SOAH DOCKET NO. 582-20-1895
TCEQ DOCKET NO. 2019-1156-IWD

IN THE MATTER OF THE	**§**	**BEFORE THE STATE OFFICE**
APPLICATION OF PORT OF	**§**	
CORPUS CHRISTI AUTHORITY OF	**§**	**OF**
NUECES COUNTY FOR TPDES	**§**	
PERMIT NO. WQ0005253000	**§**	**ADMINISTRATIVE HEARINGS**

PORT ARANSAS CONSERVANCY'S
WRITTEN CLOSING ARGUMENTS ON REMAND

APRIL 12, 2022

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Despite being given ample opportunity to correct the many errors and unanswered questions after the first hearing, the Port of Corpus Christi Authority of Nueces County (Port) still has not presented an Application which could be granted.

The Port still cannot get right the most basic information about the Application, asserting that the depth of the channel at the outfall location is 90 feet, when even its own bathymetry maps show the depth as 65 feet. Further, the Port has indicated the depth of the discharge would be approximately 65 feet, yet that is the channel bottom depth at the outfall location identified by the Port in the Application. It is truly remarkable that the Port continues to have these most basic points wrong after all of the opportunities to get this right.

The United States Environmental Protection Agency (EPA) has recognized the deficiencies and filed interim objections to the Draft Permit with the Texas Commission on Environmental Quality (TCEQ or Commission). The errors and omissions in the Application are shocking and include the following, among others:

- The Port has not presented accurate and consistent information about the outfall location;
- The Port has not presented evidence demonstrating there will be no significant lethality to aquatic life, including red drum;
- The Port's modeling is not conservative, does not comply with the CORMIX User Manual, and assumes mixing of effluent where it indisputably will not occur;
- The Port has not accounted for the actual conditions at the discharge location identified in the Application, reversing its prior opinions and now ignoring evidence of the existence of any significant eddy in the area;
- The Port and the TCEQ misclassified the facility as a minor discharge under the EPA's worksheet, when EPA has determined it is a major discharge; even the TCEQ's own witness indicated that a major discharge is subject to heightened review, which this Application has not undergone.

Of these, perhaps the most shocking revelation is that the Port, for the first time in rebuttal testimony, concedes that the outfall location identified in the Application is not accurate. Specifically, the Port's rebuttal testimony states that the precise location of the diffuser has not been established. Yet all of the evaluation and modeling by both the Port and Executive Director (ED) of the TCEQ depends on both a specific outfall location and depth of the discharge, i.e., the 20 diffuser ports. The TCEQ Application requires identification of that outfall location through latitude and longitude identifiers going to six decimal places, which gives a precise location within 4 inches. The Port is bound by its representations in the Application and cannot, on rebuttal, now back away from such representations. This alone should result in denial of the Application.

The Port appears to believe that none of this matters because it can just pin down the details later. That is not consistent with the issues referred by the Commission to be addressed by the Administrative Law Judges (ALJs), nor does it comport with the requirements of the permitting process, which include an antidegradation review, CORMIX modeling, requirements for public notice and comment, and this contested case proceeding. The ALJs are required to answer the questions referred by the Commission and they are required to answer them based on the evidence in the record related to the Application and Draft Permit as they currently exist. Yet, the record demonstrates giant gaps and unanswered questions about the proposed facility, and the evidence clearly indicates the potential for serious harm to aquatic life if the permit is granted.

This case presents a stark choice: Will the clear proof of the deficiency in the Port's evidence in this record and the positions of EPA for this first-of-its-kind facility in Texas be ignored, as the Port argues they can. That result would clearly have significant adverse impacts on the long-term health of aquatic life or the marine environment of the Corpus Christi Bay system.

PAC has presented testimony from ten different, eminently-qualified scientists who have testified that this permit has not been shown, with any level of confidence, to be protective of the marine environment. They note the sensitive environmental nature of the waters and the potentially disastrous effects to that environment if this permit were issued. Plainly and simply, under any diligent objective analysis, this permit must be denied.

I. BACKGROUND FACTS

In this case, the Port seeks a wastewater discharge permit for Texas's first marine-water desalination plant. The facility is proposed to be located on Harbor Island, which sits inside the Redfish Bay State Scientific Area (RBSSA), with its discharge adjacent to it. The proposed facility will discharge roughly 100 million gallons per day of highly saline wastewater directly into the Aransas

Pass tidal inlet, an area that has been called "the heart – the engine" of the marine ecosystem for the region. Why is this area so critical? Because, as Dr. Brad Erisman testified in the first hearing, it is the most important, multi-species spawning site for the most economically valuable sportfishes in the entire region.[1] This is not just any water body; it is one of the most sensitive, yet productive, waterbodies in the United States. Knowledge of the features of the Aransas Pass tidal inlet and other contextual background facts are critical to the analysis of the issues referred by the TCEQ.

An important background fact to this case—which the ED inexplicably tried to keep from the ALJs—is that the EPA has significant concerns about this Application, has filed interim objections to the Draft Permit, has advised that TCEQ improperly characterized the discharge as minor when it is major, and has indicated that the permit will not be a valid NPDES permit unless and until TCEQ addresses the concerns raised by EPA in its interim objections.[2] While PAC recognizes that EPA's regulatory oversight is not an issue in this proceeding, this information is absolutely relevant because it gives additional credence to PAC's evidence on the issues referred by the TCEQ on remand. If EPA has agreed with PAC's experts on certain issues, that is additional evidence bolstering the credibility of PAC's experts in regard to those issues.

Moreover, the ED's testimony and actions in this case, especially in light of the EPA's determinations, reveal that the ED has stopped being an unbiased regulator and is acting as a total advocate for this Applicant—a role that should give the ALJs pause and reason to view the ED's evidence and arguments with considerable scrutiny. Even in the first proceeding, the ED did not concede that the permit was deficient until the ALJs determined such in the face of clear evidence. Then, and only then, did the ED reverse its advocacy for issuance of the permit and acknowledge the permit should not be granted but should be remanded. The ED appears to be continuing this approach in the face of clear evidence again that the Application is not accurate and the outfall and discharge information is unreliable.

II. DISCUSSION OF COMMISSION'S REFERRED ISSUES ON REMAND

In remanding this case to the ALJs, the Commission identified the specific issues to be addressed, each of which is discussed below.

[1] Ex. PAC-1 at 6:15-16. Dr. Erisman has a PhD in Marine Biology and is among the most experienced researchers in the world on essential fish spawning habitat. Ex. PAC-1 at 1:7-14.

[2] *See* Exs. PAC-59R and PAC-89R.

1. Remand Issue No. 1 - Significant Lethality Standard

As an initial matter, the Commission remanded for the ALJs to apply a different legal standard than the "no mortality" standard that witnesses for all parties, including the Port and ED, had previously testified applied.[3] Specifically, the Commission directed the ALJs to "apply the appropriate legal standard for non-numeric criteria found in 30 Texas Administrative Code § 307.6(e)(1) for evaluating the impacts to aquatic organisms that move through a zone of initial dilution" (ZID).[4] That standard states that "[a]cute total toxicity levels may be exceeded in a ZID, but there must be no significant lethality to aquatic organisms that move through a ZID."[5]

Thus, the Port is required to demonstrate that there will be "no ***significant lethality*** to ***aquatic organisms*** that move through a ZID." The highlighted language is important. The test is not whether there will be no significant lethality to particular species or life stages that exist within the channel. The rule requires that the evidence demonstrate there will be no significant lethality to "aquatic organisms" that move through the ZID. This means **any aquatic organisms**, including all species and life stages (such as larvae), that come into the ZID. The evidence clearly demonstrates that the Port failed to meet its burden of proof on this issue; moreover, the evidence affirmatively shows there will be significant lethality to aquatic organisms that move through the ZID.

The Texas Surface Water Quality Standards (TSWQS) do not define "significant lethality." Administrative rules, which have the same force as statutes, are construed in the same manner as statutes.[6] The rules of statutory construction require that a statute be interpreted in accordance with its plain meaning unless the language is ambiguous or the plain meaning leads to absurd results.[7] "The plain meaning of a word may be found in a simple dictionary."[8] Significant is defined as "having meaning" or "having or likely to have influence or effect; important."[9] This plain meaning is consistent with the use of the word "significant" throughout the TSWQS.[10]

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[3] PAC continues to assert that the "no mortality" standard is the correct standard under the law, but understands the Commission has already decided contrary on this issue. Unless and until the courts rule otherwise, PAC understands the "no significant lethality" standard is what the ALJs are applying on remand.

[4] Ex. AR-R 2 (Admin Record – Remand Tab G) at ¶I.1.

[5] 30 Tex. Admin. Code § 307.6(e)(1).

[6] *TPCIGA v. Morrison*, 212 S.W.3d 349, 353 (Tex. App—Austin, 2006, pet. denied).

[7] *Clark v. State*, Cause No. 10-18-00322-CR, 2020 Tex. App. LEXIS 9292, *5 (Tex. App.—Waco 2020, no pet.).

[8] *Id*.

[9] Merriam-Webster, Significant Definition & Meaning - Merriam-Webster, Mar. 30, 2022.

[10] "Significant" is used numerous times in the TSWQS in various contexts. *See e.g*., 30 Tex. Admin. Code §§ 307.3(a)(41), (50), (51), (54), (56)-(58), (71) ("significant long-term human consumption"), 307.4(j)(2) ("significant risk of ingestion"), 307.6(d)(5)(E), (e)(2)(A) ("significant potential for exerting toxicity"), 307.9(b) ("significant areas of a water body").

In conducting their analysis of the potential for significant lethality, PAC's experts considered whether the lethality would be meaningful. Dr. Greg Stunz testified that he understands significant lethality to mean mortality that has an effect on the sustainability of the population.[11] Scott Holt testified that, although significant lethality is a statistical term, he believed in the rule it was likely intended to mean "important or consequential."[12] Dr. Kristin Nielsen testified that significant can mean either statistically significant or biologically significant and, in this case, her testing addressed both.[13] Given the plain meaning of the term, and the testimony of the experts, PAC asserts that "significant lethality" is to be understood as lethality that is either statistically or biologically meaningful and likely to result in a meaningful effect on the population.

But, to be clear, the only population we are concerned with is the population in the ZID because that is the only population the rule is concerned with. And this must be the case, for consider a discharge into the ocean. If such a discharge immediately killed every creature it contacted within the ZID, it still would not likely meaningfully affect the population of the species in the entire ocean, given the vastness of the ocean. But, certainly the regulatory standards could not allow such a lethal discharge. The concern is not the impact upon a species as a whole, but rather the impact upon the specific organisms in the ZID. A discharge that kills a meaningful amount of those organisms in the ZID—regardless of how significant that number is compared to the number of aquatic organisms in the entire waterbody (or the hemisphere or the world?)—is significant. The Port's experts appear to miss this point.

Instead of addressing the rule as it is written, the Port instead focuses much of its evidence on the number of living things that will enter the ZID *relative to* the size of the entire "estuarine community that may be present in the receiving water of the channel."[14] But the rest of the channel is irrelevant to the standard set out in the rule. Rather, the rule focuses on the impact upon any aquatic organism moving through the ZID. And that is what the ALJs must evaluate.

Because it focuses on a standard of its own invention, the Port presents evidence that is simultaneously too narrow (because it ignores hundreds or thousands of species), and too broad (because it focuses on living things that never enter the ZID). If the ALJs apply the rule as it is written, this issue becomes somewhat easier to address because much of the Port's evidence can be relegated to interesting—but unrelated and generic—context that does not address the rule.

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[11] Remand Tr. Vol. 5 at 1072:11-1073:3.

[12] Remand Tr. Vol. 6 at 1319:1-10.

[13] Remand Tr. Vol. 7 at 1808:7-14.

[14] Ex. APP-LF-1R at 82:28-83:2 (Direct Testimony on Remand of Dr. Lance Fontenot).

Much of the Port's pre-filed testimony simply states, with no further explanation, that there will not be "significant lethality." However it is apparent the Port and its witnesses (1) adopted a conclusion first and then developed a rubric and cherry-picked data to support a pre-determined "right" answer, and (2) never meaningfully considered what would constitute "significant" death of the relevant population.[15]

The Port designated Dr. Lance Fontenot as the expert on the discharge's impact on marine life. His dissertation focused on snakes and frogs.[16] Most of his professional work consists of litigation support and expert witness work for oil and gas companies in the coastal zone of Louisiana.[17] Most of his work in Texas has been for industrial clients, and the investigation, assessment, and remediation of contaminated sites.[18] He has not visited Port Aransas and does not know the density of red drum larvae in the Corpus Christi Ship Channel.[19] He also believes (incorrectly) there is no functional benthic community near the outfall.[20] Dr. Fontenot performed an Ecological Risk Assessment (ERA) for the discharge and concluded that "there will not be an adverse effect to aquatic life, including early life stages."[21] Contradicting literally every other witness to testify on the topic of lethality for the past three years, Dr. Fontenot does not concede that even one aquatic organism will die due to increased salinity. The weight of evidence against Dr. Fontenot's conclusions is discussed in the next section. But, before turning to that, it is important to note a few thoughts about the Port's "no significant lethality" analysis.

One theme of the Port's case is that Dr. Fontenot's six "Target Species" have "tremendous fecundities."[22] He testified that for each female, which releases millions of eggs throughout the spawning season, only two eggs have to reach adulthood and spawn in order to maintain the population.[23] According to Dr. Fontenot, this matters because any mortality of organisms that pass

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[15] This was most apparent when Randy Palachek was cross examined and clearly had to "wing it" when asked to define "significant lethality." Remand Tr. Vol. 4 at 863:23-864:1 ("Let's say greater than a 20 percent or so effect."). And according to Palachek, "no" death might mean less than 20%, or it might mean "zero mortality," *id*. at 866:1-4.

[16] Ex. APP-LF-1R at 3:11-16.

[17] Remand Tr. Vol. 3 at 593:1-5.

[18] Remand Tr. Vol. 3 at 593:6-10.

[19] Remand Tr. Vol. 2 at 390:4-6, 393:7-11.

[20] Remand Tr. Vol. 2 at 404:25-405:6. Thus, Dr. Fontenot has no concern regarding an effluent plume along the floor of the channel, and its impact on things that live in the mud. *Id*. at 404:3-7.

[21] Ex. APP-LF-1R at 9:27-10:2. Among other things, the ERA is used for Superfund and Remediation sites after people have made bad decisions or accidents have occurred, or both. Ex. AP-LF-1R, at 12:21-29 (citing ERA Guidance for Superfund (USEPA 1997) & Conducting ERA at Remediation Sites in Texas (TCEQ 2018)).

[22] Ex. APP-LF-1R Rebuttal at 8:16.

