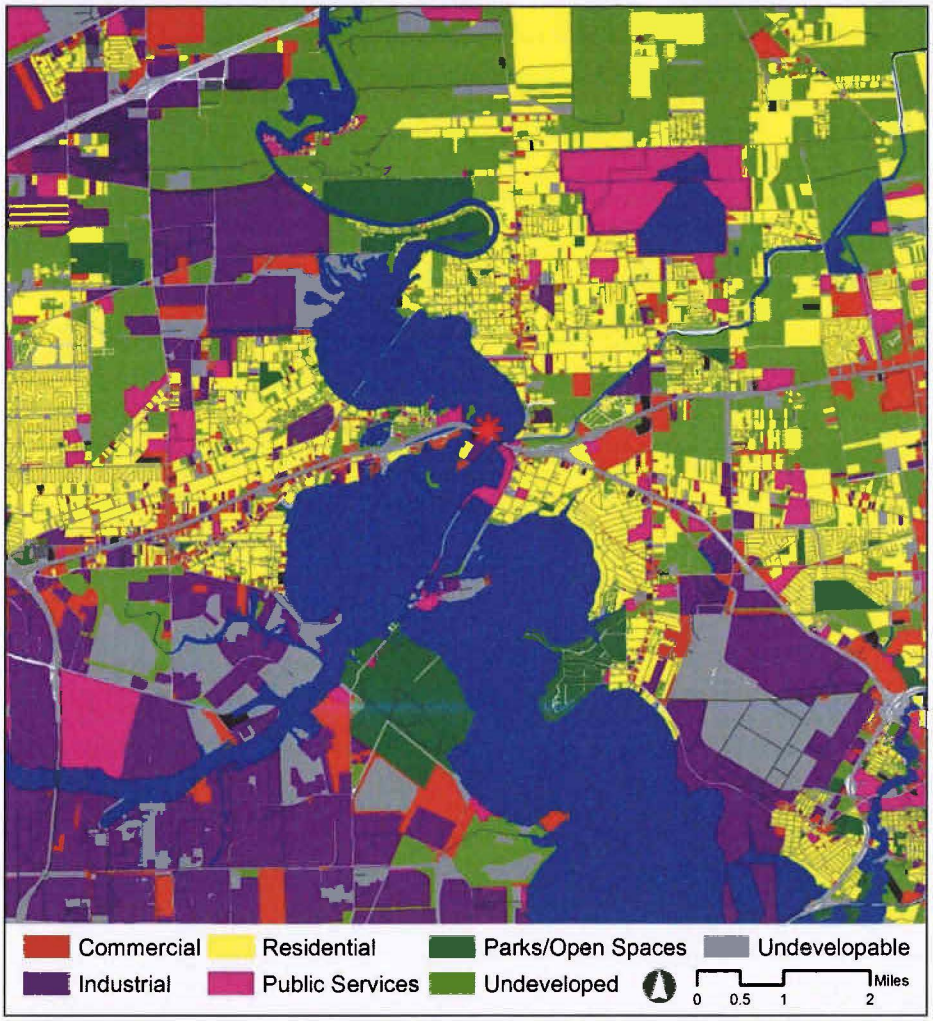


Figure 7. 2014 Land Use (HGAC, 2013)

Residential growth patterns are expected to continue in the immediate area. As indicated in Figure 8, projections out to 2040 conducted by the Houston Galveston Area Council (HGAC) indicate that development will expand north of Interstate-10 and throughout the northeast east portion of the waste pit site. Industrial infill is predicted to the northwest of the site. Projected development in these areas will increase the number of people at risk to flooding, inundation, and potential contamination. The conversion of open space and undeveloped land will also add impervious surfaces, which will likely increase the number and intensity of inland flooding events (Brody, Zahran et al. 2008). Moreover, development near the coast will increase the number of people at risk from storm surge. We address the direct impacts of both riverine flooding and current and future coastal surge impacts in a following section.

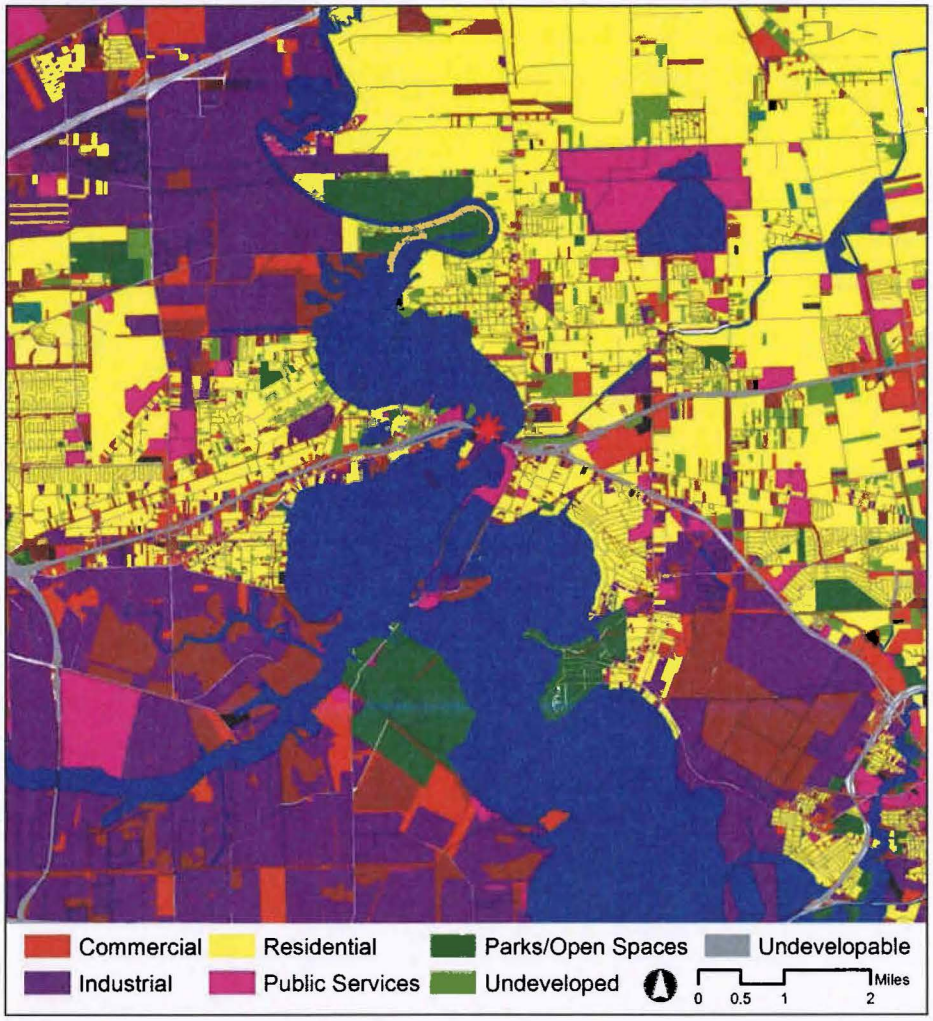


Figure 8. Projected 2040 Land Use (HGAC, 2013).

Population Characteristics

Assessing the characteristics of the population surrounding the waste pit site helps identify which segments are particularly vulnerable to flooding (Cutter and Emrich 2006). Socially-vulnerable populations are slower to recover from disasters (Peacock, Grover et al. 2011), and are more impacted by disasters (Zahran, Brody et al. 2008). Thus, socially vulnerable areas are generally more affected by inundation and do not have the resources to recover leaving a larger population at risk from dioxins.

This assessment uses data previously collected on social vulnerability with the following dimensions: Potential Child Care Needs, Potential Elder Care Needs, Potential Transportation Needs, Potential housing Needs, and Potential Civic Capacity Needs (Peacock, Grover et al. 2011). These dimensions are measured using 17 individual variables collected from the American Community Survey, all of which were aggregated at the Census Block Group level (Table 1). Once calculated, these dimensions were combined to create a social vulnerability index, that when mapped, elucidates the spatial pattern of environmental inequity.

Table 1. Social Vulnerability Index Measurement.

Variables	Dimensions	Index
1. Single parent households with children 2. Children with age below 5	Potential Child Care needs	Social Vulnerability Index
3. Elders with age above 65 4. Elders (65+) below poverty level	Elder Care Needs	
5. Public transportation dependency (workers using public transportation) 6. Occupied housing units without a vehicle	Public Transportation Needs	
7. Vacant housing units 8. Persons in renter occupied housing units 9. Race/Ethnicity (non-White population) 10. People in group quarters 11. Housing units built 20 years ago 12. Mobile homes 13. Persons in poverty	Temporary Shelter and Housing Recovery needs	
14. Occupied housing units without a telephone 15. School enrollment less than high school 16. Labor force (16+) unemployed 17. People (5+) speak English not well or not at all	Civic Capacity	

There are approximately 16,700 people living within in a 5 mile radius of the superfund site. Population densities directly adjacent to the San Jacinto River range from 1.3 people/sq. miles to 9.2 people/sq. miles, which is fairly dispersed compared to a traditional urban core. However, one of the block groups containing the highest population density in the study area is located directly north-west of the site. In contrast, the block group directly south of the site has one of the lowest population densities (1.3 people/square mile). The elderly population and the population under five years of age are dispersed throughout the study area, where the highest percentages of these populations are located less than five miles from the site. According to the U.S. Department of Health and Human Services, the poverty guideline for a family/household of 4 people is $23,850 (DHHS, 2014). While the average household income in the study area is $47,396, the populations that live below the poverty guideline tend to live in block groups closest to the Superfund Site (refer to the Appendix for maps of the individual variables discussed above).

The variables listed in Table 1 were used to generate a Social Vulnerability Index (SVI) at the Census Block Group level (Figure 9). Overall, Baytown has the highest degree of social vulnerability to floods, with high population concentrations in the southeast portion of the jurisdiction and a large area around Spur 330 (indicated in red as 'very high'). Other areas with 'high' social vulnerability include the parts of Channelview bordering the San Jacinto River and extending northward into the unincorporated regions around the cities of Sheldon and Barrett.

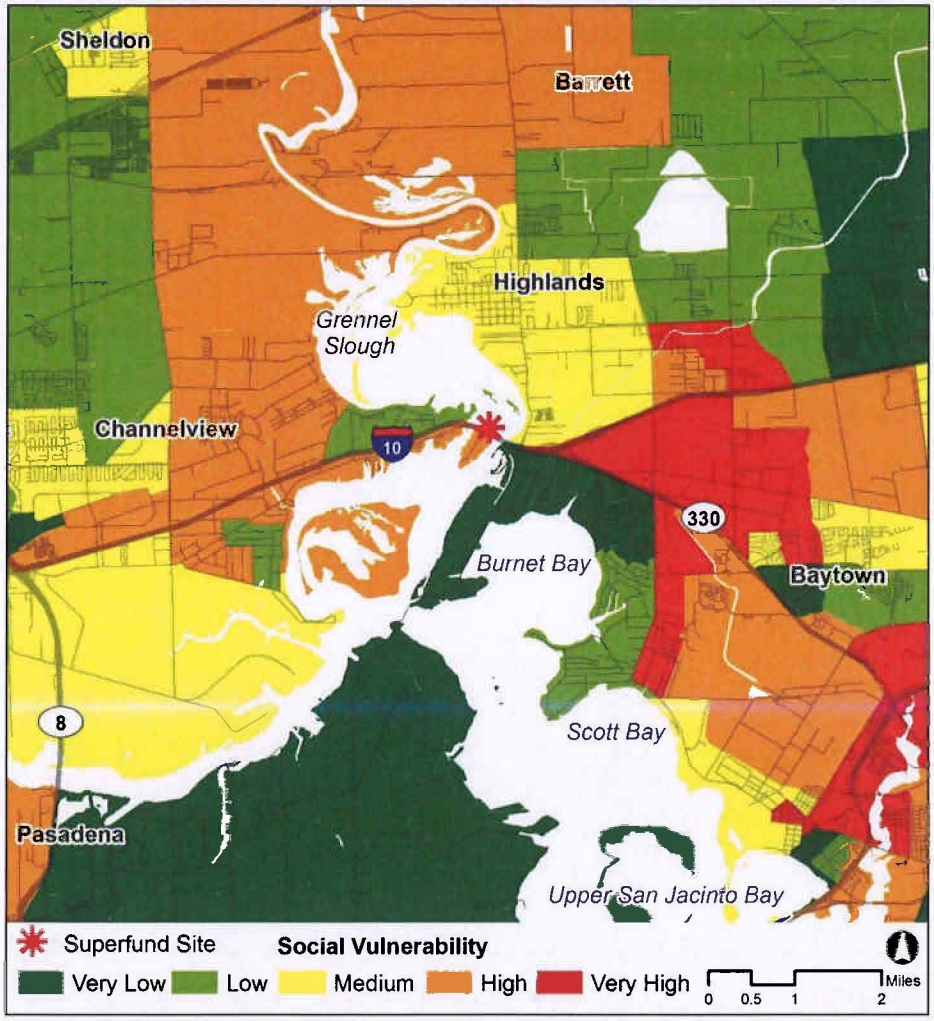


Figure 9. Social Vulnerability Index.

The level of social vulnerability within the study area is likely driven by the percentage of population that is either below 5 or above 65 years of age. Of particular concern is the population under 5 (Figure 10), as studies has shown that nursing infants consume about 50 times more dioxin per day than adults due the prevalence of dioxins accumulating in breast milk (Papke, 1998; Schecter et al., 1994). Moreover, it is estimated that roughly 10-14% of exposure to dioxins occurs via nursing (Patadin et al., 1999; Schecter et al., 1996).

Figure 10. Percentage of Population Below 5 Years of Age by Block Group.

Lastly, another key trend stemming from the socioeconomic analysis is that the populations with high social vulnerability are located in areas most susceptible to storm surge and flooding. These populations would not only be most sensitive to dioxin exposure, but also have the most difficult time evacuating and recovering from a flood event, further exacerbating the adverse impacts to this segment of the community. That said, exposure to the dioxins could potentially occur without the presence of a major storm due to the documented potential for chemical leakage. Rather, it is the erosive and structurally degrading effect of the storms themselves that could result in a higher probability of exposure in the future.

Flood Impacts

The spatial combination of physical and socioeconomic risk ultimately determines the level of adverse impacts from floods. Structures and residents located in flood-prone areas results in the loss of property, lives, and overall well-being. As noted above, the San Jacinto waste pits are uniquely situated in an area that experiences both riverine and storm surge-based flooding, resulting in major previous impacts to the surrounding community. Further compounding future impacts is the fact that both physical risk and

socioeconomic profiles are changing. The primary driver of future flood loss in this region is unquestionably increasing development and associated population growth. However, changes in physical exposure, including climate change, will also increase the severity of future flood events.

This section examines the previous and projected impacts from flooding on the San Jacinto waste pits, with particular emphasis on the spatial extent of inundation around the waste pits as an indicator of potential dioxin exposure. While storms routinely claim human lives, this analysis focuses on property loss, which is the most ubiquitous and severe impact associated with flooding in the U.S. Also, inundation of property is the most likely vector for dioxin contamination and increased bioaccumulation in the environment.

Surge-Based Flooding

As noted above, flooding via storm surge is the major threat to the waste pit site and surrounding properties. The position of the site close to the mouth of a river or freshwater inflow makes it especially vulnerable given the mechanics of a storm surge. There are actually two inundation events: first, the initial rise and pulse of water inundating the waste pit site; second, the backwash of water as the surge releases back into Galveston Bay and ultimately the Gulf of Mexico. The intense tidal flushing can essentially deliver a "double dose" of pollutants to upstream residents, as well as a single downstream dose as the water returns to the Bay.

Based on the NOAA hurricane surge inundation zones (Figure 11), the waste pit site would be inundated by any hurricane and tropical storm due its low elevation and vulnerable location. Given its vulnerability, the site will almost certainly experience repetitive erosive surge events in the coming years, further degrading the structural integrity of on-site protective devices.

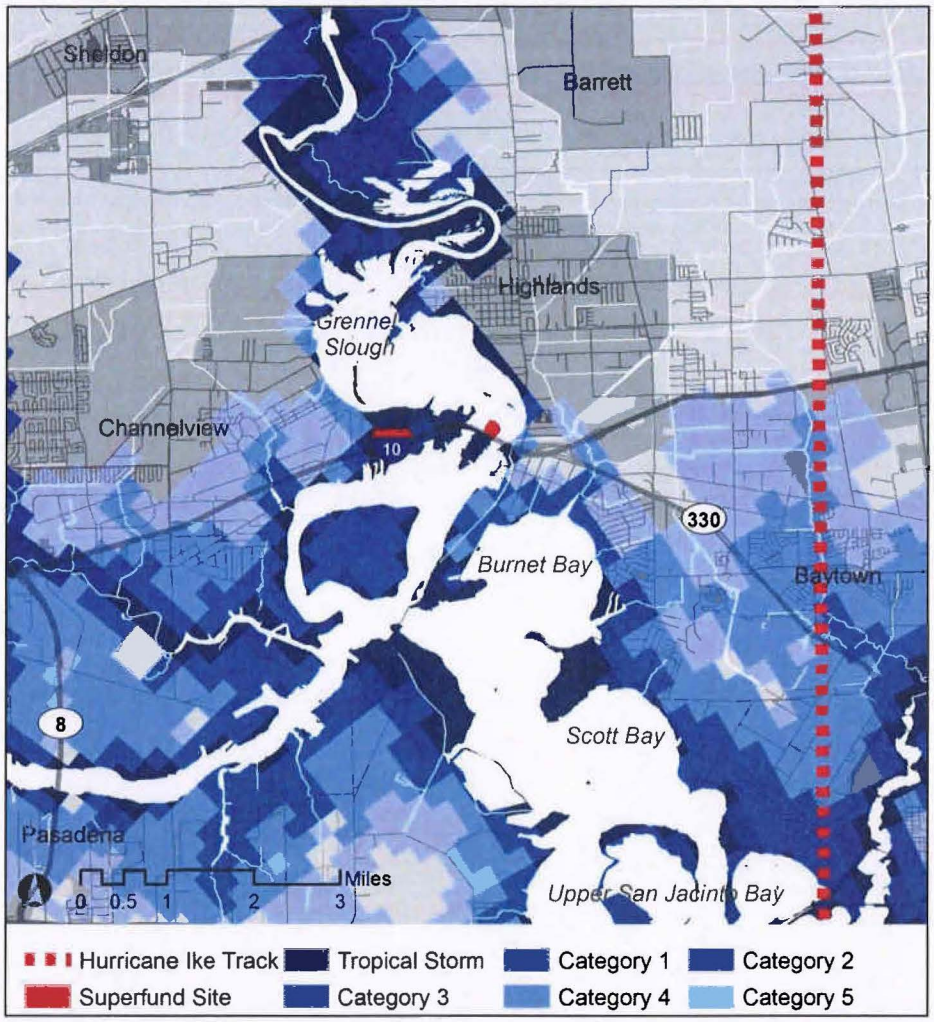


Figure 11. Surge Inundation Zones Produced by NOAA Models.

Most recently, Hurricane Ike, a strong Category 2 hurricane, made landfall in 2008 behind a very large surge event. While Ike was not even considered a 100-year storm, it caused approximately $21.3 billion in flood insurance claims (the third most costly storm in U.S. history), with the vast majority of the damage occurring in the Galveston Bay region (FEMA, 2009). This storm overwhelmed the waste pit site and could have contributed to scouring and associated leakage of dioxins detected nearby. Figure 12 shows the amount of insured residential flood loss caused by Hurricane Ike aggregated to Census Block Groups around the site. These losses totaled approximately $22.3 million in residential flood loss within approximately 5 miles of the site. The majority of these losses (up to $11 million) occurred in the neighborhoods just south of the waste pit site around Burnet Bay (Figure 12). Areas to the north of Highlands also incurred property damage as the storm surge pushed past the waste pit site and up into the San Jacinto River (see Appendix B for map of individual points of insured loss). Furthermore, analysis of a FEMA-based model for Hurricane Ike predicts the Census Block in which the waste pit site is located would experience up to $29 million in property damage.

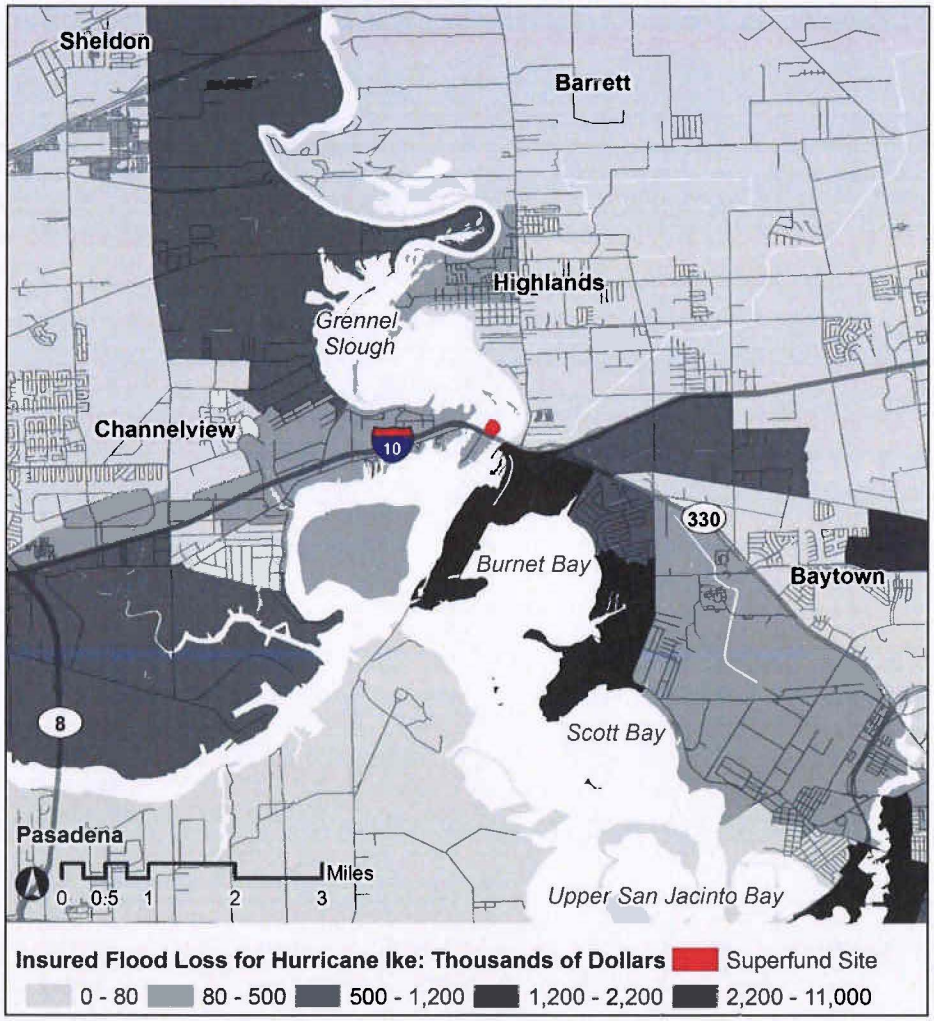


Figure 12. Insured Losses from Hurricane Ike by Census Block Group.