[23] Ex. APP-LF-1R Rebuttal at 8:19-23.

through the ZID "will, in reasonable scientific probability, have no effect on this extraordinary fecundity."[24] It is unlikely that the Port and Dr. Fontenot are this confused. Rather, it appears they are intentionally setting up a straw man that can be easily knocked down. They basically say that no matter how many organisms die from exposure to the discharge – the surviving females of the six Target Species will continue to spawn millions of eggs. But what does this have to do with the level of mortality that will occur to aquatic organisms that pass through the ZID? Absolutely nothing.

While PAC disagrees with the following assertions by the Port, the reality is that they need not be disproven because they have no value whatsoever to the proper inquiry under the rule:

- A "substantial fraction of the planktonic stages that enter Aransas Pass from the Gulf of Mexico will reach the nursery habitats via Aransas Channel and Lydia Ann Channel and bypass the CCSC altogether;" and
- "[O]f the fraction that enters the CCSC, only a very small portion will pass through the narrow ZID in the immediate vicinity of the effluent diffuser."[25]

These themes were repeated often and vigorously, and can pretty much be ignored in relation to the first remanded issue.[26] Why? Because they are entirely irrelevant to the standard in the rule. What happens to aquatic organisms that never encounter the ZID is not germane to the issue of "significant lethality to aquatic organisms that move through a ZID." As discussed in the next section, most of the Port's evidence on the significant lethality issue is similarly irrelevant to the actual standard in the rule.

2. Issue A: Whether the Proposed Discharge will Adversely Impact: the Marine Environment, Aquatic Life, and Wildlife, Including Birds and Endangered or Threatened Species, Spawning Eggs, or Larval Migration.

In considering this issue, it must be noted there are two types of adverse impacts: (1) lethal impacts and (2) sub-lethal impacts. PAC first addresses lethal impacts, then turns to sub-lethal impacts.

A. There Will be Significant Lethality in the ZID.

1. Much of the Port's Evidence is Irrelevant or Unreliable.

First, it is important to remember that the Port has the burden of proving, by a preponderance of the evidence, that there will be no significant lethality in the ZID. The Port's evidence is clearly

[24] Ex. APP-LF-1-R Rebuttal at 8:2-27. Dr. Fontenot uses the phrase "reasonable scientific probability" quite often and loosely. It is the classic expert's *ipse dixit* that is fatal under the *Robinson* standard for the admissibility of expert testimony.

[25] Ex. APP-LF-1-R Rebuttal at 9:22-27.

[26] Taken collectively, these themes appear to be a re-packaging of the Zone of Passage theory that the Port posited in the first merits hearing. This theory has already been discounted by the ALJs. *See* 02/05/2021 Proposal for Decision at 65.

lacking in this regard. The Port has produced a huge volume of testimony, exhibits, and supporting literature on the existing marine environment, salinity, and six Target Species. The overwhelming majority of it is like fast food – abundant and low quality. It appears that the intent was to overwhelm the ALJs with the sheer volume of information. But, in fact, very little of this evidence is actually relevant to the concerns raised in this case.

For example, Dr. Fontenot offers a lot of data and opinions regarding eggs and adults but these two life stages, especially for red drum, have not been identified as a significant cause of concern for Protestants. Dr. Fontenot has selected the Eastern Oyster as one of his Six Target Species, and says they appear to be "the least tolerant to high salinities." But that doesn't matter because "oyster reefs do not occur at the depths (60 ft) of a navigation channel bottom within the area of the Outfall."[27]

Dr. Fontenot repeatedly asserts in his testimony and exhibits that "EPA has provided salinity levels that reflect acceptable changes in salinity for the protection of habitats and estuarine organisms."[28] In fact the EPA "Gold Book" does not have any regulatory impact.[29] The ten pages on salinity touch on estuarine species only briefly, citing to a 1953 paper and 1968 NTAC Report.[30] The 4 ppt "variation permitted" is linked to natural salinity of 13.5 to 35 ppt to protect "desirable food plants and other habitat-forming plants"[31] – which do not exist in the area of the outfall.

But let's assume for the sake of argument that Dr. Fontenot's 4 ppt (or 10% increase) over ambient salinity is a relevant limit. The only way to conclude that benchmark will not be exceeded is by ignoring the ED's CORMIX results, because they reveal the following: Salinity at the edge of the ZID will increase as much as 4.11 ppt in some cases and 12% in others.[32] So, the ED's evidence reveals an exceedance even of Dr. Fontenot's supposed relevant standard. But, in addition to that, let's consider some other conclusions by Dr. Fontenot.

It is not disputed that red drum are a recreationally and economically important species and that the CCSC is an important corridor for young larvae that must get from the Gulf to the estuarine seagrass

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[27] Ex. APP-LF-1R at 47:7-10. It begs the question, why then was the Eastern Oyster even selected as one of the Six Target Species? And while this testimony was offered without a hint of irony, this area used to be one of the most productive oyster beds in Texas. Human choices and activity have completely eliminated them. Remand Tr. Vol. 1 at 95:19-22.

[28] Ex. APP-LF-1R at 55:24-25.

[29] Ex. PAC-86R at 2 of 395 (PDF pages of un-numbered exhibit).

[30] National Technical Advisory Committee to the Secretary of the Interior.

[31] Ex. PAC-86R at 264 of 395. TPWD and the GLO noted and rejected the salinity limits of 4 ppt or 10% over ambient. Ex. PAC-7 at 19 (Table 1).

[32] Ex. PAC-65R.

beds to survive. Step 2 of Dr. Fontenot's ERA is "Exposure Assessment."[33] Exhibit EA 6-1 reflects Dr. Fontenot's Evaluation of the Exposure Potential of Estuarine Indicator Species/Life Stages.[34] He concludes that the Exposure Potential to Desalination Effluent for Red Drum Larva is "NA" or "not applicable."[35] **What?** This is clearly wrong, as the clear weight of the evidence reflects that red drum larvae will be found in the ZID and exposed to desalination effluent. But apparently Dr. Fontenot believes that red drum larvae will magically not come into any contact with the desalination effluent.

Step 3 of Dr. Fontenot's ERA is "Effects Assessment."[36] Exhibit EFA 2-1 "summarizes the relative abundance and salinity tolerances for the six target aquatic species in Aransas and Corpus Christi bays, Texas.[37] Red Drum larvae are "not present."[38] **Again – what?** This conclusion and the prior one show how utterly unreliable Dr. Fontenot's analysis is. But let's keep going.

2. The Port's Own Evidence Shows Significant Lethality.

Step 4 of Dr. Fontenot's ERA is "Risk Estimation." First, it must be noted that the exhibits in Appendix 7, created and relied on by Dr. Fontenot, report on modeled salinities at 84.3 meters from the discharge. This is half the length of the chronic aquatic life mixing zone and reflects nothing about salinity within the ZID or within the mixing zone.[39] Of the many sources cited by Dr. Fontenot in Appendix 7, there is exactly *one* that reports on red drum larvae mortality due to salinity: the Thomas paper.[40] From the Thomas paper, Dr. Fontenot extracts certain data for red drum larvae: (1) a 50 ppt, 24 hour post-hatch NOEC; and (2) 60 ppt, 24 hour post-hatch LOEC.[41] But he conveniently ignores other important information from the very same Thomas paper he relies on. Specifically, the Thomas paper identifies the LD50 (i.e., where half of subjects died) for red drum larvae spawned at 32 ppt. This is probably the most relevant piece of information from the report because it represents the most comparable circumstances and concerns for the present case, with background salinities of comparable

[33] Ex. APP-LF-1R at 11:29-12:3.

[34] Ex. APP-LF-1R, attached Ex. EA 6-1.

[35] Ex. APP-LF-1R, attached Ex. EA 6-1.

[36] Ex. APP-LF-1R at 12:4-6.

[37] Ex. APP-LF-1R at 16:24-25.

[38] Ex. APP-LF-1R, attached Ex. EFA 2-1.

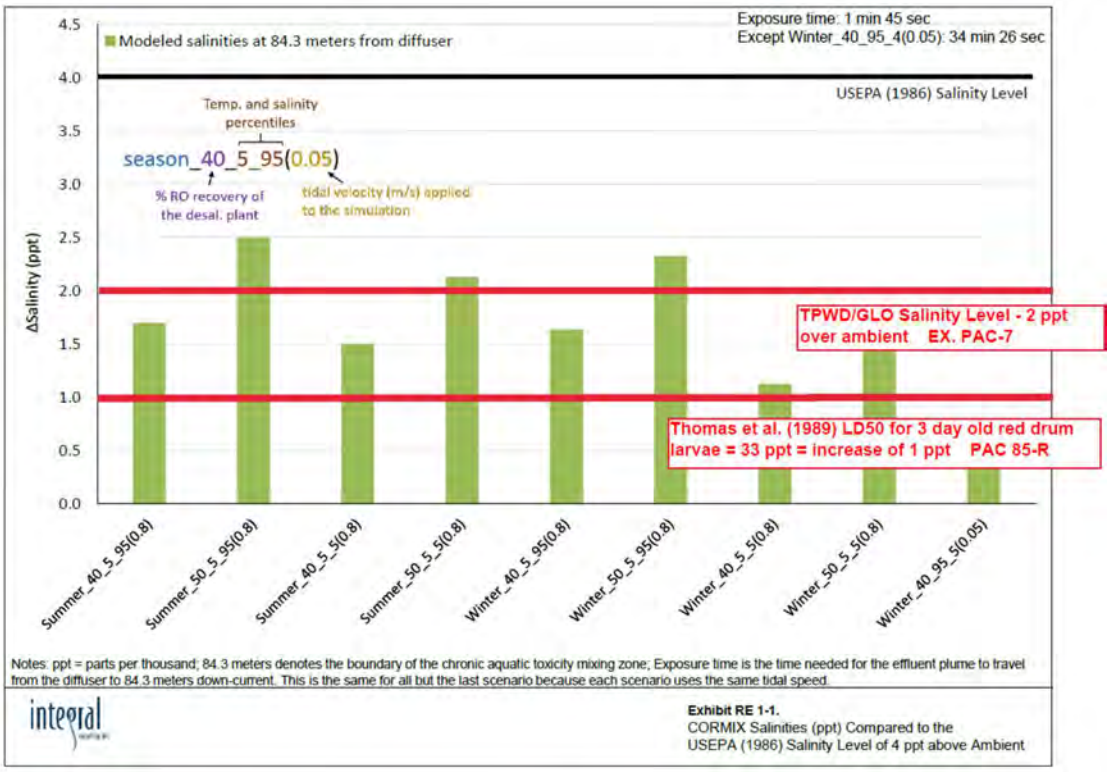
[39] "[P]otential adverse impacts within the ZID and mixing zones, such as lethality, could have cascading effects that impact the water body's designated use and quality." *See* 02/05/2021 Proposal for Decision at 41.

[40] Dr. Fontenot cites to this authority as Thomas et al. 1989. It is Exhibit PAC-85R.

[41] Ex. APP-LF-1R, attached Exs. RE 1-3, RE 1-4. After careful review, PAC cannot determine how Dr. Fontenot derived these numbers from the Thomas paper. The paper does not contain the phrase "No Observable Effect Concentration" (NOEC) or "Lowest Observable Effect Concentration" (LOEC).

levels. That data shows that for red drum larvae, the LD50 is (1) 41 for 1-day old larvae; (2) 33 for 3-day old larvae; (3) 42 for 5-day old larvae; (4) 45 for 7-day old larvae; and (5) 45 for 9-day old larvae.[42] These numbers do not appear in Dr. Fontenot's pre-filed testimony or any of his charts or graphs, despite the fact they are clearly the most relevant data from the Thomas paper. These numbers show that red drum larvae can be expected to die in significant numbers from the proposed discharge, as the modeling reveals expected salinity levels for which significant red drum larvae died, as shown in the Thomas paper.

The chart below reflects Dr. Fontenot's exhibit, edited by PAC solely to add in red (1) the TPWD/GLO salinity standard of 2 ppt over ambient, and (2) the Thomas paper's LD50 for 3-day old red drum larvae of 33 ppt (1 ppt over spawning salinity).



Why or how Dr. Fontenot discounted and elected to omit this highly relevant data from his Exhibits RE 1-1, RE 1-2, RE 1-3, and Re 1-4 is unknown. But, in addition to that, Dr. Fontenot and the Port also ignored the data below regarding mortality from the Thomas paper:

- Atlantic Croaker larvae (1) had narrower limits for salinity tolerance than fertilized eggs; (2) 3-day old survival was only high in the range of 10 to 25 ppt; and (3) survival was severely reduced at salinities greater than 30 ppt.[43]

[42] Ex. APP-LF-1R, attached Ex. EFA 1-3, page 2 of 3.

[43] Ex. PAC 85-R at 32 of 85 (PDF pagination of the complete Exhibit), 41, 47, 48.

- Half of 3-day old spotted seatrout larvae, reared at 32 ppt, died at 43 ppt.[44]
- "Salinity limits for no salinity related mortality during the pelagic larval stage spawned in near full strength sea water and reared under optimum temperature conditions" are (1) 15-33 ppt for red drum and Atlantic croaker, and (2) less than 10 to 40 ppt for spotted seatrout.[45]

Again – the Thomas paper is the *only* source cited for red drum larvae salinity tolerance in Fontenot's Exhibits RE 1-3 and RE 1-4 and *none* of this data is mentioned. But all of it supports a finding that there will be significant lethality to aquatic organisms that move through the ZID.

3. PAC's Experts Overwhelmingly Demonstrate Significant Lethality.

In addition to the evidence above, the voluminous testimony from PAC's expert witnesses show this as well. Dr. Stunz, Dr. McKinney, Dr. Nielsen, Dr. Schlenk, Dr. Esbaugh, and Mr. Holt **all** testified there is expected to be significant lethality from the proposed discharge.[46] Five of these are the foremost experts on the specific waterbody and aquatic life species in issue, and one of them (Dr. Schlenk) is one of the foremost experts in the world on the impacts of desalination discharges. Moreover, although he is not one of PAC's experts, Dr. James Tolan with TPWD testified he expected increased mortality from the salinity in the discharge.[47]

Of the 24 testifying witnesses, only one has real world experience with the mortality of red drum larvae undergoing an abrupt salinity change—Dr. Stunz—who testified that:

> In my research I have transported early life phases (e.g., 20-30 day old and younger) red drum from Texas Parks and Wildlife holding tanks into specially designed, aerated coolers for transport to our research laboratories. Early in the experimental process, we discovered the extraordinarily sensitive nature of these early life phases to even minor salinity changes, as transferring the red drum from the tanks into water we prepared for transport sometimes resulted in a 100% mortality rate. I stress that we planned and prepared carefully for the successful transport and survival of these specimens; but virtually all of them died. We determined that the death rate could be attributed to modest differences in salinity between the TPWD tanks and our coolers. We began transporting the very young red drum in TPWD water collected from the hatchery (their acclimated source water) and virtually eliminated mortality caused by transport other than from physical damage (e.g. netting damage).[48]

[44] Ex. PAC 85-R at Fig. 18.