To further assess the future impact of storms on the waste pit site and potential inundation of surrounding neighborhoods, we predicted the extent of two storm events. First, we modelled a hurricane Ike-level storm as a baseline event currently driving mitigation policy in the Houston-Galveston region, using a SLOSH (Sea Lake and Overland Surges from Hurricane) model developed by the National Weather Service. Second, we analyzed a NOAA developed category 5 hurricane as a worst-case scenario. As shown in Figure 12, the surge associated with an Ike-type storm (demarcated in dark blue) produces an inundation height of 12 feet above sea level at the waste pit site. Based on its elevation, this synthetic storm submerges the site by nearly 10.5 feet of water. The worst-case Category 5 scenario (demarcated in light blue) not only increased surge height at the site, but also the extent of inundation, and possibly chemical exposure, to surrounding communities.

It is also important to note that critical infrastructure near the site such as schools, water reservoirs, and waste water facilities inundated by the two storm scenarios. Of particular concern is the Lynchburg

Reservoir approximately half a mile from the Superfund site. This reservoir holds about 1.5 billion gallons of water and provides drinking water to nearly 600,000 residents (Blumenthal, 2005). Ranging from 4-7 feet above sea level, the reservoir is susceptible to surge inundation from both the Hurricane Ike SLOSH scenario, and the category 5 NOAA scenario. The Ike scenario would overtop the reservoir's southern tip and portions of the western edge whereas the Category 5 hurricane would completely inundate the reservoir, potentially exposing residents to contaminants via drinking water (Figure 13).

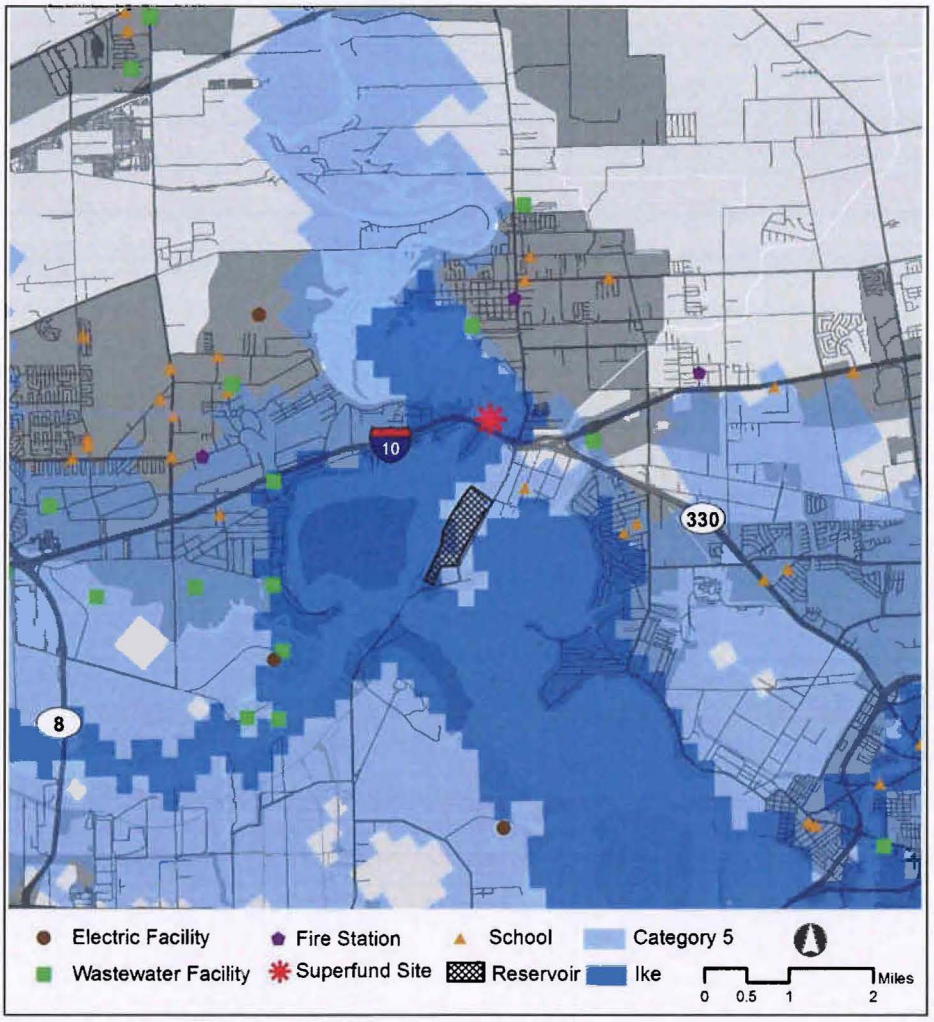


Figure 13. Surge Inundation for Hurricane Ike (using SLOSH) and a Category 5 Hurricane (using NOAA).

As mentioned above, recent development sprawling from Houston has dramatically increased the number of people near the superfund site. If the existing cap were to fail, surge near the site could potentially expose residential parcels to dioxin-laden soils. Key areas of focus are north of the site as hurricane surge tends to push water up the San Jacinto River. Based on the spatial extent of inundation produced by the two scenarios above, we summarized the number of residential parcels impacted for the HGAC land use

maps for years 2014 and 2040 (Figure 14). Based on current land use surrounding the waste pit site, 81 properties would be affected by a storm surge similar to Hurricane Ike. A category 5 storm surge would increase the affected parcels to 750. If the same storm were to hit the area in 2040, nearly ten times as many parcels north of the waste site would be inundated (1,085 parcels), a storm similar to Hurricane Ike would inundate 115 parcels (Figure 14).

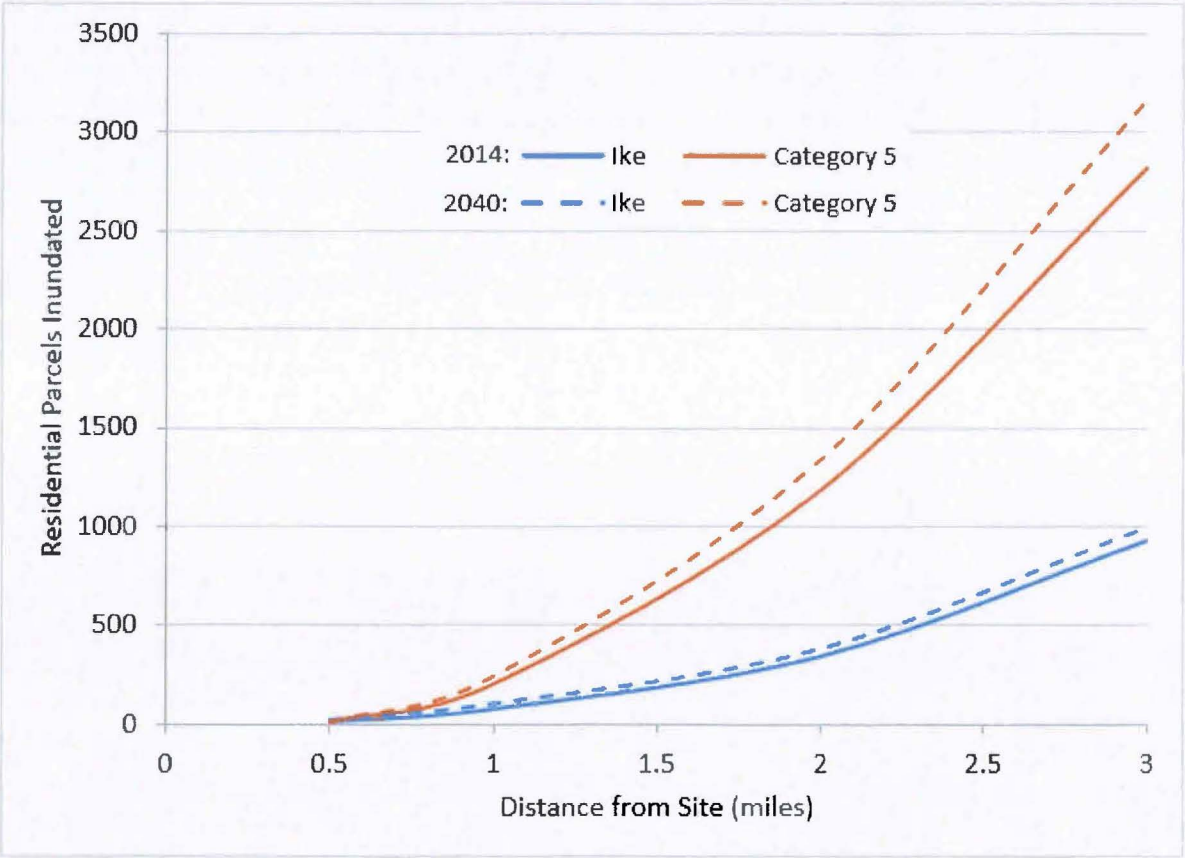


Figure 14. Number of Residential Parcels Inundated by Hurricane Ike and Category 5 scenarios.

Freshwater Flooding

It should also be noted that the San Jacinto waste pits are also vulnerable to damaging high-peak flows from regional runoff. Frequent large rainfall events can easily submerge the waste pits, causing them to overtop their levees and possibly spill contaminants into the San Jacinto River. Historical crest records from a USGS gage indicate that the waste pits have been exposed to potentially high-scouring flows at least 27 times since 1973 (Bedient, 2013). During these events the waste pits can remain submerged under water for days at a time. In 2001, for example, Tropical Storm Allison dropped over 18 inches of rain in this region, causing at the time one of the costliest tropical storms in US history (Stewart, 2001). During this storm, water flooded residential structures as a result of swelling rivers and streams or from local ponding. If the event was strong enough, dioxin-laden soil could have been scoured from the site and deposited into local residential structures; however, it would likely be diluted at that point. As shown in Figure 15, the majority of impacts (up to $1.5 million) from rainfall-based storms occurred to the

northeast and southeast of the waste pit site when the San Jacinto River and Ship Channel crested their banks.

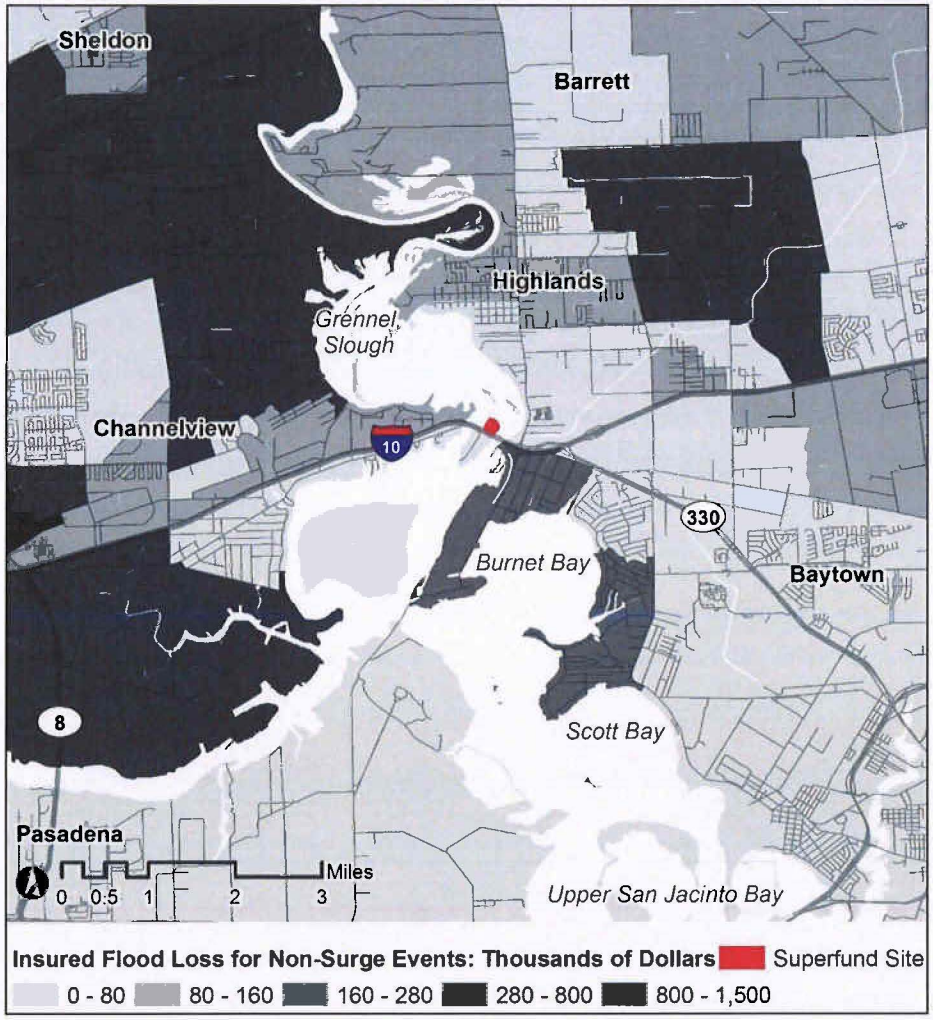


Figure 15. Insured Losses for Freshwater Flooding, 1999-2009.

CONCLUSION

The San Jacinto Waste Pits are located in an area that is vulnerable to many different physical threats: hurricane surge, wave action, riverine flooding, subsidence, and sea level rise. These forces, over time, have eroded the sediment and embankments around the site, which are likely the primary reasons for the eventual leakage of the toxic chemicals into the surrounding environment. The threat of human exposure when this site was built during the 1960's was much lower than it is today. Historical development has rapidly increased the amount of people that live within a few miles of the site and this trend is projected to continue well into the future.

More serious attention needs to be given to the local socioeconomic and built environment characteristics of this hazardous site. The threat of future surge and riverine flood events coupled with a changing climate and increasing development all have a ratcheting effect on the amount of impact this superfund site could inflict on surrounding communities. As risk of failure increases so too does the risk of exposure from flood-induced water vectors. Bioaccumulation is already occurring exposing local fisherman and residents to harmful chemicals that consume the fish and crabs. Sediment contaminated with dioxins could potentially be scoured from the site and transported into neighboring residential areas, school and wastewater management facilities, and a reservoir that provides drinking water. That said, the installation of the temporary geomembrane by the EPA is a first attempt to prevent leaking and exposure, but this is likely the first of many repairs that are likely to occur due the vulnerable location of this site.

Based on the flood risk assessment above, it is my expert opinion that the waste pits should be fully removed as outlined by Alternative 6 in the Feasibility Study conducted for CIMC and International Paper, Inc. (Anchor QEU, 2013). As already mentioned, the site is in an extremely vulnerable location to repeated inundation, which will only increase in the future. There is insufficient evidence that any proposed on-site remediation alternative can effectively stabilize the pits over the long term and prevent the leakage of contaminants to surrounding areas. The information contained in this report provides a more complete understanding of the flood risks associated with the site and can offer guidance to decision makers as they contemplate future mitigation actions.

WORKS CITED

Akhtar F, Garabrant D, Ketchum N, Michalek J. (2004). Cancer in US Air Force veterans of the Vietnam war. *J Occup Environ Med* 46: 123-13.

Anchor QEA, LLC. (2013). Draft Feasibility Study Report: San Jacinto Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation and International Paper Company. August 2013.

ATSDR. (2012). Public Health Assessment. San Jacinto River Waste Pits Channelview, Harris County, Texas. EPA Facility ID: TXN000606611 October 30, 2012.

Bertazzi PA, Consonni D, Bachetti S, Rubagotti M, Baccarelli A, Zocchetti C, et al. (2001). Health effects of dioxin exposure: a 20-year mortality study. *Am J Epidemiol* 153: 1031–1044.

Bawden GW, Sneed M, Stork SV, Galloway DL .(2003). Measuring human-induced land subsidence from space. USGS Fact Sheet 069-03. http://pubs.usgs.gov/fs/fs06903/

Beauchamp, R.A. (2013). San Jacinto River Waste Pits Superfund Site - Exposure Pathways Analysis. Texas Department of State Health Services and Agency for Toxic Substances & Disease Registry.

Blumenthal, R. (2005). Houston Narrowly Avoids a Water Crisis. New york Times.

Brody, S. D., S. Zahran, W. E. Highfield, H. Grover and A. Vedlitz. (2008). Identifying the impact of the built environment on flood damage in Texas. *Disasters* 32(1): 1-18.

Cutter, S. L. and C. T. Emrich. (2006). Moral hazard, social catastrophe: The changing face of vulnerability along the hurricane coasts. *The Annals of the American Academy of Political and Social Science* 604(1): 102-112.

Federal Emergency Management Agency. (2009). Mitigation Assessment Team Report: Hurricane Ike in Texas and Louisiana. FEMA P-757.

Galveston Bay Foundation. (2014). San Jacinto River Waste Pits Superfund Site. http://galvbay.org/advocacy_sjrwp.html Accessed 06/04/14.

Haynes, D. and Johnson, J.E. (2000). Organochlorine, heavy metal and polyaromatic hydrocarbon pollutant concentrations in the Great Barrier Reef (Australia) environment: a review. *Marine Pollutant Bulletin* 41: 7-12.

Houston-Galveston Area Council. (2013). Regional Land Use Information System (Regional Growth Forecast).

Harris County Flood Control District. San Jacinto River Watershed. http://www.hcfcd.org/L_sanjacriver.html Accessed 06/04/14.

Houston Galveston Subsidence District. (2014). http://www.hgsubsidence.org/index.html. Accessed 05/20/2014.

Houston, C. O. (2014). Houston Facts and Figures. http://www.houstontx.gov/abouthouston/houstonfacts.html. Retrieved 5/22/2014.

Trungale Engineering and Science. (2007). Instream Flow Targets for the Trinity and San Jacinto River Basins Senate Bill 3: Environmental Water Planning. Prepared for: National Wildlife Federation.

Integral Consulting Inc. (2010). Technical Memorandum on Bioaccumulation Modeling: San Jacinto River Waste Pits Superfund Site. Prepared for: McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6.

Integral and Anchor QEA. (2013). Remedial Investigation Report. Prepared of U.S. Environmental Protection Agency, Region 6, on behalf of McGinnes Industrial Maintenance Corporation and International Paper Company. May 2013.

Kransler, K.M., McGarrigle, B.P. and Olson, J.R. (2007). Comparative Developmental Toxicity of 2,3,7,8-tetracholorodibenzo-p-dioxin in the Hamster, Rat and Guinea Pig. *Toxicology* 229: 214-225.

Keim, B. D., Muller, R. A., & Stone, G. W. (2007). Spatiotemporal patterns and return periods of tropical storm and hurricane strikes from Texas to Maine. *Journal of Climate 20*(14).

Leos, Valmichael. (2014). San Jacinto River Waste Pits TCRA. United States Environmental Protection Agency: On-Scene Coordinator. http://www.epaosc.org/site/site_profile.aspx?site_id=6534. Accessed 06/04/14.

Micheletti, C., Critto, A., and Macromini, A. (2007). Assessment of ecological risk from bioaccumulation of PCDD/Fs and dioxin-like PCBs in a coastal lagoon. *Environment International* 33: 45 – 55.

Martin, D.M., T. Morton, T. Dobrzynski, and B. Valentine. (1996). Estuaries on the Edge: The Vital Link Between Land and Sea. A Report by American Oceans Campaign. http://www.americanoceans.org/estuary/edge.htm.

Papke, O. (1998). PCDD/PCDF: Human Background Data for Germany, a 10-year experience. *Environmental Health Perspectives* 106 (S2): 723-731.

Patandin, S., Dagnelie, P.C., Mulder, P.G.H., Op de Coul, E., van der Veen, J.E., Weisglas-Kuperus, N., and Sauer, P.J.J. (1999). Dietary exposure to polychlorinated biphenyls and dioxins from infancy until adulthood: A comparison between breast-feeding, toddler and long-term exposure. *Environmental Health Perspectives* 107 (1): 45-51.