[45] Ex. PAC 85-R at Fig. 24.

[46] Their specific testimony is set out and cited further below.

[47] Ex. PAC-55R at 70:15-71:7.

[48] Ex. PAC-52R at 23:3-14. The incredible sensitivity of red drum larvae is one reason they are not an EPA standard test species.

Having witnessed firsthand how abrupt salinity change can cause mortality of red drum larvae, Dr. Stunz performed a number of calculations to estimate the possible scale of death caused by the outfall.[49] Assuming mortality of only 25% (either immediate or delayed), he determined that represents 767,552 dead red drum larvae per day on the *incoming* tide only.[50] For more abundant shrimp larvae, the comparative number is 46,053,129.[51] For even more abundant zooplankton, it is 4,605,312,863.[52] And these are only three of the many species found near the outfall.[53]

Unlike many other witnesses, Dr. Stunz is actually very familiar with this waterbody. As for the contention that any organism's exposure will be brief, he testified:

> We've been sort of referring to that area like the – there's a flow of water either coming in and out, and the larvae will just literally move through that ZID and effluent area. I don't think that's the case at all. . . . we call it the washing machine . . . to think that we could model something like that in my opinion is – is – it's just so dynamic, so the larvae will be coming in, they'll be going back and forth, they'll be up and down in the water column . . . They're not going to float at the surface. . . . last night, there was several hours of slack tide. We don't know what will happen during that slack tide. And then even if they make it through, they've still got to come back out, that they could be exposed again. I'm not saying the modelers here are bad or not experts by any means. I think they're smart. But to think that we have the scientific capability to model such a dynamic place that you oftentimes can't even navigate through, I just don't think that is realistic.[54]

And as for the contention that the abrupt decrease back to ambient salinity will be harmless, Dr. Stunz testified to the contrary:

> [T]hey're still facing an abrupt change. They've going from whatever ambient is to whatever the higher salinity is, and we seem to not be talking about they come out of it. So they've got to deal with osmoregulation on both sides. . . . They might be trying really hard to osmoregulate and then all of a sudden they're out and they're like, oh, wait a minute, now I've overcompensated, and they've got to reverse that process.[55]

The only Ph.D. toxicologist to testify and the only witness to conduct laboratory testing on red drum larvae is Dr. Kristin Nielsen. She has never before testified as an expert witness; her research has been peer reviewed by third parties, being submitted both to a scientific journal for publication and to

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[49] Ex. PAC-52R GS-2 at 3.

[50] Remand Tr. Vol. 5 at 1244:1-13, 1245:11-20, 1246:1-21, 1248:2-7.

[51] Ex. PAC-52R GS-2 at 4.

[52] Ex. PAC-52R GS-2 at 5.

[53] Ex. PAC-68R

[54] Remand Tr. Vol. 5 at 1063:25-1065:15.

[55] Remand Tr. Vol. 5 at 1237:23-1239:11.

Dr. Matthew Alloy, with EPA.[56] Dr. Nielsen's "follow up" LC50 test (which, it is important to note, was conducted on red drum spawned in salinities of 35 ppt) revealed:

- A No Observable Effect Concentration (NOEC) of 35 ppt;
- A Lowest Observable Effect Concentration (LOEC) of 37 ppt; and
- An LC50 (death to half of subjects) of 37.7 ppt.[57]

This means that the only salinity that did NOT cause significant lethality to red drum larvae was the 35 ppt control treatment, which is the same salinity level they were spawned in. With a LOEC of 37 ppt, Dr. Nielsen's results demonstrate that a 2 ppt increase in salinity will potentially cause significant lethality within the ZID.

Kirk Dean's analysis, on behalf of the Port, concluded that relevant summer water salinities in the receiving waters currently are usually below 37.0 ppt.[58] An increase of ambient salinity by 2 ppt would alter the receiving environment so that these summer salinities are normally above the 37 ppt level at which Dr. Nielsen observed effects upon lethality, and above the 37.7 ppt threshold at which Dr. Nielsen observed death of 50% of the subjects.

Dr. Nielsen also conducted two LT50 tests by exposing red drum larvae to full strength effluent salinity of 68.7 ppt. The first LT50 test used larvae spawned in 31 ppt and the second LT50 test used larvae spawned in 35 ppt.[59] During both of the LT50 testing, there was significant lethality observed at every timepoint evaluated, including the first timepoint, which was 4 minutes for the first LT50 test and 10 minutes for the second LT50 test. Dr. Nielsen concluded that significant effects on the survival of larval red drum in the ZID will begin sometime between 0 and 4 minutes.[60] Furthermore, larvae and other organisms within the ZID will be subject to additional stressors such as varying dissolved oxygen levels, elevated temperatures, intense sunlight, predators, and mechanical forces from waves, wind, and resulting from the velocity of the discharge.[61]

Mr. Holt analyzed the potential impacts as well, and he concluded that the discharge amounts and the expected salinity levels—even those identified by the Port itself—would be lethal to significant

[56] Ex. PAC-48R at 5:4-6, 6:20-7:2.

[57] Dr. Esbaugh testified this result is similar to the results in the Thomas paper. Remand Tr. Vol. 8 at 1948:19-1949:7.

[58] Ex. KD-8R. Moreover, the summer salinities do not necessarily represent peak spawning season, as that occurs in September and October. Remand Tr. Vol. 8 at 2050:9-11.

[59] Ex. PAC-48R KN at 14, Figure 7.

[60] Ex. PAC-48R KN at 14:5-8.

[61] Ex. PAC-48R KN at 29:4-7.

amounts of aquatic life.[62] Similarly, Dr. Larry McKinney testified that the saline plume in the immediate area of the discharge will kill millions of larvae who are unable to swim around it and are physically incapable of handling the significant increase in salinity concentrations through which they will pass.[63] He further noted the Corpus Christi Bay is already salinity stressed 53% of the time and the addition of 96 million gallons per day of highly concentrated brine will likely lead to a significant decrease in biodiversity within the bay.[64] Dr. Schlenk—one of the foremost experts in the world on desalination discharge impacts—testified that the proposed discharge was expected to result in significant lethality to aquatic life.[65] And Dr. Esbaugh continued to maintain his position, from the last hearing, that the proposed discharge was expected to result in high mortality to aquatic life.[66]

Dr. Nielsen's testing, the Thomas paper's findings, and PAC's expert testimony all show that significant lethality of aquatic organisms, including red drum larvae, is expected within the ZID. Even if one were to completely discount Dr. Nielsen's testing, the Thomas paper's findings, and the totality of PAC's experts, the Port's evidence certainly does not demonstrate there will be no significant lethality to aquatic organisms, including red drum larvae, in the ZID.

B. There will be Significant Sub-Lethal Impacts from the Discharge.

Even apart from lethal impacts, the evidence indicates there will be sub-lethal adverse impacts from the proposed discharge. Before discussing those, PAC would first note the deficiencies in the Port's adverse impacts analysis.

1. The Port's Analysis does not Properly Evaluate Adverse Impacts from Salinity.

The Port's adverse impacts review is simplistic and fails to address the relevant considerations. Dr. Fontenot recites and charts ambient salinity in the CCSC for a ten year period and based on that data, concludes that: "These data show that natural background salinities in the water fluctuate greatly on a seasonal basis. The estuarine species present in this system have adapted to survive and thrive in an aquatic environment defined by constantly changing salinity levels."[67] This is really no more than a

[62] Ex. PAC-46R at 5:6-24, 17:6 – 19:3.

[63] Ex. PAC-47R at 14:9-12.

[64] Ex. PAC-47R at 14:12-15.

[65] Ex. PAC-50R at 15:11-19.

[66] Ex. PAC-45R at 6:11-15; Ex. PAC-5 at 6:1-4, 12:15-17.

[67] Ex. APP-LF-1R at 28:12-15.

description of an "estuary" – a transition zone between river and marine environments, subject to both freshwater flows and the influx of salt water. By definition, estuarine dependent species can tolerate changing salinity levels. **If they did not . . . they would not *be* estuarine dependent species**.

This simplistic view – that the environment is already quite salty and aquatic organisms seem just fine – ignores a number of very concerning facts that are set forth in the Vulnerability Assessment of Coastal Bend Bays:[68]

- Rising salinity levels have been a concern in the Coastal Bend since the 1990s.[69]
- Sea surface temperatures in CC Bay have been rising since the 1970s, causing lower dissolved oxygen concentrations, and increasing evaporation/salinity.[70]
- Salinities are increased 1 to 3 practical salinity unites (psu) by the ship channel during dry periods, and 3 psu during wet periods.[71]
- Average salinities are already at levels that could impact species abundance and diversity, and therefore, small increases in salinity could add additional pressure to a system that is already experiencing salinity stress.[72]
- We have already reduced the freshwater inflow to the Corpus Christi Bay system by 99 percent.[73]
- The Nueces Estuary (including CC Bay) is an unsound ecological environment.[74]
- The red drum population has not been self-sustaining for decades. Texas Parks & Wildlife has stocked 800 million red drum fingerlings along the Texas coast since 1975.[75]

Moreover, the capacity of a species to tolerate a range of conditions does not mean that an abrupt change within that range will not kill or otherwise harm an individual organism. As Dr. Dean testified:

> [I]f I were to be transported up to the top of Mount Everest magically, I would not be able to survive up there. Actually, nobody would be able to survive up there for very long, but there are people who have been living in the mountains for years that become acclimated to low oxygen and have tremendous lung power and can live at elevations of, you know, 15, 20,000 feet, I presume and in that same way, organisms can acclimate to different salinity ranges if they're exposed slowly and over a long period of time.[76]

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[68] Ex. PAC-70R.

[69] Ex. PAC-70R at 43.

[70] Ex. PAC-70R at 44.

[71] Ex. PAC-70R at 45.

[72] Ex. PAC-70R at 49

[73] Remand Tr. Vol. 5 at 1062:12-17.

[74] Remand Tr. Vol. 5 at 1062:15-1063:2.

[75] Ex. PAC-60R at 4.

[76] Remand Tr. Vol. 3 at 671:13-23.

Dr. Fontenot also conceded that abrupt changes, like the Mt. Everest example, can be deadly.[77] The fact that species have adapted to certain salinity levels does not address the issue of abrupt changes. Moreover, the fact that abrupt changes might occur in natural conditions also does not matter. Tornadoes occur in nature and kill people. The existence of conditions in nature that cause harm does not then give the Port carte blanche to cause similar harm.

Another major tenet of the Port's case is that organisms will float in a linear fashion through the plume at a constant speed, and thus exposure duration will be extremely short. Dr. Fontenot testifies "Therefore, any toxicity results based on 24 hours, or more, of exposure to salinity are highly conservative and unrealistic within the context of the current assessment."[78] As a toxicologist, Dr. Fontenot certainly knows that is not how this works.

The Port really wants to have its cake and eat it too. The Port and ED contend that this Application for the first of its kind marine water desalination plant should be treated like every other wastewater Application. For example, they assert that the "critical conditions" at which the concentration of effluent is highest should dictate permit conditions – despite the fact that the critical conditions do not reflect the "worst case" salinity concentrations.

But, when those standard tests produce results the Port does not like, it argues vociferously for the creation of a brand new test that contradicts the TSWQS[79] and is also literally impossible to apply with any measure of confidence: discount the data if you believe exposure duration in the real world will be less than 24 (or 48 or 72) hours. Dr. Esbaugh testified about why that is not the way the regulations work for *any* toxicant.

> . . . So there's a lot of uncertainty about what exactly exposure duration is, and it's also very hard to assess what the significance of exposure duration is at different developmental time points. So, for example, one hour at one development stage is very different than one hour at another developmental stage. That is why, in general, the water quality standards procedures avoid this entire issue by advocating for set duration testing that applies to acute tests, chronic tests, and of course, the human –human mixing – human health mixing zone.

[77] Remand Tr. Vol. 2 at 487:24-25.

[78] Ex. APP-LF-1R at 47:20-22.

[79] *See e.g.*, 30 Tex. Admin. Code § 307.6(e)(2)(B) ("In addition to the other requirements of this section, the effluent of discharges to water in the state must not be acutely toxic to sensitive species of aquatic life, as demonstrated by effluent toxicity tests. Toxicity testing for this purpose is conducted on samples of 100% effluent, and the criterion for acute toxicity is mortality of 50% or more of the test organisms *after 24 hours of exposure*.") (emphasis added).

> . . . If you were meant to, say, draw analogies to copper or aluminum or any of the other toxicants that were in the permit. There's no discussion of exposure duration, and that's because the water quality standards effectively exclude that.[80]

The Port's criticism of the exposure times reflected in the testing should be disregarded.

2. The Port's Own Evidence Indicates There Will be Adverse Effects on the Marine Environment.

Based in part on studies of salinity toxicity and tolerance, Dr. Fontenot concludes that "the predicted changes in salinity resulting from the Effluent will not be of sufficient magnitude or duration to cause significant impacts to the estuarine community that may be present in the receiving water of the channel."[81] Yet the Thomas paper he relied on appears to say quite the contrary about non-lethal impacts of salinity on relevant species:

- Salinity extremes significantly impaired all phases of reproduction and larval development examined in spotted seatrout, Atlantic croaker and red drum.[82]
- For spotted seatrout, the salinity range for successful reproduction was 20-45 ppt.[83]
- In croaker, successful fertilization and hatching only occurred between 25 and 35 ppt and larval development between 15 and 35 ppt.[84]
- Although moderate increases in salinity may not be acutely lethal to estuarine fishes, resultant increases in energy requirements for acclimation leave fewer energy reserves for growth and reproduction.[85]
- Fertilized Atlantic Croaker eggs will not hatch in water above 35 ppt.[86]
- For spotted seatrout, three week growth rates were significantly better in 16 than in 28 ppt or 45 ppt salinity. . . slower growth during early stages retards development and increases the length of the larval stage and coincident potential for high mortality rates from external causes.[87]

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[80] Remand Tr. Vol. 8 at 1955:17-1956:3, 1972:2-6; *see also* Ex. PAC-45R at 10:5-21 ("I am working with an agreed upon procedure used in the U.S. for the development of water quality standards. The Draft Permit has toxicological assessments for a number of metals and chemicals, and these assessments are all done without a thorough understanding of the exposure duration.. The reasons that these fundamental toxicological assessments can be performed is because exposure duration is not part of the decision making equation.").

[81] Ex. APP-LF-1R at 82:30-83:2.

[82] Ex. PAC-85R at 6 of 85 (PDF numbered page of exhibit): Summary.

[83] Ex. PAC-85R at 6 of 85.

[84] Ex. PAC-85R at 6 of 85.

[85] Ex. PAC-85R at 8 of 85.

[86] Ex. PAC-85R at Figure 10.

[87] Ex. PAC-85R at 60 of 85.