Pasadena Citizen, The. (2014). Ryan urges EPA to require complete dioxin removal from San Jacinto River waste pits (2014, May 10) *The Pasadena Citizen*. http://www.yourhoustonnews.com/pasadena/news/ryan-urges-epa-to-require-complete-dioxin-removal-from-san/article_3c5965be-b414-55ad-991e-6eab8c70e339.html

Peacock, W. G., H. Grover, J. Mayunga, S. Van Zandt, S. D. Brody, H. J. Kim and R. Center. (2011). The status and trends of population social vulnerabilities along the Texas Coast with special attention to the Coastal Management Zone and Hurricane Ike: The Coastal Planning Atlas and Social Vulnerability Mapping Tools, A report prepared for the Texas General Land Office and The National Oceanic and Atmospheric Administration. College Station, TX: Texas A&M University.

Pulsinelli, O. (2013). Population Boom lands Houston on Fastest growing list. Houston Business Journal. http://www.bizjournals.com/houston/news/2013/03/14/houston-harris-county-among.html?page=all. Retrieved 5/12/2014.

Rifai H, P.I. (2006). Total Maximum Daily Loads for Dioxins in the Houston Ship Channel, Quarterly Report No. 3. University of Houston, July 2006.

Ronk, J. and Guven, B. (2013) San Jacinto River Waste Pits Superfund Site Technical Document Review: May 2013 Baseline Ecological Risk Assessment. Houston Advanced Research Center.

San Jacinto River Authority. (1957). Master Plan Report for the Full Scale Development of the San Jacinto River Authority. Conroe, Texas.

Schecter, A., Startin, J., Wright, C., Kelly, M., Papke, O., Lis, A., Ball, M., and Olson, J.R. (1994). Congener specific levels of dioxins and dibenzofurans in U.S. food and estimated daily dioxin toxic equivalent intake. *Environmental Health Perspectives* 102: 962-966.

Schecter, A., Papke. O., Lis, A., Ball, M., Ryan, J.J., Olson, J.R., Li, L., and Kessler, H. (1996). Decrease in milk and blood dioxin levels over two years in a mother nursing twins: Estimates of decreased maternal and increased infant dioxin body burden from nursing. *Chemosphere* 32(3): 543-549.

Shroeder, Paul R. (2013). Review of Design, Construction and Repair of TCRA Armoring for West Berm of San Jacinto Waste Pits. Prepared for the U.S. Environmental Protection Agency, Region 6. US Army Corps of Engineers: Engineer Research and Development Center.

Stephen, F.D., Greizerstein, H., Kostyniak, P.J., Mendola, P., Vena, J.E., Buck, G.M., and Olson, J.R. (1998). Effects of exposure to Great Lakes contaminants on immune parameters in Lake Ontario Anglers. *The Toxicologist* 42: 97.

Stewart, Stacy R. (2001). "Tropical Cyclone Report Tropical Storm Allison." National Hurricane Center. http://www.nhc.noaa.gov/2001allison.html. Retrieved: May 30th, 2014.

Torres, M.A., Barros, M.P., Campos, S.C.G., Pinto, E., Rajamani, S., Sayre, R.T., Colepicolo, P. (2008). Biochemical biomarkers in algae and marine pollution. *Ecotoxicology and Environmental Safety* 71: 1-15.

Texas Commission on Environmental Quality. (2014). San Jacinto River Tidal: A Project for Legacy Pollutants in Fish. http://www.tceq.texas.gov/waterquality/tmdl/47-sanjacintolegacy.html. Accessed on May, 28th 2014.

Texas Department of State Health Services: Fish and Shellfish Consumption Advisory. (2013). ADV-50.

U.S. Department of Health and Human Services. (2014) Poverty Guidelines. http://aspe.hhs.gov/poverty/14poverty.cfm. Accessed 05/23/14

United States Environmental Protection Agency. (1999). Polychlorinated Dibenzo-p-dioxins and Related Compounds Update: Impact of Fish Advisories.

United States Environmental Protection Agency. (2012). San Jacinto River Waste Pits. http://www.epa.gov/region6/6sf/texas/san_jacinto/. Accessed 06/04/14.

Vena, J.E., Bucl, G.M., Kostyniak, P., Mendola, P., Fitzgerald, E., Sever, L., Freudenheim, J., Greizerstein, H., Zielezny, M., McReynolds, J. and Olson, J. (1996). The New York Angler Cohort Study: Exposure Characterization and Reproductive and Developmental Health. *Toxicology and Industrial Health* 12(3/4): 327-334.

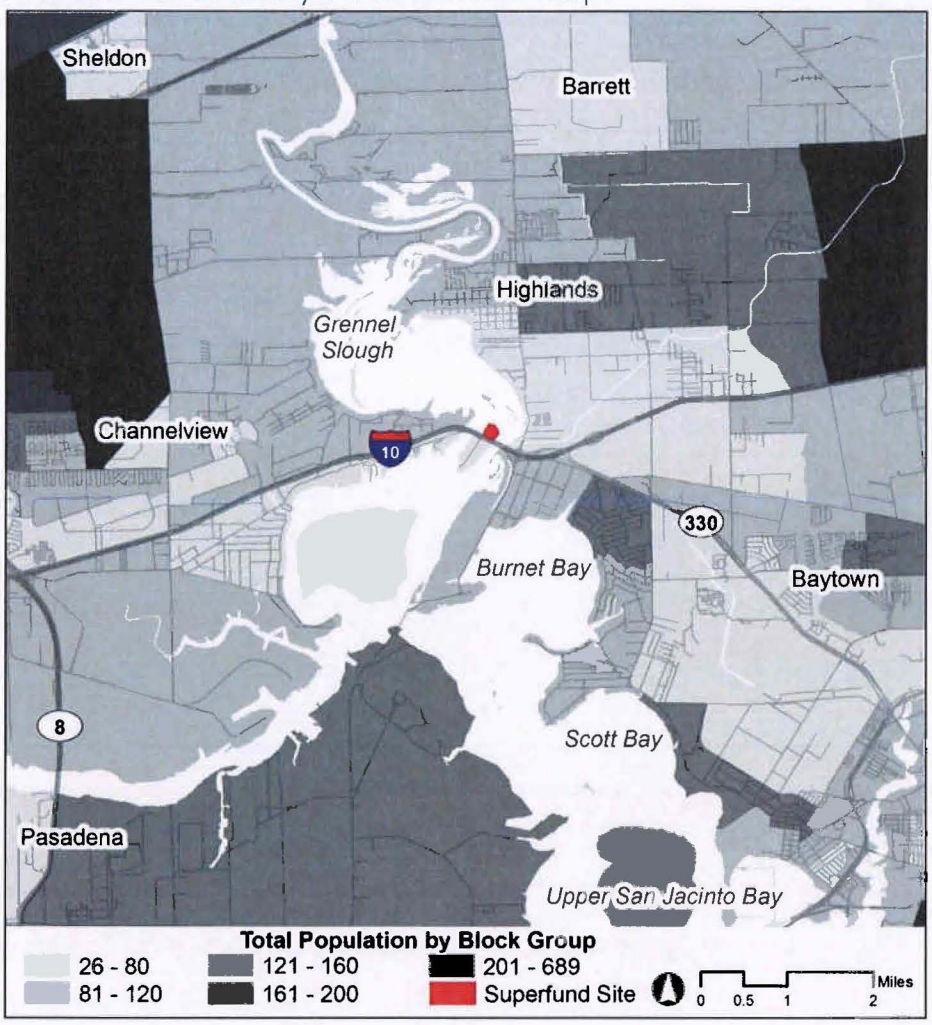
Yoskowitz, D. W., Gibeaut, J., & McKenzie, A. (2009). The Socio-Economic Impact of Sea Level Rise in the Galveston Bay Region. Corpus Christi, TX: A report for the Environmental Defense Fund. Harte Research Institute for Gulf of Mexico Studies, Texas A&M University. Available online at http://seg. tamucc.edu.

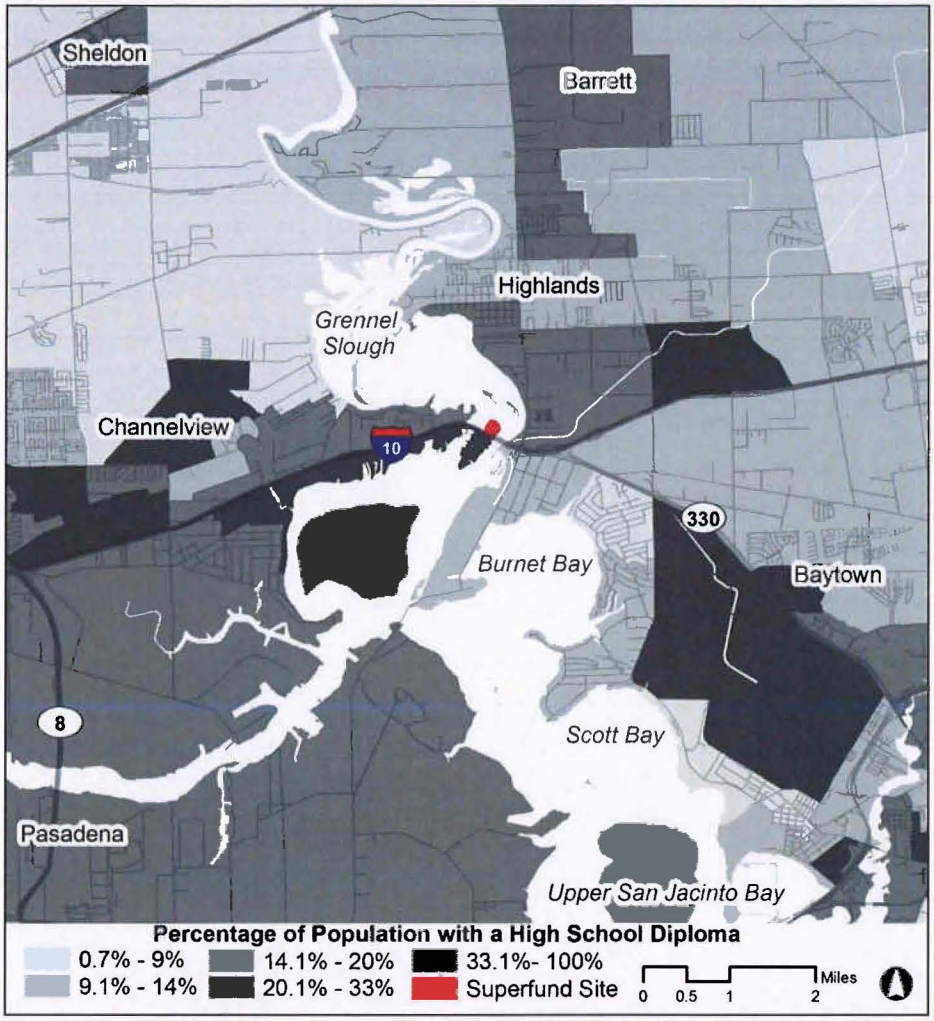
Warner, N. N., & Tissot, P. E. (2012). Storm flooding sensitivity to sea level rise for Galveston Bay, Texas. *Ocean Engineering 44*: 23-32.