Moreover, Dr. Fontenot's Exhibit EFA 1-3 reflects the following lethality information, which he simply ignores in his rebuttal testimony:

- For spotted seatrout: (1) the LD 50 for 3 day old larvae is 42.5 ppt; and (2) larvae and/or juveniles experienced 100% mortality at 45 ppt and temperatures of 24 and 28 degrees C.[88]
- For Atlantic Croaker: (1) the LOEC for eggs and larvae was 45 ppt; and (2) the LD50 for 5 day old larvae was 33 ppt.[89]
- For red drum: (1) for eggs, the best hatch-out and growth rates were at 33-43 ppt; and (2) the LD50 for 3 day old larvae was 33 ppt.[90]

Under critical conditions, the proposed discharge would elevate the salinity levels above these ranges. Thus, the Port's own evidence demonstrates significant adverse impacts to the marine environment that may be expected from the proposed discharge.

3. PAC's Evidence Shows There Will be Sub-Lethal Adverse Impacts on the Marine Environment.

In addition to the Port's own evidence, the evidence from PAC's experts clearly demonstrates sub-lethal adverse impacts expected from the proposed discharge. The only witness to actually conduct testing on red drum was Dr. Kristin Nielsen. She found significant effects on body size and eye size of larval red drum exposed to 45 ppt as compared to 40 ppt and lower.[91]

Scott Holt calculated the amount of ambient water (of 30 ppt) required to dilute 96 million gallons per day of discharge (of 60 ppt) down to 40 ppt.[92] "To achieve that dilution requires 191 million gallons of ambient water per day."[93] And that ambient water is full of marine organisms that the Port and its experts completely ignore. The very water used to dilute the effluent will contain multitudes of aquatic organisms that will come into contact with the full strength hypersaline discharge water. Mr. Holt testified that the CC Ship Channel contains "probably many thousands" of species of aquatic invertebrates, including clams, snails, starfish, sponges, barnacles, worms, and phytoplankton (which forms the foundation of the food chain).[94] There are "probably at least a hundred species" of aquatic

[88] Ex. APP-LF-1R, attached Ex. EFA 1-3 at 1.

[89] Ex. APP-LF-1R, attached Ex. EFA 1-3 at 2.

[90] Ex. APP-LF-1R, attached Ex. EFA 1-3 at 2.

[91] Ex. PAC-48R KN-3 at 8.

[92] Ex. PAC-46R at 14:21-25.

[93] Ex. PAC-46R at 15:2; Ex. PAC-75R.

[94] Ex. PAC-46R at 11:1-16.

vertebrates.[95] During the spawning season, there are 100 red drum larvae per 100 cubic meters of water.[96] For Atlantic Croaker that is 200-300 and for post-larval shrimp that is 4,000-5,000.[97] The 191 million gallons of ambient water per day required to dilute the effluent "could equate to approximately 723,000 red drum larvae during the peak of spawning season, or up to 1.8 million Atlantic croaker larvae, or 32 million shrimp postlarvae."[98]

Dr. Greg Stunz confirmed Mr. Holt's testimony regarding the numbers of diverse species of organisms that live in the CCSC.[99] In response to Dr. Fontenot's speculation that the CCSC lacks a functional benthic community, Dr. Stunz stated that is "a remarkable statement and patently false."[100] He testified regarding the potential for delayed latent mortality, sublethal effects, and compounding multiple stressors affecting the short- and long-term survival of marine organisms.[101]

For example, exposure to a toxicant may cause impaired reproduction, inability to avoid predation, or food procurement challenges leading to starvation or reduced growth rate.[102] Specifically, Dr. Stunz identified "the very low (even zero) dissolved oxygen concentration" in the area of the deep hole sampled by the Port,[103] and turbulence caused by the discharge, as multiple stressors that will be present in the real world CCSC – and that are "not accounted for in WET or other similar testing.[104] As for the testing performed by the Port, Dr. Stunz opined that the inland silverside and mysid shrimp are not particularly relevant to this area:

> For example, red drum, Penaeid shrimp, southern flounder or a host of other species would have been much more appropriate study subjects and easy to obtain from captive hatchery spawns; these species routinely occur in the area of the outfall. Moreover, compared to other species that are found in the Ship Channel, these two test subjects for

[95] Ex. PAC-46R at 11:17-23. Compare this to Dr. Fontenot's testimony that he thinks there are 30-40 species of aquatic vertebrates and another 30-40 species of aquatic invertebrates in the CCSC. Remand Tr. Vol. 2 at 390:17-391:18.

[96] Ex. PAC-46R at 13:20-23.

[97] Ex. PAC-46R at 13:23-25.

[98] Ex. PAC-46R at 15:2-5. Dr. Fontenot agreed that living organisms in the ambient water entrained to cause dilution will mix with the plume. Remand Tr. Vol. 2 at 443:7-444:4.

[99] Ex. PAC-52R at 14:1-23.

[100] Ex. PAC-52R at 27:6-13 ("The areas along the Corpus Christi Ship Channel have been historical shrimping grounds for a variety of economically important shrimp species that burrow in the sediment (benthos) and are part of the functional benthic community.").

[101] Ex. PAC-52R at 9:11-17.

[102] Ex. PAC-52R at 10:17-21.

[103] Ex. PAC-52R at 20:23-25.

[104] PAC-52R at 21:4-16. Stunz cites a paper co-authored by the Port's expert, Dr. Knott, which found that ecological impacts of a desalination discharge "were disproportionate to the relatively minor change in salinity" and the reduced population of sessile marine invertebrates was caused by hydrodynamic stress. Ex. PAC-52R GS-8 at 1 (Abstract).

> the WET testing were not particularly sensitive to salinity. Most importantly, these species are not estuarine-dependent species, nor do they rely on migration from inlets as corridors to reach their nursery grounds and outward migrations to join adult spawning stocks. Thus, the study did not choose appropriate study subjects to make conclusions regarding impacts to marine life that occur in this area. Finally, silverside subjects were 7-11 days old and the shrimp were 7 days old. The Ship Channel is full of organisms that are less than 7 days old, and that are far more sensitive to abrupt changes in salinity.[105]

Dr. Esbaugh elaborated on the expected harm that could result from a persistent bottom layer plume of effluent that would reduce oxygen levels. Stratified layers tend to result in lower dissolved oxygen, since aquatic organisms will consume the limited oxygen available within that stratified layer.[106] The Port's water quality data reflected ambient oxygen levels equal to approximately 35% saturation.[107] Declines below 35% saturation could be damaging to the local wildlife. For example, the critical oxygen threshold for the lone bivalve species is approximately 39% saturation; the critical oxygen threshold for blue crab is 38% saturation, and available data for red drum have been as high as 35% saturation. "These data alone suggest that fish, bivalves (i.e. oysters) and crabs could be severely challenged by hypoxia cause by an effluent-induced persistent stratified bottom layer."[108]

3. Issue C: Whether the Proposed Discharge will Adversely Impact Recreational Activities, Commercial Fishing, or Fisheries in Corpus Christi Bay and the Ship Channel.

This matter was remanded to SOAH, in part, to allow the Port to submit additional evidence on whether the proposed discharge will adversely impact recreational activities, commercial fishing, or fisheries in Corpus Christi Bay and the ship channel.[109] The Port's zoologist,[110] Dr. Fontenot, does not offer any opinions on this remanded issue. He presumably considered it unnecessary to comment on this remanded issue because he concluded there will be no adverse impact on the marine environment at all. For all of the reasons previously discussed, the Port failed to carry its burden on this issue.[111] Moreover, the competent and credible evidence indicates there will be an adverse impact.

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[105] Ex. PAC-52R at 26:9-20.

[106] Ex. PAC-45R at 14:4-8.

[107] Ex. PAC-45R at 14:19-24.

[108] Ex. PAC-45R at 15:21-16:4.

[109] Ex. AR-R 2 (Admin Record – Remand Tab G) at ¶I.2.C.

[110] Ex. APP-LF-1R at 3:1-3.

[111] *See* 30 Tex. Admin. Code §§ 80.17(a) and 80.17(c)(3).

Dr. Larry McKinney has spent more than 50 years studying marine environmental issues and management of ecological resources around the world, in the Gulf of Mexico, and on the Texas coast.[112] From 1986 to 2002 he evaluated or oversaw evaluation of every major industrial permit potentially impacting Texas coastal marine resources on behalf of TPWD.[113] Dr. McKinney has testified that the reproductive activity that occurs at the Aransas Pass Tidal Inlet is one of the most important factors in maintaining healthy and productive populations of red drum, spotted seatrout, sheepshead, black drum and southern flounder.[114] In 2000, Dr. McKinney established the Redfish Bay State Scientific Area for purposes of education, scientific research, and preservation of habitat with particular educational and scientific value. It contains examples of every major type of Texas coastal habitat important to recreational and commercial fisheries and is central to sportfishing economies of the coastal Bend.[115]

Dr. McKinney described Dr. Greg Stunz as "the top fisheries scientist in the Gulf of Mexico and one of the best in the United States."[116] Dr. Stunz testified that marine fisheries populations are driven by year class strength. If one year is impaired, it can be "catastrophic."

> When you have a lot of babies, you have a lot of subsequent adults. When you have few babies, you don't have many adults. . . . the reason it's important in fisheries is because sometimes an entire year class can be wiped out . . . Currents just go the wrong way and the fish never make it to where they're supposed to. That's called a mismatch hypothesis. These individuals [larvae in the CCSC] have already matched. There's no mismatch here. They made it into the inlet. And if you wiped out an entire cohort going by there at 40 parts per thousand, which, . . . adding salinity is going to further increase that, you could drastically change – alter the entire year class of that fishery . . . We want a lot of very strong year classes coming through because you have to have sustainability for those fisheries.[117]

Dr. Nielsen testified that Texas has a $3.2 billion recreational fishing industry, two thirds of which comes from red drum and speckled seatrout fisheries, both of which are estuarine-dependent species that thrive in the Coastal Bend area. The area supports some of the most robust populations of red drum in the nation.[118] Dr. Nielsen explained the cascading, long-term adverse impacts on larvae in the CCSC:

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[112] Ex. PAC-47R at 4:19-24.

[113] Ex. PAC-47R at 5:15-18.

[114] Ex. PAC-47R at 14:29-30:4.

[115] Ex. PAC-47R at 15:5-12.

[116] Ex. PAC-47R at 26:2-3.

[117] Remand Tr. Vol. 5 at 1234:13-1235:14 ("If this was to happen during the wrong time . . . serious catastrophic effects for certain species for that year class.").

[118] Ex. PAC-48R at 9:25-10:3.

> [T]he sudden reduction in the number of red drum larvae that successfully reach the seagrass beds in any given year would mean lower adult fish numbers are available to fishermen 3 to 5 years later. Fewer adults mean fewer successful spawns the next year, further depressing fish populations through a series of feedbacks. Because red drum are so long lived, adverse impacts to seasonal recruitment of young can impact the health of fisheries for years. In fact, red drum are not expected to recover from the low productivity of the 2010, 2011, 2012 and 2013 year classes (from the Deepwater Horizon oil spill) until the year 2053.[119]

There is an abundance of peer-reviewed scientific literature to show that the collapse of important marine fisheries eliminates sustainable livelihoods for nearby communities.[120]

The Port put all its eggs in the "no adverse impact of any kind to anything, anywhere" basket and did not offer any evidence to contradict PAC's experts regarding the discharge's adverse impact on recreational activities, commercial fishing, or fisheries in Corpus Christi Bay and the ship channel. Their testimony regarding the ecological, recreational, and economic value of the CCSC and its role in sustaining iconic Texas fisheries is entirely unchallenged.

4. Issue D: Whether the Application, and Representations Contained therein, are Complete and Accurate.

This matter was remanded to SOAH, in part, to allow the Port to submit additional evidence on whether the Application, and representations contained therein, are complete and accurate.[121] It should be shocking that, after many years and great expense, the Port still got a lot of things wrong and did not even offer a corporate witness to sponsor the Application.

A. No Sponsorship for Application.

The Application requires an authorized person to sign a certification that the information submitted is "true, accurate, and complete." Although the Port's original Application contained such a certification, at the first hearing the Port did not present any witness to sponsor the Application. The ALJs determined the Application was not accurate in that the channel depth provided was wrong.[122] The Port's Amended Application contains the same certification, and again the Port did not present any witness to sponsor the Application as a whole. Two of the Port's witnesses testified that certain portions of the Application and supporting materials are satisfactory but neither purported to sponsor the entire

[119] Ex. PAC-48R at 10:7-16.

[120] Ex. PAC-48R at 10:7-16.

[121] Ex. AR-R 2 (Admin Record – Remand Tab G) at ¶I.2.D.

[122] 02/05/2021 Proposal for Decision at 78.

Application as satisfying the Remand Order. Thus, in three years, no one who would face cross examination under oath was willing to testify that the Application, and representations contained therein, are complete and accurate. And, as seen further below, it is easy to understand why—because the Application still contains glaring errors.

B. The ED's Witnesses Did Not Validate the Data in the Application.

Before turning to the errors in the Application, it is important to point out that the ED's review does not reflect any determination that all information in the Application is accurate. Shannon Gibson was the permit coordinator for the original Application and the Amended Application. She testified at the hearing that she relies on the applicant to provide accurate information and "assumes" that what is in the Application is correct.[123] In her pre-filed testimony, Ms. Gibson identified the limited items in an Application that she actually attempts to verify.[124] Peter Schaefer acknowledged this remanded issue but merely stated that he relied on several identified portions of the Application and nothing he needed for his review was missing. Apparently he was not willing to testify under oath that any of this information was "complete" or "accurate."[125]

C. The Application and Representations Therein are ***not*** Complete and Accurate.

If there was one thing the Port ought to get right this time around, it would be the thing it got wrong last time: the channel depth. But it did not, and the evidence below is a damning indictment.

There are significant errors in the amended Application on the depth and location of the outfall. The Application states that the discharge will be located approximately 229 feet off the shoreline.[126] As required, the Application identifies the location of the discharge by latitude/longitude by degrees, minutes, and seconds. It states the outfall will consist of "buried/submerged pipeline and diffuser barrel."[127] Figure 2 in the Application is an aerial map showing the Approximate Diffuser Location at 229' from a point along the shore that is between the two protruding groins, i.e., the extensions of the points of land coming off Harbor Island.[128]

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[123] Remand Tr. Vol. 9 at 2219:16-22.

[124] Ex. ED-SG-1 Remand at 13:9-14:27 (addresses, signatories, affected landowners; technical reviewers should confirm discharge route, diffuser analysis, outfall coordinates).