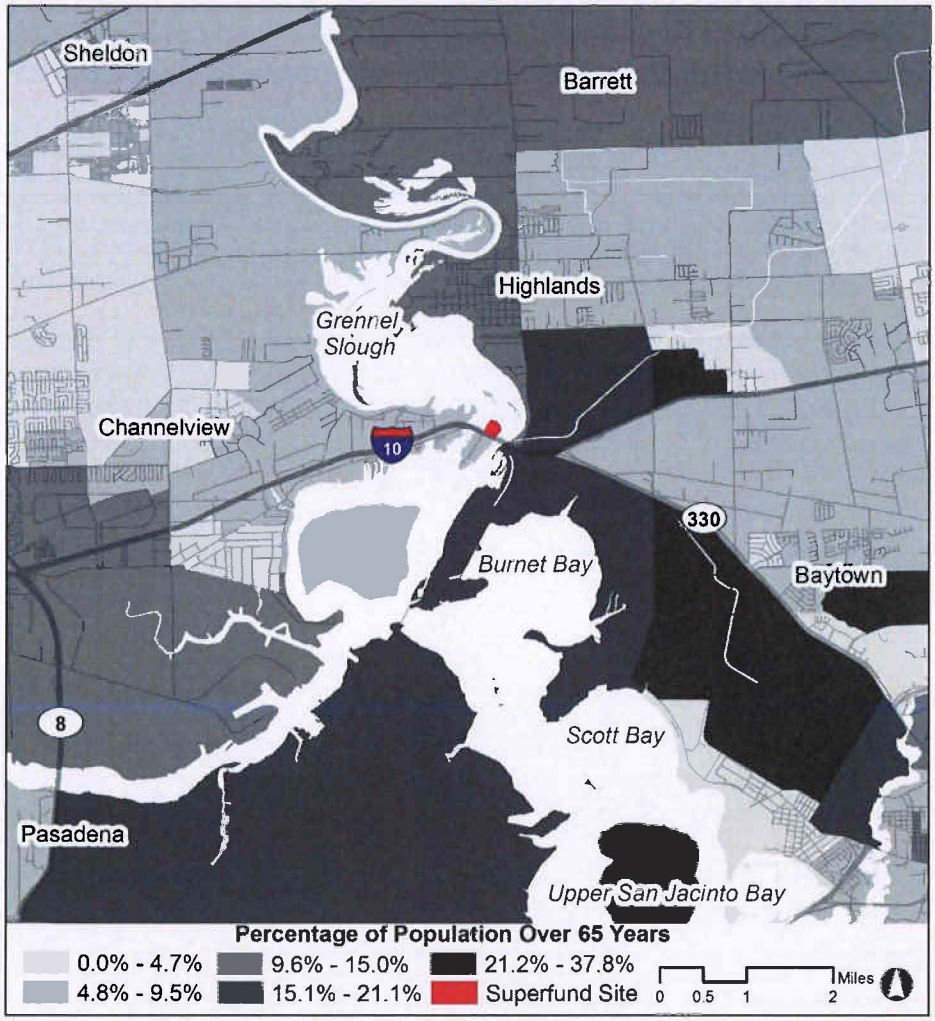
Zahran, S., S. D. Brody, W. G. Peacock, A. Vedlitz and H. Grover. (2008). Social vulnerability and the natural and built environment: a model of flood casualties in Texas. *Disasters* 32(4): 537-560.

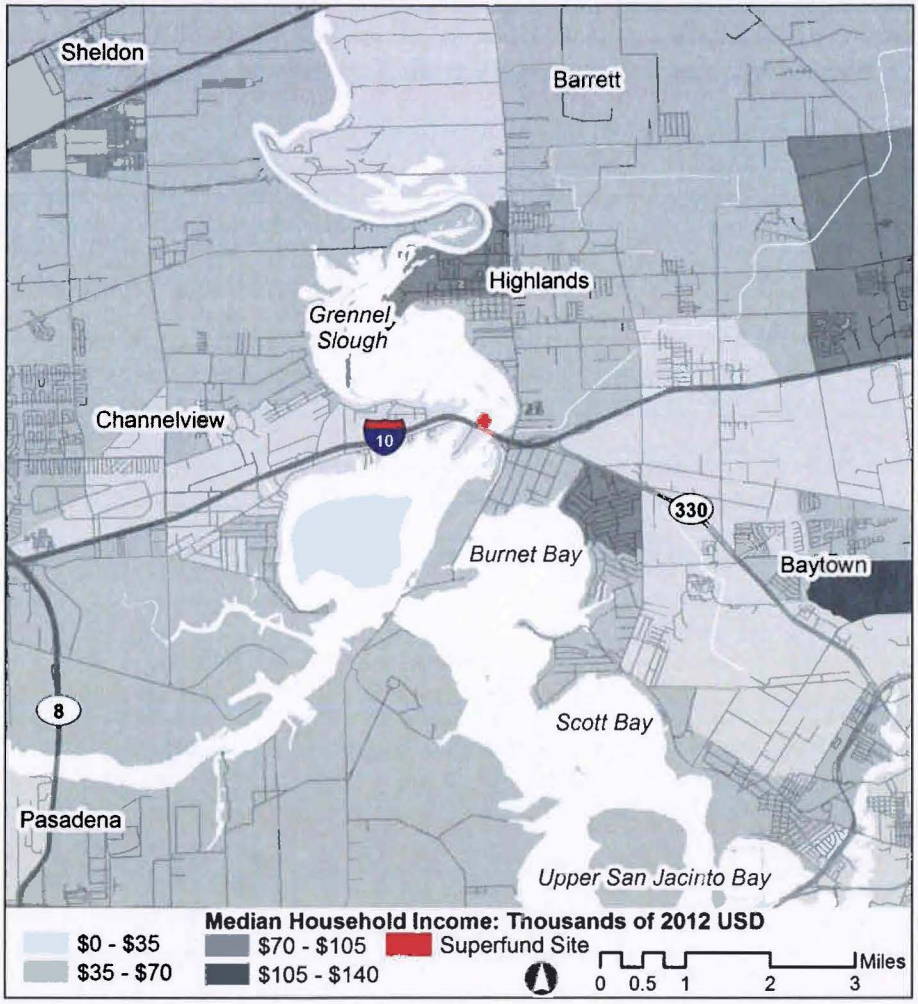
APPENDIX

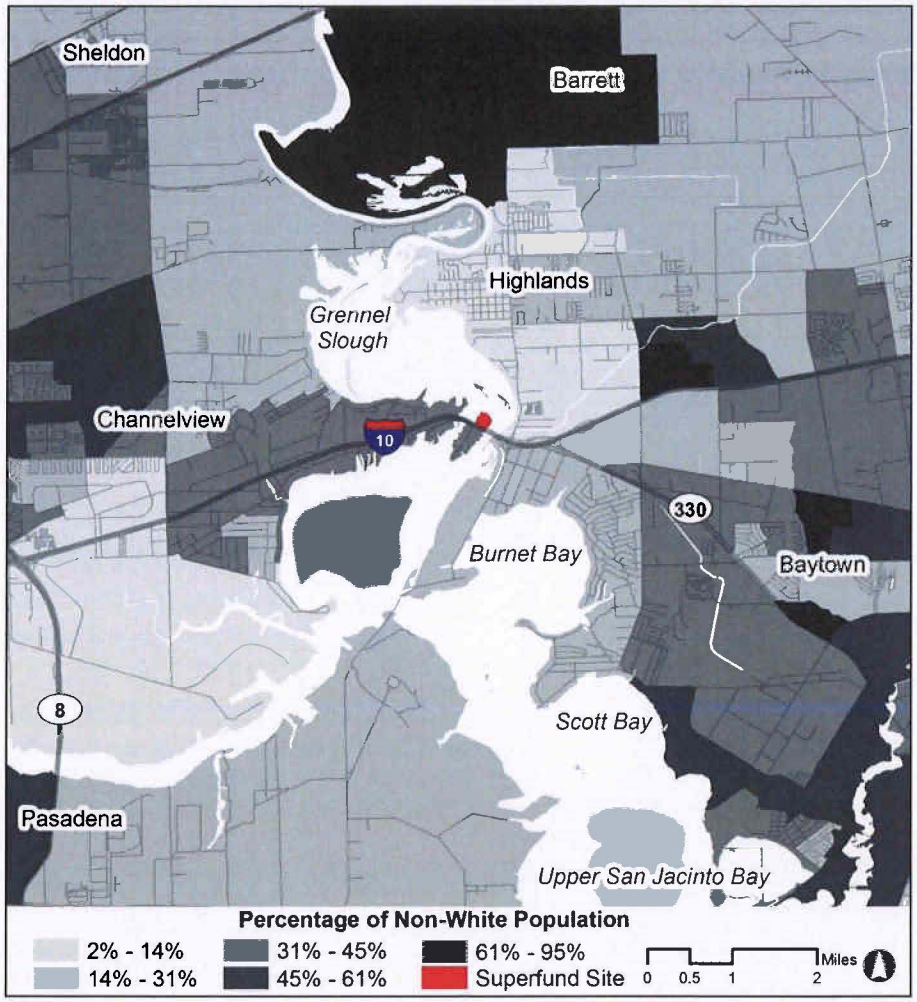
A. Social Vulnerability Index Variable Maps



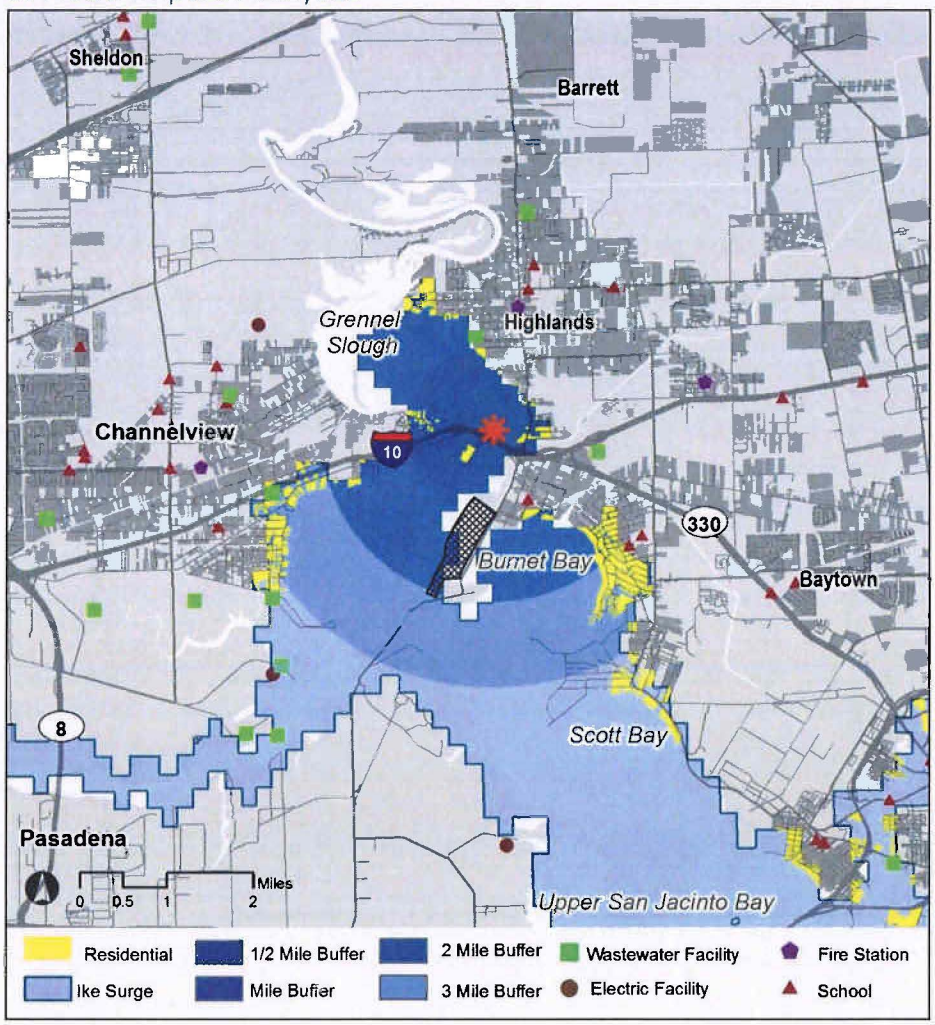

Sheldon
Barrett
Highlands
Grennel Slough
Channelview
10
330
Burnet Bay
Baytown
8
Scott Bay
Pasadena
Upper San Jacinto Bay
Percentage of Population with a High School Diploma
0.7% - 9%
9.1% - 14%
14.1% - 20%
20.1% - 33%
33.1%- 100%
Superfund Site
0 0.5 1 2
Miles


Sheldon
Barrett
Highlands
Grennel Slough
Channelview
10
330
Burnet Bay
Baytown
8
Scott Bay
Pasadena
Upper San Jacinto Bay
Percentage of Population Over 65 Years
0.0% - 4.7%
4.8% - 9.5%
9.6% - 15.0%
15.1% - 21.1%
21.2% - 37.8%
Superfund Site
Miles
0 0.5 1 2

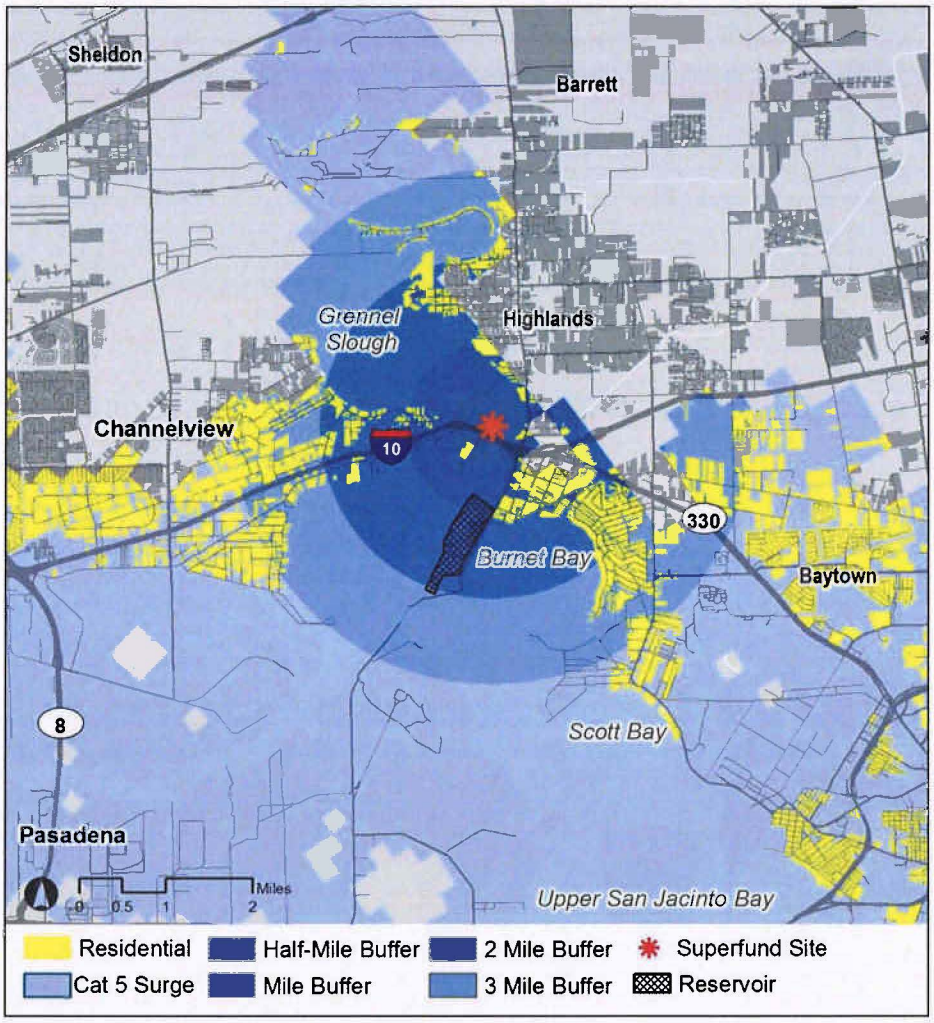

Sheldon
Barrett
Highlands
Grennel Slough
Channelview
10
330
Burnet Bay
Baytown
8
Scott Bay
Pasadena
Upper San Jacinto Bay
Median Household Income: Thousands of 2012 USD
$0 - $35
$35 - $70
$70 - $105
$105 - $140
Superfund Site
0 0.5 1 2 3
Miles


Sheldon
Barrett
Highlands
Grennel Slough
Channelview
10
330
Burnet Bay
Baytown
8
Scott Bay
Pasadena
Upper San Jacinto Bay
Percentage of Non-White Population
2% - 14%
14% - 31%
31% - 45%
45% - 61%
61% - 95%
Superfund Site
0 0.5 1 2
Miles

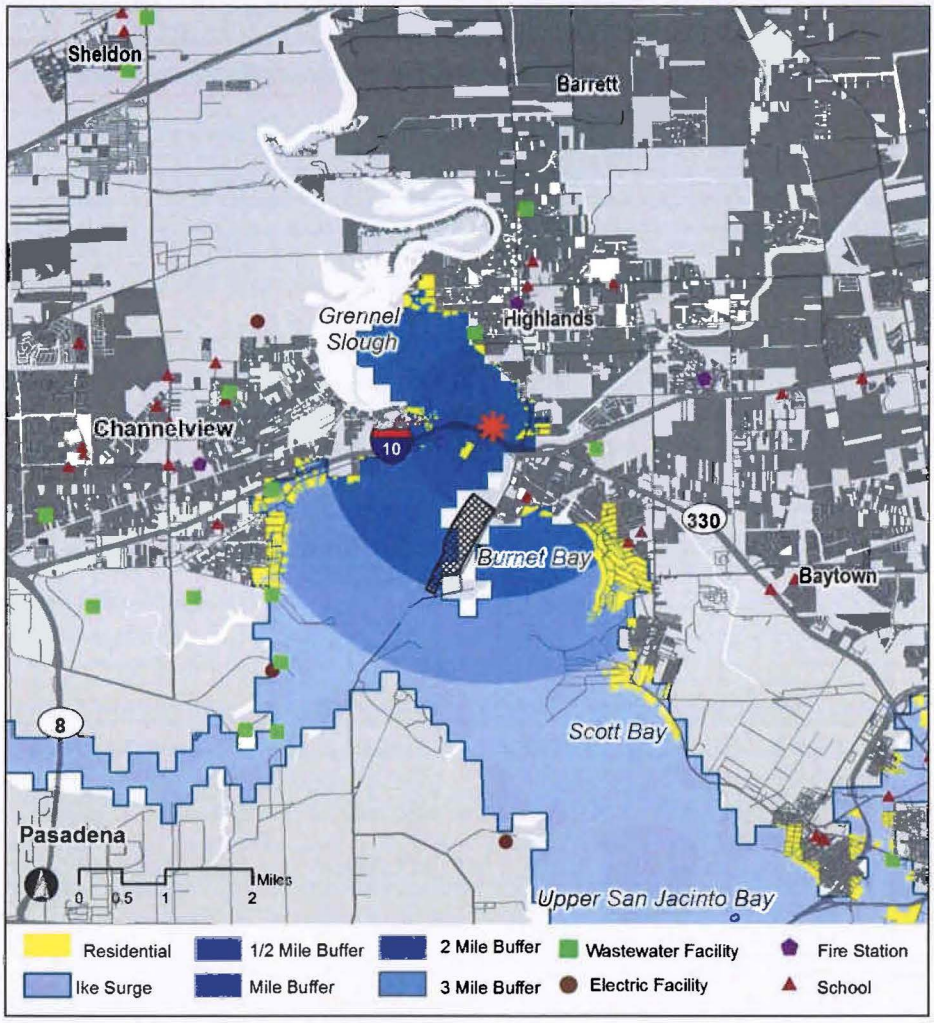
B. Flood Impact Analyses



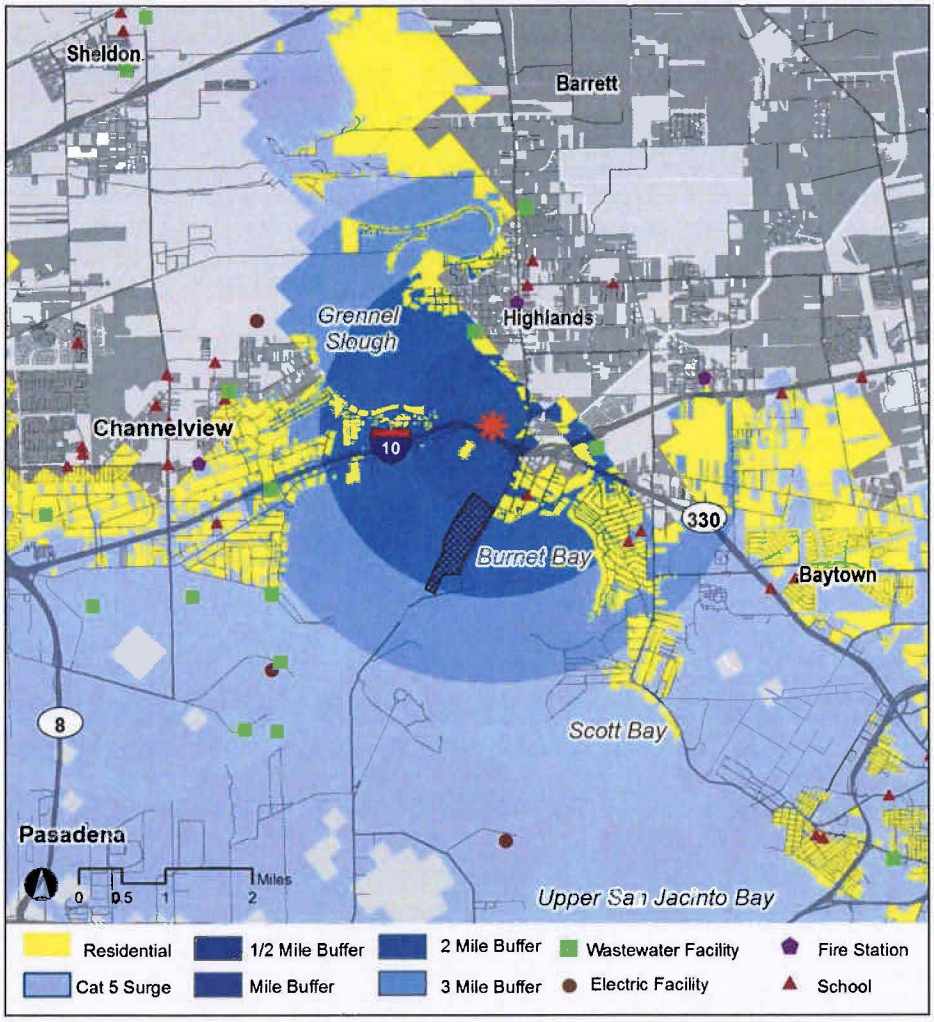
Current Residential Land Use Ike Inundation