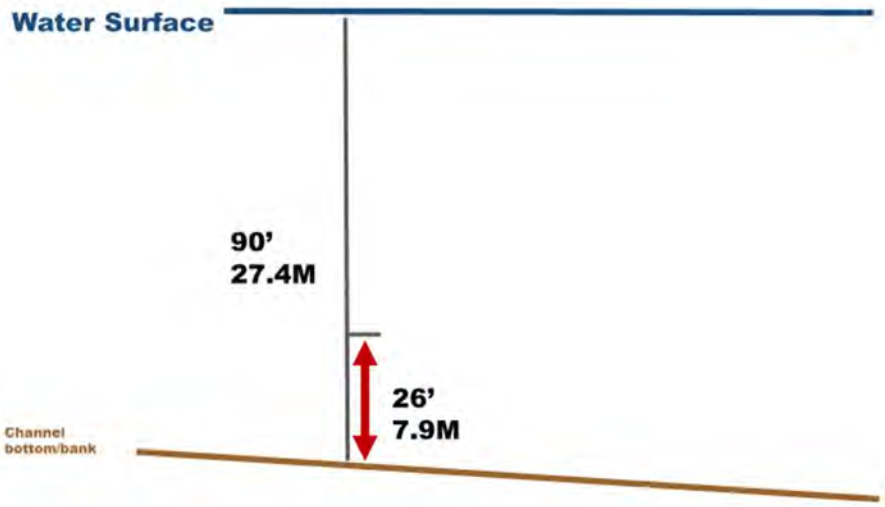
[125] Ex. ED-PS-1 Remand at 23:13-24.

[126] Ex. AR-R4 (Admin Record – Remand Tab I) at 228 (Item No. 11).

[127] Ex. AR-R4 (Admin Record – Remand Tab I) at 231 (Section 4 Outfall/Disposal Method Information).

[128] Ex. AR-R4 (Admin Record – Remand Tab I) at 245 (Figure 2).

Dr. Tischler's June 24, 2021 Diffuser Design Memo (the Memo) was submitted in support of the Application and it contains the following representations: (1) the "diffuser will be located on the north bank of the Corpus Christi Channel" as shown in Figure 1; (2) the "actual depth of the barrel below the water surface will be determined in the final design based on construction requirements and the side slope of the channel."[129] The Memo states that the port height above bottom will be 7.9 meters (25-26 feet) and the depth of channel at location of discharge will be 27.4 meters (90 feet) at mean low tide.[130] No schematic is provided but here is what that description looks like:



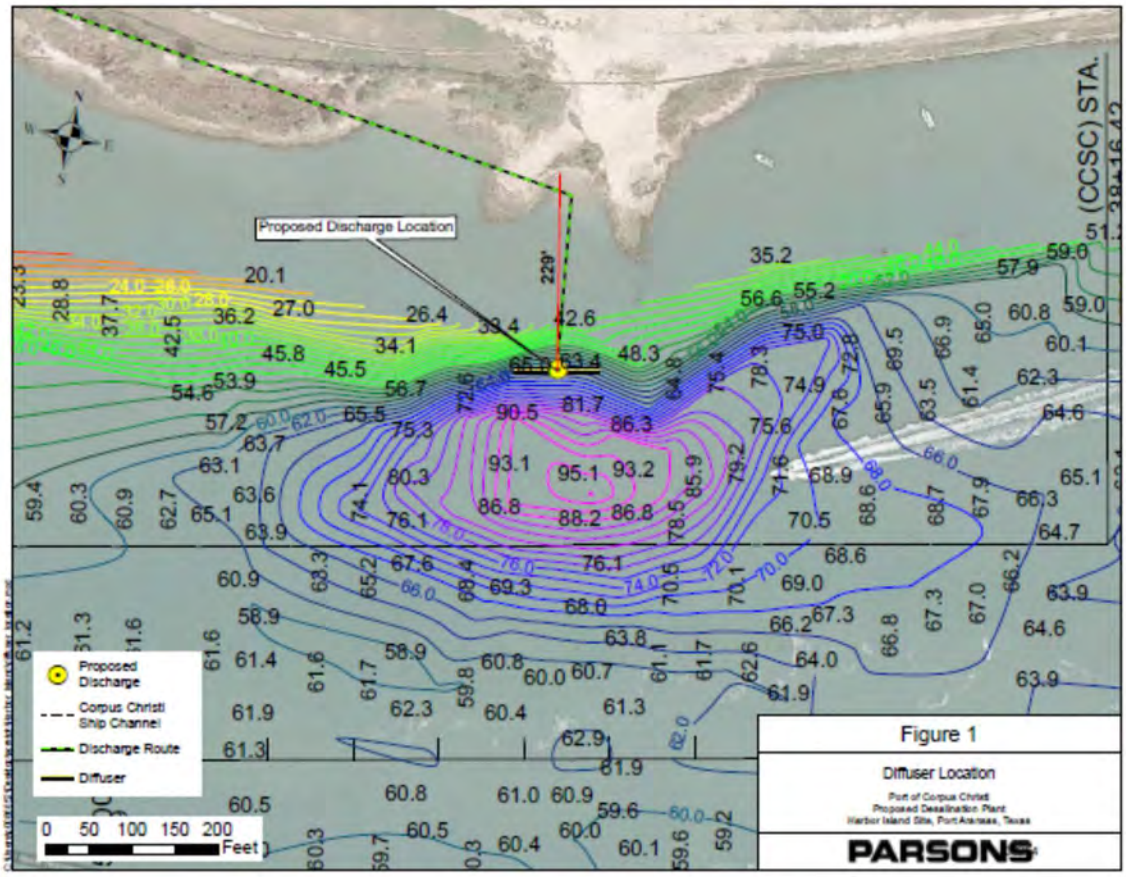
This appears to be confirmed by Dr. Tischler's statement in the Memo that the "diffuser will be located on the north slope of the eddy-generated 'hole' in the channel. The channel depth at the point of discharge of 27.4 m (90ft) is based on the bathymetry of the site as confirmed by the June 2021 study."[131] Two things are interesting about the Memo: first, Dr. Tischler identifies an "eddy-generated hole" even though the Port now claims no such eddy exists in the area; second, he states the diffuser will be located on the north slope of a 90-foot hole. However Figure 1 of the Memo shows the proposed discharge location, vis-à-vis that bathymetry, at a depth of approximately 65.0 feet, with the depth not dropping to 90 feet until you get approximately 60 to 70 feet away from the diffuser.[132]

[129] Ex. AR-R4 (Admin Record – Remand Tab I) at 247-48.

[130] Ex. AR-R4 (Admin Record – Remand Tab I) at 248 (Table 1).

[131] Ex. AR-R4 (Admin Record – Remand Tab I) at 248.

[132] Ex. AR-R4 (Admin Record – Remand Tab I) at 254 (Figure 1).



This inconsistency caused the ED to ask for clarification, and the Port responded:

> The depth at which the diffuser discharges is 65 feet below the surface. The location is on a steeply sloping side of the channel and the ports discharge at an angle of 30 degrees to horizontal and point across the channel toward the opposite bank. This results in the depth of the channel at which the effluent discharges into at approximately 90 feet.[133]

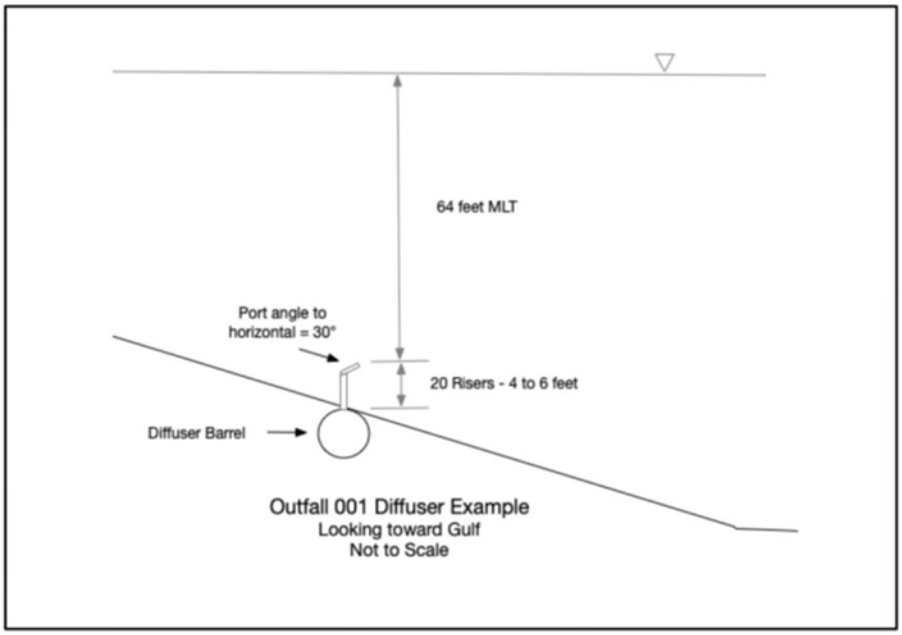
This "clarification" was cited almost verbatim in the Memo, in the mixing analysis reviewed by Ms. Cunningham[134] and in her direct and live remand testimony.[135] The live testimony addressed Dr. Tischler's remand rebuttal exhibit[136] that shows the diffuser barrel buried beneath the side slope of the hole at a water depth of roughly 70 feet and the diffuser ports elevated about 4 to 6 feet above the barrel, as demonstrated by the following graphic:

[133] Ex. ED 7 Remand p 0001

[134] Ex. AR-R5 (Admin Record - Remand Tab J) at 00137, 00138

[135] Ex. AR-R5 (Admin Record - Remand Tab J) at 00135, Ex. ED-KC-1R at 0008:20-28, and Remand Tr. Vol. 9 at 2311:18 through 2312:24.

[136] Ex. APP-LT-16R.



The net of this mess of conflicting statements is that the Application contour map (Figure 1 above) shows a channel floor depth at the discharge point to be 65 feet, while the narrative in the clarification response and the Memo say the depth at that point is 90 feet. The Memo puts the discharge ports atop 26-foot (7.9 meters) risers, while Dr. Tischler's position in his remand rebuttal testimony was that the discharge ports sit atop risers that are 4 to 6 feet tall. Dr. Tischler's remand rebuttal testimony is not part of the Application, but it is informative of the inaccuracies in the Application, because no one believes 26-foot risers could withstand the reversing tidal flows in the ship channel. It bears noting that the bathymetry reflected in Figure 1[137] is inconsistent with 2019 Corps of Engineers bathymetry of that same area and with Figure 4 of the Parsons June 24, 2021, "Measured Bathymetry" memo.[138]

Figure 1 was not withdrawn or corrected. Nothing was provided to explain how a diffuser installed at the location shown in Figure 1 (at a depth of 65 feet) could be consistent with a discharge into 90 feet of water. The Port's position must be that the depth of the channel at the location of the diffuser ports is simply irrelevant. Apparently the Port believes (without actually stating) that it can select any depth of water in the direction the ports will face (here that is south), at any distance from the diffuser that it arbitrarily chooses, as the channel depth of the discharge location. Based on Figure 1, why is that depth 90 feet rather than 81.7 or 95.1 feet? No one knows.

[137] Ex. AR-R4 (Admin Record – Remand Tab I) at 00254

[138] Ex. AR-R4 (Admin Record – Remand Tab I) at 00185; Ex. PAC-53R at 10:9-19.

As it is now, we are literally right back where we were two years ago with the original Application—with modeling and input data that does not accurately match what is in the Amended Application and the Administrative Record. The channel depth provided in the Amended Application and used in the CORMIX modeling is, again, wrong.[139]

The Port does not actually defend the information in the Application as "complete and accurate" because the Port's position is that the information in the Application is irrelevant. Dr. Tischler's pre-filed rebuttal testimony is almost indignant at the thought that the information in his Diffuser Design Memo should be consistent with the information in the Application itself. He testifies, without a hint of irony or embarrassment, that the precise location of the discharge is still unknown.[140]

And, as noted above, Dr. Tischler's rebuttal schematic shows the ports' height above the bottom as 4' – 6' or 1.2–1.8 meters (not the 7.9 meters stated in the Diffuser Design Memo) and the depth of channel as 68' – 70' or 20.7 – 21.3 meters (not the 27.4 meters stated in the Diffuser Design Memo). If the Port intends to actually have the diffuser ports sitting on risers 4-6 feet above the channel bottom, and maintain a discharge depth of 65 feet, this means the channel bottom will have to be 69-71 feet in depth (i.e., 65 feet from the water surface and 4 feet above the bottom requires a minimum water depth of 69 feet; and 65 feet from the water surface and 6 feet above the channel bottom requires a minimum water depth of 71 feet). This will require the discharge location to be moved from where it is currently identified in the Amended Application. It is hard to believe that as we sit here today, the Port's evidence about the discharge location is still this muddled and uncertain, especially when the Commission explicitly required the Port on remand to provide updated information on the "depth of the channel, site-specific ambient velocity, and the depth of the diffuser."[141]

With respect to the location of the discharge and bathymetry of the discharge location, Bruce Wiland testified to the many errors and inconsistencies in the Port's Application and supporting materials.[142] If the discharge is in the location identified in the Application, at the depth described in the Diffuser Design Memo, then the 20 ports for the discharge must be buried in whole or in part below

[139] 02/05/2021 Proposal for Decision at 78.

[140] Ex. APP-LT-1-R Rebuttal at 2:4-31.

[141] Ex. AR-R2 (Admin Record – Remand Tab G) at ¶II.

[142] Ex. PAC-53R at 10:3-19 (bathymetry and location of the discharge in the Diffuser Design Memo are wrong and not consistent with Army Corps of Engineers data or Parsons Summary Technical Memo); 11:3-14 (the lat/long in Application do not match location of diffuser or discharge ports in the Figure 1 of Diffuser Design Memo). *See also* PAC-53R at 12:1-14:3 and PAC-53R BW-2 & PAC-53R BW-3.

the channel bottom and not in the water.[143] This is important because the location of the discharge is a material input in the CORMIX model on which everyone relies.[144]

Dr. Nielsen compared Dr. Tischler's Diffuser Design Memo in the Amended Application to the Port's water sampling data and the TSWQS. The TSWQS require that samples used "to determine standards attainment in ambient water must be representative in terms of location, seasonal variations, and hydrological conditions. . . . Sample results that are used to assess standards attainment must not include samples that are collected during extreme hydrologic conditions such as high-flows and flooding immediately after heavy rains."[145] The Diffuser Design Memo represented the receiving water samples would "be collected over a relatively short time period."[146] As Dr. Nielsen confirmed, the Port's samples were collected over two days in June 2021 during a period of abnormally high rainfall in Port Aransas.[147]

Based on the sample size and collection window, the Port did not satisfy the requirements of TSWQS § 307.9. The Port's samples are in no way representative of the typical water quality or contaminant concentrations present and cannot be used to evaluate standards attainment or to predict the concentration of contaminants that will be present in the effluent.[148]

Finally, despite that the Port's Process Design Basis and Narrative states that the intake will pull in millions of gallons of sediment, no sediment sampling was done.[149] The Port's representations that "intake surface water from the Gulf of Mexico is not located near chemical source areas and will not contain appreciable suspended solids/sediments" is belied by the high concentration of contaminants within sediments in the area[150] and the uncertainty in the location, design and operation of the intake structure.

For these reasons, the Port has failed to satisfy its burden to prove that the Application, and representations contained therein, are complete and accurate.

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[143] Ex. PAC-53R at 17:4-9.

[144] Ex. PAC-53R at 18:12-19:2

[145] 30 Tex. Admin. Code § 307.9(b).

[146] Ex. PAC-48R at 24:3-5.

[147] Ex. PAC-48R at 24:12-14.

[148] Ex. PAC-48R at 24:16-25:6.

[149] Ex. PAC-48R at 25:11-14.

[150] Ex. PAC-48R KN-2 at 24

5. Issue G: Whether the Modeling Complies with Applicable Regulations to Ensure the Draft Permit is Protective of Water Quality, Utilizing Accurate Inputs.

As one of the Port's own experts conceded, the decision on the reliability of the modeling will hinge upon which experts the ALJs and Commissioners determine have used the correct inputs and performed the required analysis of the results.[151] The Port and the ED used inaccurate data and improper inputs, failed to consider worst-case scenarios, and made unreasonable assumptions in the modeling. Accordingly, the Port and ED's CORMIX modeling fail to demonstrate the Draft Permit is protective, and the Port has failed to meet its burden of proof on this issue.

In contrast, PAC's experts are the most knowledgeable on the proper set up and use of the CORMIX and SUNTANS models. And they, like PAC's experts in the first hearing, performed the type of sensitivity analyses that the CORMIX User Manual recommends. Their evidence demonstrates that, because the ED and Port did not use accurate inputs or do the required analysis of the results, the Port and ED's modeling predictions 1) are not conservative, 2) overestimate mixing, and 3) are unreliable at the mixing zone boundaries.

A. Regulatory Requirements for Modeling.

The real issue is whether the Draft Permit is protective of the water quality and the marine species in the receiving water. For the modeling to support that goal, it must "utilize[e] accurate inputs." There are very few laws, regulations, or standards that govern modeling. While the ED has pointed to its standard operating procedures for CORMIX modeling, the ED's staff admitted in the initial hearing they are guidelines, not regulations. All parties are relying on guidance from the CORMIX User Manual, which is an exhibit in the record as both ED-5 Remand and APP-LT-7-R.

But that is not to say there are no regulations that impact the modeling. One important regulation for modeling inputs relates to the requirements for "the point of discharge." By statute, an applicant is required to include, and the Commission is required to identify in the permit, the "point of discharge." In particular, Texas Water Code § 26.029 provides:

> CONDITIONS OF PERMIT; AMENDMENT. (a) In each permit, the commission shall prescribe the conditions on which it is issued, including:
>
> (1) the duration of the permit;
>
> (2) the **location of the point of discharge** of the waste. . . (Emphasis added.)

[151] Remand Tr. Vol. 1 at 205:4-11.

"Point of discharge" is not defined in the statute but there are several sections of the law that set distances from the "point of discharge." For example, Texas Water Code § 26.030(b) states:

> In considering the issuance of a permit to discharge effluent comprised primarily of sewage or municipal waste into any body of water that crosses or abuts any park, playground, or schoolyard **within one mile of the point of discharge**,

Section 26.028 of the Texas Water Code has similar language specifying the distance from the "point of discharge." TCEQ rules do not define the "point of discharge" but the term is incorporated into the rules. TCEQ rules at 30 Tex. Admin. Code § 305.45 (providing for the contents of permit Applications) and 30 Tex. Admin. Code § 305.48 (providing additional requirements for TPDES permits) identify that the required information shall be included on forms prescribed by the ED. The Application forms used by the ED require information regarding the point of discharge.[152]

In TCEQ's instructions for completing the Industrial Wastewater Permit Application, the agency references the "point of discharge" numerous times. For example, the instructions require for discharge permits:

> Around the point(s) of discharge and one mile downstream of the discharge route(s), all parks, playgrounds, and schoolyards must be highlighted with the names provided.[153]

These Instructions also require that the latitude and longitude be specified in the Application for the discharge location to at least six figures.[154] This level of specificity results in a location that is precise to within four inches. There is then a note in the Application materials that "The relocation of the discharge point . . . may require a Major Amendment."[155] In the Diffuser Design Memo in the Application, Dr. Tischler identifies the "channel depth at the point of discharge" as being 27.4 m (90 ft) . . ."[156] Thus, everyone recognizes the point of discharge must be identified with specificity.

The importance of the latitude and longitude of the discharge location was made clear in the first hearing when PAC raised the fact that the latitude and longitude in the Application set the discharge at a different location than shown on maps in the Application. In the face of these discrepancies, the Port's representative, Sarah Garza, testified the latitude and longitude in the Application is what the Port relied on for the location of the discharge.[157] The ED's modeling expert, Ms. Cunningham, also

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[152] The forms used by the Port for its Application use the term point of discharge at Tab I 00225, 00228 and 00238.

[153] Ex. ED-SG-7 at 27 of 122 (b. USGS Topographic Map, last bullet point).

[154] Ex. ED-SG-7 at 39 of 122 (4. Outfall/Disposal Method Info: Outfall Latitude and Longitude).

[155] Ex. ED-SG-7 at 28 of 122.

[156] Ex. AR-R4 (Admin Record – Remand Tab I) at 00248.

[157] Ex. PAC-18 at 31 of 44, lines 13-14.

relied on the latitude and longitude for her modeling and her recommendation for permit terms. She drafted a permit provision (Other Requirement 4 in the Draft Permit)[158] that requires "The permittee **shall maintain the diffuser at Outfall 001** to achieve a maximum of 14.6 …" and she identifies Outfall 001 with the latitude and longitude in the Application.[159] Thus, when it comes evaluating the accuracy of the modeling inputs, we start with the requirement there must an accurate outfall location and accurate diffuser parameters identified in the Application for the modeling to be reliable.

PAC and its experts relied on the latitude and longitude identified by the Port in the Application for their evaluation and for their location inputs, including the depth of the discharge and its distance to the bank, in their modeling. Doing this, however, revealed that there was a disconnect. The depth of the channel at the outfall location identified in the Application is 65 feet. Yet the Port indicated that the discharge would be 65 feet beneath the water surface. This would place the discharge ports at or just below the channel bottom at the location of the outfall—totally inconsistent with the modeling the Port used, which assumed the discharge was approximately 25 feet above the channel bottom for modeling purposes (because the Port told the ED the depth of the channel was 90 feet at the outfall location). Thus, the Port has done modeling that assumes a 90-foot water depth, with the discharge placed 65 feet below the surface and 25 feet above the channel bottom. But, the depth of the channel at the location of the outfall identified in the Application is only 65 feet. Thus, the inputs the Port used in its modeling are simply wrong and do not fit the bathymetry of the location the Port identified for the outfall.

In the face of this problem, the Port presented rebuttal testimony ridiculing PAC's experts and indicating essentially "of course, you silly goose, the diffuser ports will not be buried beneath the channel bottom; you clearly must not understand how this works."[160] But, make no mistake, PAC understands how modeling works. The problem is with the Port's data. And, recognizing that problem, the Port responded by saying the actual location of the diffuser would not be established until some unknown date in the future, by some unknown person. Specifically, on rebuttal, Dr. Tischler testifies:

> "the diffuser design memorandum does not specify an exact latitude or longitude for the diffuser barrel and ports as these will be determined for the final design."
>
> * * *
>
> "precise latitude and longitude of the diffuser ports will not be determined until the final design of the diffuser is completed."[161]

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[158] Ex. ED's Admin Record –Tab K Administrative Record at 00014

[159] Ex. AR-R5 (Admin Record - Remand Tab J) at 00136

[160] This is not a quote, but it is clear from the tenor of the rebuttal testimony and the opening statement by the Port's counsel that the Port attempts to disparage PAC's experts when the problem is the Port's own data and representations.

[161] Ex. APP-LT-1-R Rebuttal at 2:4-6, 3:15-17.

The Port's argument that it can move the discharge location, i.e., Outfall 001, after a permit is issued, is clearly contrary to Texas law, and TCEQ regulations and policies. It would make all of the inputs that the Port, the ED, and PAC used inaccurate. This is clearly not permissible. The rules require the point of discharge be specified in the Application and the Draft Permit, and it is the basis for all modeling and analysis. With this in mind, PAC now turns to an analysis of the modeling.

B. The Port and the ED Failed to Use Accurate Inputs.

It is important to remember how this case has gotten to this point, because the credibility of the parties' positions and their experts is of critical importance in determining which evidence is more reliable. As the ED finally admitted, but only in its exceptions to the original PFD,[162] the Port failed to provide the accurate information needed for modeling in the initial diffuser design and location in the original Application. The Chair of the Commission agreed,[163] and the Port promised it could provide accurate data on remand.[164] Among the data the Port promised to provide was for the eddy at the location of the discharge—an eddy the Port now says does not exist, even though its own expert referred to the "eddy-generated hole" in his June 2021 Diffuser Design Memo post-remand.

In that prior hearing, the Port used a channel bottom depth of about 63 feet for its modeling,[165] and it used a low current velocity[166] without even modeling the impacts of higher velocities to determine if its assumption was correct. The Port boasted in its application that the proposed diffuser at its location could meet the "**target levels of mixing performance" of "2.5% for the ZID, 1.5% for the aquatic life mixing zone (ALMZ), and 1.0% for the human health mixing zone (HHMZ)."**[167] Great mixing indeed, if true. As the first three columns in Table 1 below show, that boast was proven very wrong by PAC's experts before the preliminary hearing. The ED and the Port agreed and the ED revised the draft permit to the 2020 version.

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[162] Executive Director's Exceptions to the Proposal for Decision, at 10-11.

[163] "So the ALJ identified several instances in ·which the applicant failed to meet its burden. They almost all trace back to the inaccurate inputs to the CORMIX modeling that we've been discussing this morning, specifically the bisymmetry [sic] and the velocity data." Ex. PAC-57R at 49:24 - 50:4.

[164] Ex. PAC-57 at 46:15-23.

[165] Administrative Record Tab D, S. App. 000354 and 357.

[166] Administrative Record Tab D, S. App. 000353.

[167] Administrative Record Tab D, S. App 000339.

Table 1: Comparison of "critical conditions" for CORMIX modeling for the Original Application

Boundary	Modeling by ED for The 2019 Draft Permit [168]	Modeling by ED for The 2020 Rev. Draft Permit[169]	Modeling by Port for The 2019 Application[170]	Modeling by Port for The new/2020 Diffuser Design[171]	Modeling by PAC for The 2019 Application[172]
ZID:	1.95	18.4	1.75-2.06	14.8	Up to 70
ALMZ	1.34	1.34	0.45-0.86	9.79	
HHMZ	1.20	1.20	0.53-0.73	6.79	

Then until almost the end of the process, the Port and the ED continued to argue that the worst case conditions resulted at the low channel velocities. PAC's modeling, in column 5, showed how wrong that assumption was. Apparently recognizing PAC's legitimate concerns, the Port paraded out a new diffuser design at the hearing (shown in column 4 above) to offer that some design could meet the 18.4% limit in the 2020 permit, admitting its prior design would not meet the 18.4% limit.[173] But that new design did much worse at the other two mixing zones. This context is important to remember when the ALJs are trying to measure the credibility of the experts and the parties on remand.

This time around, the Port and ED continue to have inaccurate inputs, including related to the depth of the channel at the point of discharge, the distance from the discharge to the shore, and even the location of the discharge (it now appears, based upon the Port's rebuttal testimony). The inaccuracies of these inputs and the impacts of such are discussed below, along with other errors in evaluation by the ED and the Port of its modeling.

1. Wrong Channel Depth at the Discharge Location.

Mr. Tischler's Diffuser Design Memo in the amended application states that the "channel depth **at the point of discharge** of 27.4 m (90 ft) is based on the bathymetry of the site as confirmed by the June 2021 study."[174] That is not correct. It is now undisputed that the channel depth is about 65 feet at the location of the proposed discharge in the Amended Application. The Port's own bathymetry map shows this:[175]

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[168] Administrative Record Tab F ED-0037.

[169] Administrative Record Tab F ED-0059.

[170] Administrative Record Tab D, S. App. 000367.

[171] APP-LT-1 at 34-35, APP-LT-9 at 2, where critical conditions are shown for pcca es_40_5_95(1.0) and other conditions.

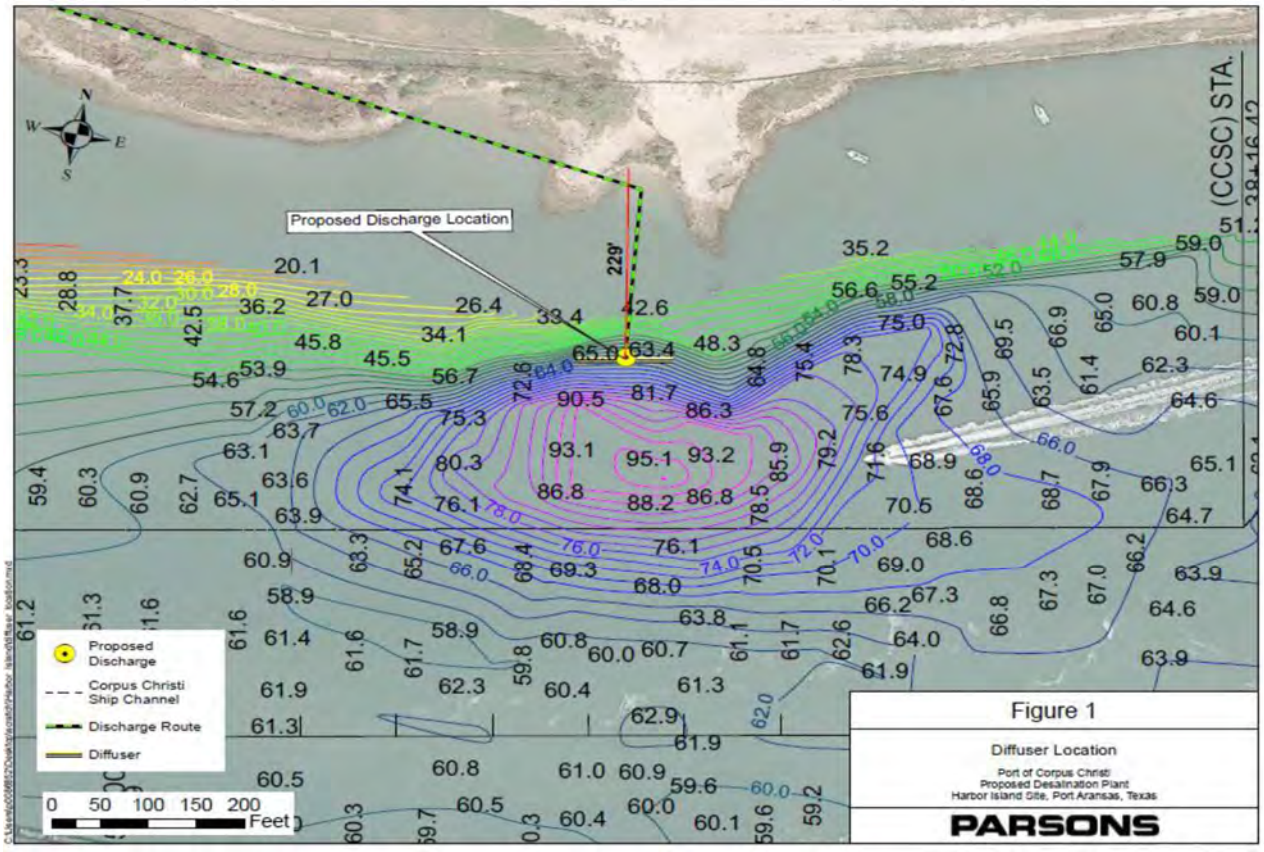
[172] Ex. PAC-2 at 8:2.