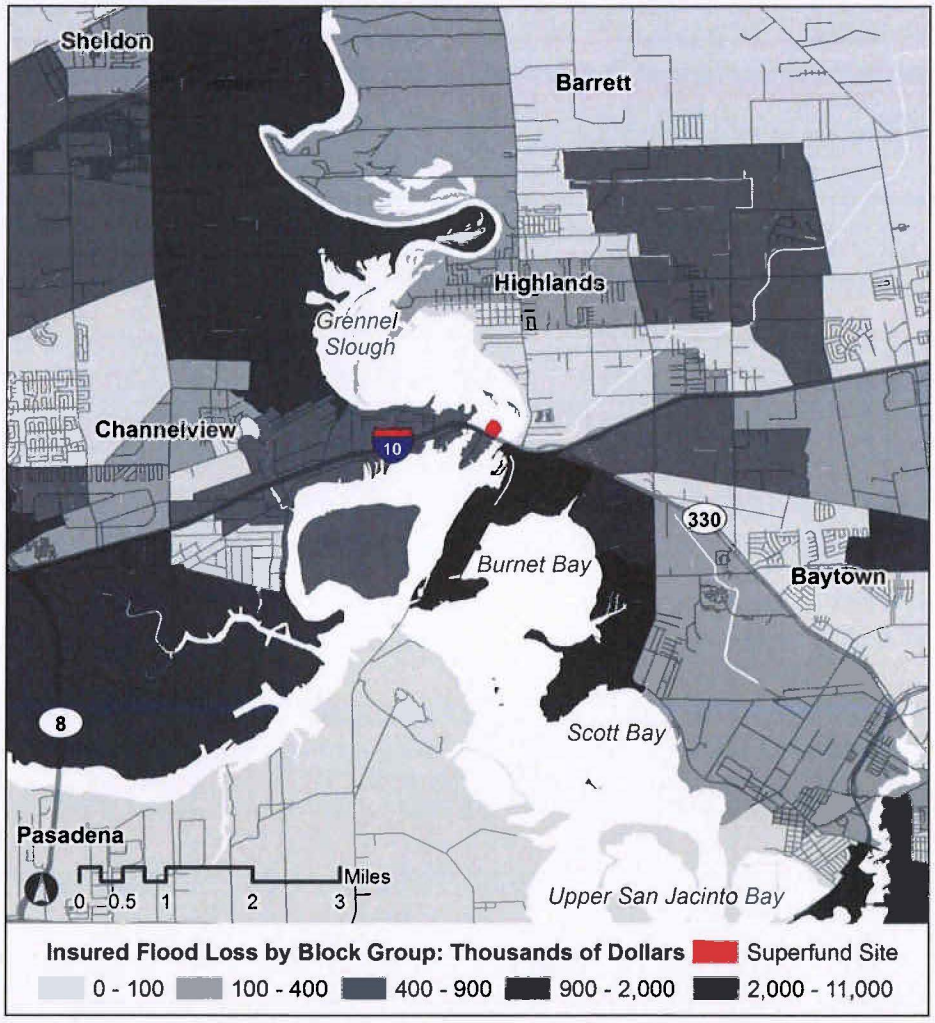
Current Residential Land Use Category 5 Inundation



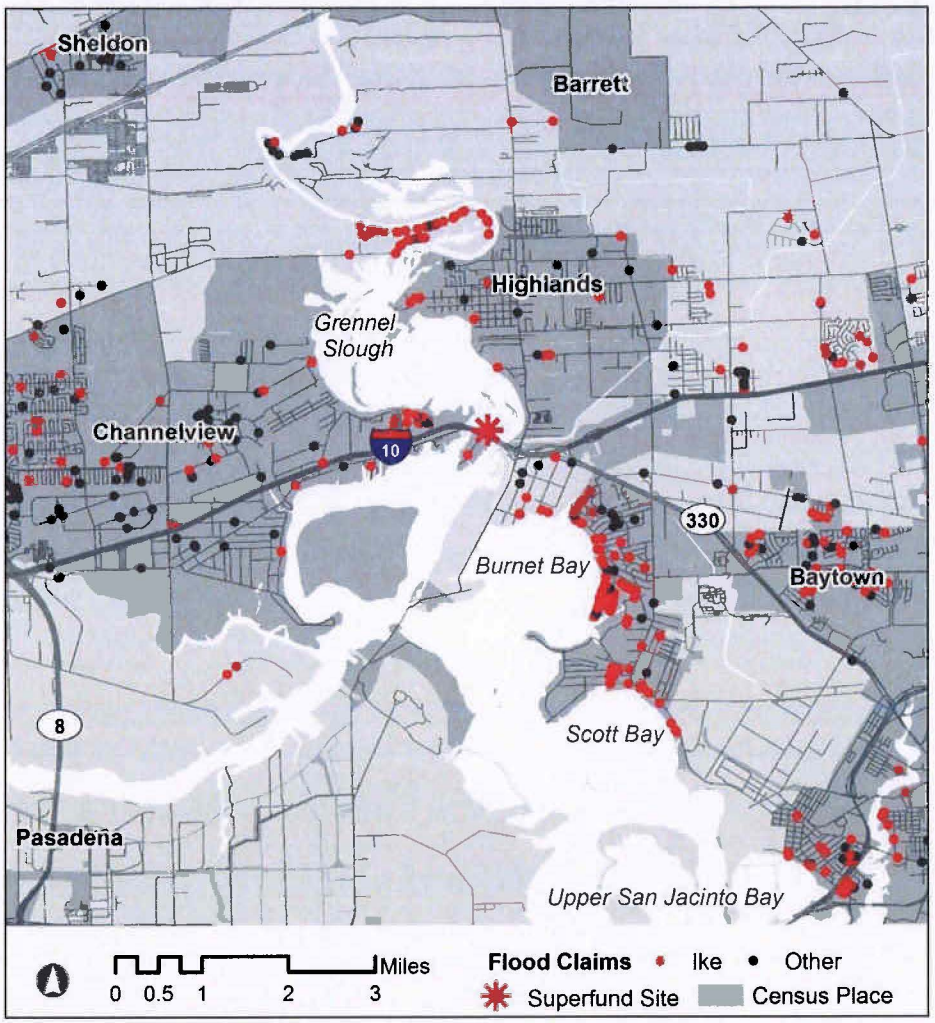
Future Residential Land Use Ike Inundation



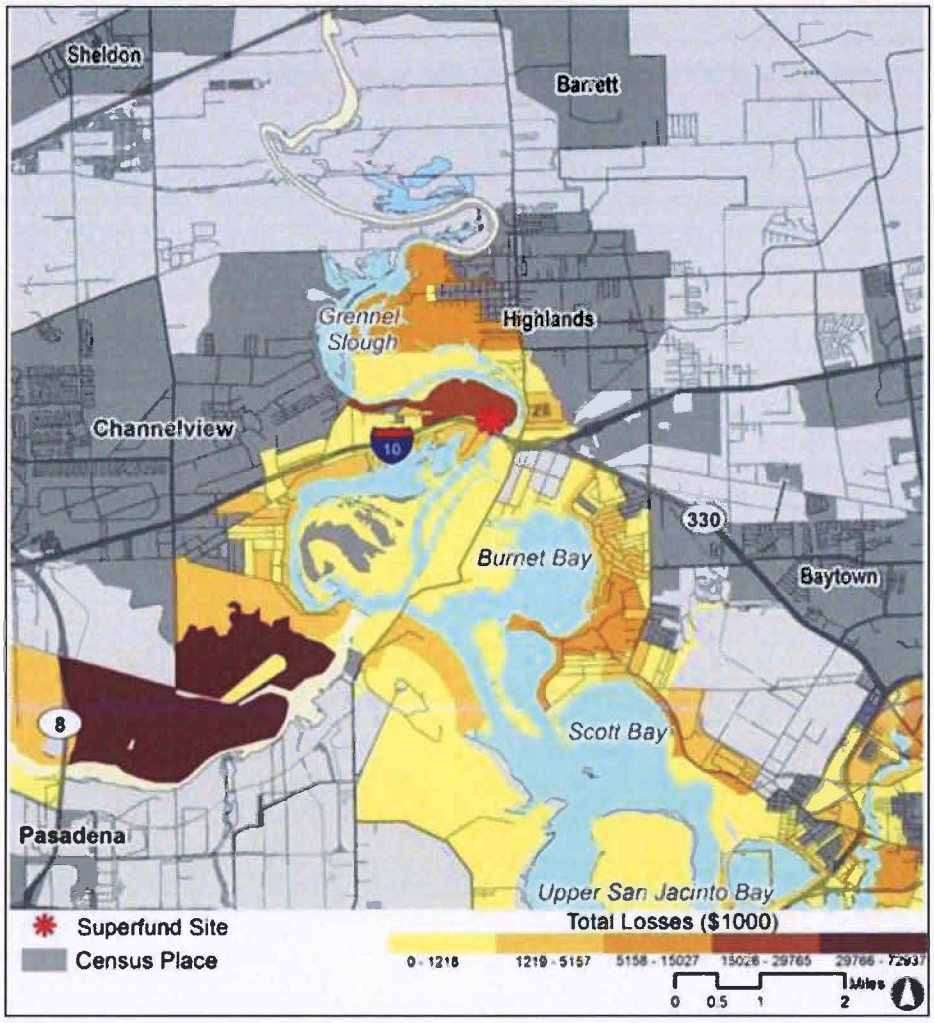
Future Residential Land Use Category 5 Inundation



Insured Residential Flood Loss by Census Block Group, 1999 to 2009.



Insured Residential Flood Loss, 1999 to 2009



HAZUS-MH loss estimation for a synthetic Hurricane Ike scenario