[173] Dr. Tischler testified, "Under the condition of high flow rates, the modeling would suggest that they [the Port] couldn't meet it [the 18.4% limit]." Tr. Vol. 3, at 264:20-265:3.

[174] Ex. AR-R4 (Admin Record – Remand Tab I) at 00248.

[175] Ex. AR-R4 (Admin Record – Remand Tab I) at Fig. 1.

Figure 1 from the Port's Updated Application AR Tab I Page 254:



As noted previously, the Port represented to the ED that the "**depth at which the diffuser discharges is 65 feet below the surface**."[176] The Port then added:

> The location is on a **steeply sloping side of the channel** and the ports discharge at an angle of 30 degrees to horizontal and point across the channel toward the opposite bank. **This results in the depth of the channel at which the effluent discharges into at approximately 90 feet**.[177]

First, it is no small irony that the Port criticized, as distortions, the graphs used by some of PAC's experts, claiming they were trying to mislead the ALJs into thinking the side of the channel was steep. In fact, Dr. Socolofsky, Mr. Osting, and Mr. Wiland used the same or very similar scales on their graphs that the Port used for similar purposes in the original application. Mr. Wiland's graphs were new data simply placed *on the Port's own graphs*. The only party to refer to the slope of the bank as "steep" was the Port, yet Dr. Tischler and Dr. Jones spent much of their testimony criticizing PAC's experts, claiming PAC was trying to distort the slope of the bank.[178] In actuality, it was the Port who

[176] Ex. ED-7 Remand at 0001.

[177] Ex. ED-7 Remand at 0001.

[178] APP-LT-1-R Remand at 4-5; APP-CJ-1-R Remand pp. 2-3.

distorted the bathymetry, to assuage concerns raised by the ED. Apparently the bathymetry is steep when it suits the Port, but not steep when it doesn't.

As a result of the Port's representations, the ED used 90 feet for "water bottom depth at discharge" in its modeling,[179] as did the Port. However, at the discharge location identified in the amended application, the depth is indisputably not 90 feet. The channel only gets to a 90-foot depth **around 60 to 70 feet south of the Application's identified discharge location,**[180] which is very close to the location of the original discharge point in the initial application. This is the first major problem with the Port and ED's modeling. The modeling is based on channel and diffuser depths that simply are wrong—contradicted by the Port's own evidence. And, the location of the diffuser is not in a steeply sloping area such that it is 90 feet immediately adjacent to the diffuser. In contrast to the ED and the Port, and to be more accurate, PAC's expert, Dr. Socolofsky, used a 70-foot depth for his modeling, following the guidance laid out in the CORMIX User Manual.[181]

For the first hearing, the ED accepted the 63-foot depth in the Application for modeling, knowing the channel depth at the discharge location was 90 feet.[182] This time, the ED accepts 90 feet as the channel depth at the currently proposed discharge location, despite knowing it is only 65 feet. How is this consistent with the TCEQ's philosophy, which includes a commitment to "base decisions on the law, common sense, sound science, and fiscal responsibility . . . apply regulations clearly and consistently . . . [and] ensure meaningful public participation in the decision-making process."[183]

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[179] Ex. AR-R5 (Admin Record - Remand Tab J) at 00137.

[180] This can be seen on Figure 1, the map of the bathymetry in Mr. Tischler's memo to Ms. Garza. Ex. AR-R4 (Admin Record – Remand Tab I) at 00254.

[181] *See* Ex. ED-5 Remand (Cormix User Manual).

[182] Ms. Cunningham testified at Tr. Vol. 6, at 74:18-75:17:

> Q: So when you model it, as you have here, at 63 feet, and it shows this type of plume and this kind of mixing, that's not a realistic picture of what happens when the effluent comes out and the bottom is at 90 feet, correct?
>
> A: If the depth were increased, yes, the plume would continue to fall.
>
> Q: . . . if you had been told that the bottom of the channel was at 90 feet rather than, you would have to have done a different model run, correct?
>
> A: I mean, you certainly could. Yeah, I'd do an additional modeling run. . . . while I haven't modeled it, I assume that the plume would fall until it hit that 90-foot boundary.

[183] Mission Statement and Agency Philosophy - Texas Commission on Environmental Quality - www.tceq.texas.gov, April 11, 2022.

2. Wrong Distance from Discharge Location to Bank.

The Port's Application also shows a distance of 229 feet from the discharge location to the shore.[184] The Port asserted that is the distance that the CORMIX User Manual refers to as the "DISTB." This 229-foot DISTB was used by the Port for its modeling[185] and the ED also accepted that DISTB for its modeling. [186] Yet the Port's own expert, Dr. Jones, used a 160-foot distance in his revised mapping of the bathymetry, identifying that distance from the discharge location and what he determined to be the closest shore at the water surface. He explained this in relationship to his exhibit APP CJ 20 R Remand and he argued that his mapping of the bathymetry is what he believes the Port should use.[187] Thus, there is a clear disagreement between the Port and the ED's modeling using 229 feet as the DISTB, and Dr. Jones' modeling and testimony using 160 feet as the DISTB. In addition, the Port and the ED's DISTB does not comply with the CORMIX User Manual.

The DISTB distance is defined in the CORMIX User Manual **not** as the distance to the shore at the surface of the water, but rather is defined as:

> the average distance between the outfall location (or diffuser mid-point) and the shoreline. It is also specified as a cumulative ambient discharge divided by the product UA times HA.[188]

"HA" is the "Average Depth" of the receiving water body determined from the equivalent cross sectional area during schematization."[189] "UA" is "the Mean Ambient Velocity," or "the average velocity of the receiving water body's flow."[190] The use of the term "average" reflects that the resulting DISTB depends on specific site data, the depth of the discharge, and the velocities at the discharge. For velocity, UA requires the mean velocity near the discharge, not the mean velocity in the channel.[191]

Thus, the DISTB is not the actual distance to any specific bank, shore, or shoreline, but is intended to represent the existence of such boundaries near the discharge (based on an "average").

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[184] Ex. AR-R4 (Admin Record – Remand Tab I) at 00254 (Figure 1 of the Tischler memo.)

[185] Ex. AR-R4 (Admin Record – Remand Tab I) at 00256 & 263 show the two examples of modeling that Dr. Tischler included in the application. These pages show the input for the DISTB at 229 feet.

[186] Ex. AR-R5 (Admin Record - Remand Tab J) at 00138.

[187] APP-CJ-20-R; Remand Tr. Vol. 1 at 259:1-7. When asked if his CJ 20 or other of the Port's figures are the best to use Dr. Jones responded, "I would recommend this one [his own]; however, once again I would defer to the Port and the experts who are actually involved in the design."

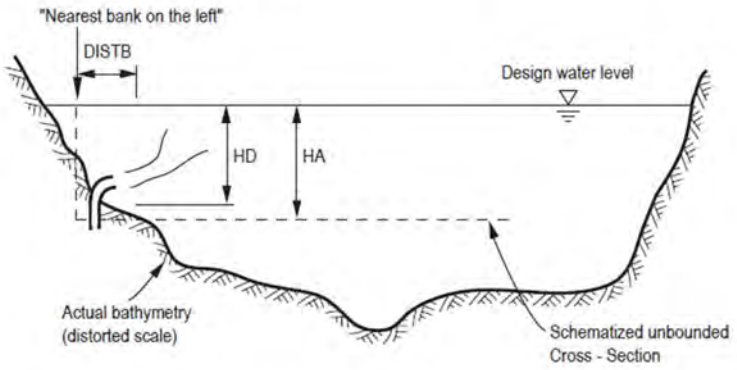
[188] Ex. ED-5 Remand, p. xx. (Bates page 0022): Distance from Shore (DISTB).

[189] Ex. ED-5 Remand p. xix. (Bates page 0021): Average Depth (HA). The use of UA and HA approach is explained in more detail at page 46 for the type of unbounded cross section used in all modeling with the conservative options by the Port, the ED and PAC's experts.

[190] Ex. ED-5 Remand, p. xxii (Bates page 0024): mean Ambient Velocity (UA).

[191] The mean velocity issue is describe below in the section on non-uniform flows.

Using the shoreline as just an actual distance (which is what the ED and the Port did) is plainly wrong, and is directly contradicted by the CORMIX User Manual's own depictions, seen below:[192]



b) Example: Unbounded Cross - Section Looking Downstream
(Small Buoyant Jet Discharge Into Large Lake or Reservoir)

This sketch clearly shows that the DISTB is not at the place where the bank emerges from the waterline, but rather occurs prior to that. The whole purpose of the DISTB is to determine where the bank will act as a barrier to mixing. And, even though the Port did not properly consider this, its expert acknowledged this principle. Specifically, Dr. Jones testified that in sloping conditions it is appropriate to account for the lack of available water for mixing close to the shoreline by locating the bank away from the actual shoreline for CORMIX modeling purposes.[193] Yet the Port did not do that here. The CORMIX User Manual approach is the proper way to evaluate whether there will be plume interaction with the bank and the extent of any negative impacts on the mixing. This is especially true for negatively buoyant plumes that will fall onto the bank, as here, most immediately after leaving the diffuser ports.

Thus, we have an amended Application indicating the CORMIX DISTB—the place where the bank will impact mixing—is 229 feet away, when the Port's own discharge location and identified diffuser depth indicate the diffuser is literally sitting on the bank. These things are in direct conflict, and using such assumptions contradicts the CORMIX User Manual. The evidence conclusively establishes the plume-bank interaction will occur closer than 229 feet from the diffuser discharge ports.

3. Additional Wrong DISTB Assumptions for CORMIX Modeling.

As a result of the Port's mischaracterizations of the bathymetry, the depth to the discharge, and its distance to shore for modeling purposes, the ED modeled the discharge using a schematization with a 90-foot deep flat bottom channel with a vertical wall for the shore or bank located 229 feet north of

[192] This is a copy of Figure 4.4(b) from the CORMIX User Manual, Ex. ED-5 Remand, p. 44. (Bates page 0072).

[193] Remand Tr. Vol. 2 at 307:9 – 308:10 (*esp.* 308:2-4).

the discharge location.[194] Schematization for the conservative option for CORMIX does require a vertical wall to represent the boundary for the closest shore or bank at the depth of the discharge.[195] All modeling experts agree that a "wall" has to be used for modeling with the CORMIX conservative option. The only question is where that wall is located in relation to the discharge location, the DISTB, a critical input that the CORMIX model requires to be used.[196]

The Port spent much time criticizing Dr. Socolofsky's testimony and modeling, claiming that his use of a bank location ignored the bathymetric reality and resulted in exclusion of much water that would be available for mixing. But, the Port and the ED's modeling assumes a 90-foot depth of water where the water is actually 0 feet deep, i.e., where the water at the surface meets Harbor Island. That schematization assumes much more water is available for mixing than is actually available.

PAC concedes that all models used by the parties have assumptions about inputs that are developed in part through schematization, and that cannot always accurately reflect the bathymetry in the discharge location. But, as the Port's own expert, Dr. Jones, has previously noted:

> . . . a complete model would account for the effects of the local coastal conditions on the discharge plume and its subsequent transport must be identified to predict the potential plume impacts. *Site-specific spatio-temporal variations in bathymetry, salinity, temperature, currents, and waves must be evaluated in terms of their effects on the discharge plume* and the potential reduction of dilution due to processes such as pooling of brine on the sea floor.[197]

However, rather than trying to determine as accurate a model as possible, the Port and ED's modeling assumes water where there is a significant amount of land, whereas PAC's modeling assumes only a small amount of land is water. As is easily seen in the graph below, PAC's modeling is based upon assumptions far more realistic than the Port's modeling. Despite the Port's assertions of "distortion," it accurately reflects the modeling assumptions of the parties. Yes, the graph would be stretched longer if using the same scales on both the vertical and horizontal axis, but the amount of "land area" (in gray) and water (in white) encompassed within the yellow and purple lines are proportionally the same and unaffected by the axis scales used. The ED's schematization is shown with

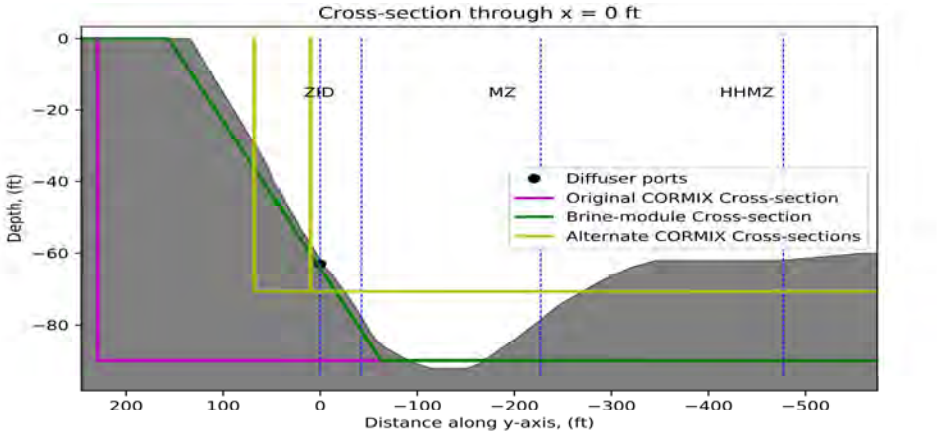
[194] Remand Tr. Vol. 9 at 2290:8-16, 2299:2-10, 2312:18-24.

[195] The CORMIX User Manual defines "Schematization" as "the process of describing a receiving water body's actual geometry with a rectangular cross section." Ex. ED-5 Remand, p. xxiv. Note the Manual is also APP. LT-7- R.

[196] Chapter 4 of the CORMIX User Manual is titled CORMIX Data Inputs. The required inputs for multi-port diffusers are identified in that chapter and include the DISTB. Ex. ED 5 Remand, p 59 (Bates pages 0087).

[197] Remand Tr. Vol. 1 at 201:14 – 202:7 (emphasis added).

the purple vertical and horizontal lines on the figure below.[198] The yellow lines represent the horizontal and two of the vertical boundaries for the bottom and bank used by Dr. Socolofsky for his model runs.



First, as can be seen from this figure, for its modeling, the ED assumed all of the shaded area to the left and below the discharge location is water. Thus, the ED's modeling assumed the discharge is not near any actual bank and it eliminated any possibility of plume interaction with the bank/boundary or any limit for plume movements to the north.[199] The ED's approach assumed unlimited water available to move as needed to maximize mixing. Those modeling assumptions—which are clearly out of line with the bathymetry in the area (as acknowledged by the Port's own expert)[200] and the fact that discharge is on, if not in, the channel bank—resulted in a prediction of 14.6% of the effluent and the predicted 1.85 ppt change in salinity at the boundary of the ZID, shown on Table 2 further below.

In contrast, Dr. Socolofsky and Mr. Osting both schematized the channel with a number of vertical lines at different distances to the discharge., i.e. potential DISTBs for purposes of their sensitivity analysis. The yellow lines are two examples, one at 3 meters left of the discharge and one 20 meters to the left. They assumed that the discharge is on the bank (which matches the data the Port provided in its Application and memo to the ED) and, thus, accounted for the fact the dense plume could interact with the bank as it falls and travels with the higher velocity currents over that bank to the east and west. That is what the CORMIX model proves. Dr. Socolofsky and Mr. Osting's modeling assumptions **relied on the Port's own Application representations**, and their modeling confirmed that boundary interaction results in 55% of effluent remaining and the 16 ppt change in salinity for both

[198] The figures is a copy of page 10 of Exhibit PAC-51R SS-6.

[199] The CORMIX User Manual defines "Boundary Interaction" as occurring "when the plume encounters a vertical (i.e. water surface, bottom, pycnocline, or terminal stratified level) or **lateral (bank) boundary.** Ex. ED-5 Remand, p. xix (Bates page 0021) (Emphasis added.).

[200] Remand Tr. Vol. 1 at 200:2-18.

their modeling with a DISTB of 0 and 3 meters. Table 2 below compares the ED, the Port, and PAC's CORMIX modeling, and shows the same pattern previously seen in Table 1:

Table 2: Comparison of "critical conditions" for CORMIX modeling for the Amended Application

Boundary	Modeling by ED % eff./Change in Salinity[201]	Modeling by Port % eff./Change in Salinity[202]	Modeling by PAC % eff./Change in Salinity[203]
ZID:	14.6%/1.85ppt	10.7%/1.35ppt	up to 55.0%/16ppt
ALMZ	8.9%/1.13ppt	4.9%/0.62ppt	up to 41.4%/12ppt
HHMZ	5.4%/0.68ppt	3.4%/0.33 ppt	up to 24.5%/7ppt

To get a more complete understanding of the range of DISTBs for which boundary interactions would occur, both Dr. Socolofsky and Mr. Osting did their modeling as sensitivity analyses. They knew that if a permit were issued, the 20 ports would not be buried (contrary to the data supplied in the Application). They concluded that the Port's data must be wrong and they had to assume some relocation of the ports would be required—not just to get them out of the ground, but also to provide room for the diffuser barrel and risers.[204] Therefore, Dr. Socolofsky and Mr. Osting made reasonable assumptions to correct for the Port's clear errors.

Because the Port's data means that some or all of its 20 discharge ports would be buried in or at the ground,[205] which clearly could not be true, PAC's experts could not create a single DISTB based upon the Port's latitude and longitude data and the representation of a 65 foot depth. They modeled that location as if the ports were actually in the water – a 0 meter DISTB - and then used different DISTB assumptions to try to understand the extent of plume-bank interaction that would occur if the discharge was relocated some reasonable distances away. Their sensitivity runs clearly show that the CORMIX model predicts the plume-bank interaction even at significant large DISTBs. These sensitivity analyses were done independently by Dr. Socolofsky and by Mr. Osting, and both confirmed the major impacts of boundary interactions on mixing at the point of discharge.

[201] Ex. Kings-Steves 21R (red figures)

[202] Ex. AR-R4 (Admin Record – Remand Tab I) at 00253.

[203] Ex. PAC-51R SS 5.

[204] See for example, the sketch produced by the Port *in Rebuttal*, APP-LT-16-R. This is the only diffuser drawing that the Port has presented.

[205] Mr. Osting did his evaluation using the actual data collected by Parson's for the bathymetry and determined that some of the 20 ports would be underground. Ex. PAC-49R at 10:4 – 11:4. Mr. Wiland did a similar analysis but used the two bathymetry maps in the Application, which as discussed above, differ as to where the contours and discharge site should be located. The results of his evaluation was very similar. Ex. PAC-53R at 11:3-14.

It is important to note that PAC is not challenging the use of CORMIX, but rather the way the Port and ED incorrectly used CORMIX, inconsistent with the CORMIX User Manual. As Dr. Socolofsky notes in his testimony, the CORMIX User Manual makes it clear that the model can evaluate plume-boundary interactions. Specifically, Dr. Socolofsky testified:

> CORMIX is designed to address boundary interaction and plume attachment, and this is a major topic of Section 2.1 in the CORMIX User Manual.[206]

The CORMIX User Manual emphasizes this in the Author's Note:

> CORMIX is broadly accepted as an easy-to-use yet powerful tool for accurate and reliable point source mixing analysis. . . Because of its ability to simulate details of plume boundary interaction, important for ecological and human health risk assessment, CORMIX is recognized by regulatory authorities in all continents for environmental impact assessment.[207]

Despite both the Port and the ED modelers' testimony that they relied on the User Manual and included a version with their testimony, it is clear that they did not use the guidance in the Manual for how to develop accurate inputs for their modeling. As a result, the Port, and possibly the ED, are simply asking the ALJs and the Commission to:

- Ignore the 65-foot depth figure given in the Port's Application and response to the ED's request for clarification as the depth at the point of discharge and accept the "effective depth" of 90 feet for modeling despite what the CORMIX User Manual clearly indicates is how to schematize the channel cross section;

- Ignore that the DISTB is not 229 feet (or that even the Port's own expert, Dr. Jones, opined that a different DISTB distance should be used) and reject the guidance in the CORMIX User Manual for the schematization for evaluating boundary interactions;

- Ignore the latitude and longitude figures in the Application which place the discharge ports literally in the channel bottom; and

- Ignore that there is no modeling for any location other than at the Application's identified latitude and longitude to allow for a post-permit relocation of the discharge.

And as will be discussed below, they are also asking that the local conditions that will further reduce mixing performance be ignored. Those conditions include:

- the barrier to straight line movement of the plume due to the bathymetry to the east and west of the discharge, i.e.. the cove,
- the pooling of effluent in a 95-foot hole to the south,

[206] Ex. PAC-51R at 13:11-13.

[207] Ex. ED-5 Remand, at v. (Bates page 0007): Author's Note.

- the creation of density currents or bottom plumes in the far field, and
- the non-uniform flow conditions created by eddies and significant changes in flow velocities to the north and south of the discharge location.

The Port, in its rebuttal testimony, now recognizes the problems with its location data and contends (quite wrongly) that its outfall location does not have to be at the latitude and longitude location identified in the Application. This position by the Port is clearly not tenable given the Commission's order requiring the Port to provide "site specific" data, as well as data regarding the discharge location. Regardless, the Port's assertion actually further supports the sensitivity analyses by Dr. Socolofsky and Mr. Osting, done to get a good understanding of the how localized bathymetry reduces the mixing performance of the diffuser even if the Port were to move it a significant distance. Dr. Socolofsky also set the DISTBs at, 5, 10, 15 and 20 meters, or up to about 65 feet, for his sensitivity runs. Mr. Osting used a similar approach. At DISTBs of 5, 10, and 15 meters, the CORMIX model continues to predict bank interaction and percentages of effluent remaining at the ZID boundary of over 30, 20, and 17% respectively.[208] Beyond 20 meters, the DISTB bank interaction to the north would not be as significant, but there are other bank interaction issues even 20 meters out into the channel, discussed further below.

C. The Port and the ED Failed to Account for Margin of Error/Safety Margin.

The CORMIX model provides session reports with every model run.[209] Those reports have significant information for the modeler and for those relying on the modeling. The most significant may be the admission that the model cannot be treated as precisely accurate, but only accurate to a 50% margin of error.[210] The session report for one of the ED's modeling runs in the record (which Ms. Cunningham agreed is comparable for all or most such model runs) provided that exact warning.[211]

That, of course, means that a prediction of 10% of the effluent at the ZID means the range of the results should be assumed to be between 5 and 15%.[212] For salinity concentrations, that range of error means that a 1.8 ppt prediction would range from .9 to 2.7 ppt. This margin of error warning is also contained in the CORMIX User Manual, which states:

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[208] *Id.* Lines 91 through 93 89. Column I.

[209] Ex. ED-5 Remand at 31 (Bates p. 0059) (Section 3.7.1: CORMIX Session Report).

[210] Remand Tr. Vol. 9 at 2304:15-21.

[211] *Id*.

[212] Remand Tr. Vol. 9 at 2306:9-14.

> **Whenever the model is applicable** . . . predictions on dilutions and concentrations, with associated plume geometries, are generally accurate to within ± 50% (standard deviation) or less.[213]

Given this margin of error and the goal of protecting water quality and the marine species in that water, the modelers must take this into account. Yet they do not. Rather, the ED and the Port assume the modeling results are **precisely accurate**. **Neither the ED nor the Port even reported this margin of error in their modeling reports, nor suggested making any accommodation for CORMIX's own margin of error consideration**, even given the clear notice in the CORMIX User Manual that plume interactions should and can be considered in running the model.

If the Port's original target for mixing of 1.5% at the ALMZ or the initial modeling results by the ED of 1.34% at the ALMZ for the original Application were true, this margin of error would not be important. But the mixing is much worse for the diffuser in the amended Application, even assuming the ED's new modeling is correct, which it is not. And the predictions of concentrations of salinity of 2.5 ppt above ambient at the ALMZ is a level above that recommended by TPWD as safe, and at a level the experts in aquatic life in the area have testified can cause significant, including lethal, impacts on sensitive marine species.[214] These margins of error cannot be ignored. This is yet another defect in the modeling done by the Port and the ED.

D. The Port and the ED Used Incorrect Salinity Concentrations.

Table 2 above shows the percentages of effluent remaining and the change in salinity at the mixing zone boundaries for the "critical conditions." However, when evaluating the impact of the salinity concentrations on marine species that result from a brine discharge, the critical conditions methodology used by the ED does not predict the expected worst case harm.

Ms. Cunningham testified in the last hearing that the critical conditions predicted by the CORMIX modeling represented the worst case conditions for mixing,[215] but she agreed in the remand hearing that her position, while true for most chemicals in the discharge, is not true for salinity.[216] Because of the significant salinity levels in the receiving water, adding desalination brine results in different worst case conditions for both the changes in salinity and the resulting total salinity

[213] Ex. ED 5 Remand p. 23 (Bates page 0051).

[214] Ex. PAC-7 at 19 (Table 1).

[215] Tr. Vol. 6 at 35:3-19.

[216] Remand Tr. Vol. 9 at 2272:14-23.

concentration in the plumes than is shown by the critical conditions methodology used by the ED.[217] This is easily seen in the data shown in Kings-Steves-21R, the excel document showing the results of the ED's modeling.

The ED's critical conditions are shown in red, on line 8 for input W_40_c, and this was used as the basis for the ED's calculations of effluent to be allowed in the Draft Permit. But, other modeling conditions actually show greater increases in salinity, both in ppt and overall % increase, than the ED's critical conditions shown on line 8. For example, Lines 19 and 20 (showing conditions for S_50_b_95 and S_50_c_95) reflect salinity levels at the ZID of 44.68 ppt (Column Sal ZID), with the increase being 4.11 ppt over ambient (or 10% over ambient)(Columns "Sal Dif ZID" and "Sal % above ZID"), and 33.43 ppt, with the increase being 3.50 ppt over ambient (a 12% increase over ambient).[218] For the ALMZ, the ED's critical conditions, line 8 shows 1.13 ppt, as the salinity increases, whereas the similar conditions in line 19 show 2.5 ppt as that increase. If TCEQ adopted the limit of 2 ppt as TPWD and GLO recommend, the permit would have to be denied.

These salinities in the ED's own data are higher than the ED's critical conditions calculations for salinity. Thus, higher worst case conditions for salinity occur even according to the ED's own modeling. Yet the ED disregarded these results to instead hew to a slavish consistency with the "critical conditions" methodology that is used in all wastewater permits cases. That may work for other chemicals in a discharge, but does not reflect the worst case for salinity.

Moreover, all we have from the Port and the ED is a partial set of the thousands of conditions that could affect the salinity conditions. The ones the Port and the ED ran all have the same set of **inputs** for densities for ambient and effluent waters and most of the same **inputs** for velocities, 0.8 m/s. Neither the Port nor the ED has done anything to actually attempt to determine the inputs that provide the worst case conditions for salinity impacts.[219] And, as shown by the ED's own modeling, the 2.5 ppt and 7% figures are not the worst case results. The Port has failed to meet its burden to show the modeling inputs are accurate for the purposes for which the modeling was performed.

E. The Port Failed to Properly Consider the Impact of the Cove.

For some unexplained reason, the Port moved its discharge for the Amended Application north into a cove. That move creates even greater problems for the use of the CORMIX model than putting

[217] Remand Tr. Vol. 9 at :2275:24-2276:4.
[218] Ex. Kings-Steves-21R; Remand Tr. Vol. 9 at 2271:22-2276:17.

[219] That is true for PAC also, but identifying the proper inputs is not PAC's burden. PAC need only show the ED and Port's inputs are wrong. PAC does not have to spend the money doing the Port's job.

the diffuser ports on the bank. The presence of the cove, surrounding the discharge on three sides, means that the plume-boundary interactions involve more than just those for the bank coming down from the north. The move results in interactions with the sides of the cove as well. When asked about this move, Mr. Osting stated:

> . . .it is my opinion that the new location for the proposed discharge is worse for mixing. It is certainly worse for using the CORMIX model to determine mixing results.[220]

Dr. Socolofsky echoed that opinion, testifying:

> Again, I want to emphasize, it is not the model but the location that is the problem. It is a location that, in my opinion, is worse for use of the CORMIX model than the original location of the discharge.[221]

As one of the Port's modeling experts explained, running the model, even with the bank interaction, is not the end of the evaluation of the mixing analysis. The local bathymetry, as well as other site specific conditions, need to be considered once the schematized channel is used for the CORMIX model. As noted previously, Dr. Jones opined that "**Site-specific spatio-temporal variations in bathymetry**, salinity, temperature, currents, and waves must be evaluated in terms of their effects on the discharge plume and the potential reduction of dilution . . . ."[222]

The existence of the cove is obvious in Figure 1 of the Diffuser Design Memo in the Application,[223] especially if the discharge area is enlarged. The underwater extensions of the two points of land coming off Harbor Island continue southward of the diffuser and at depths above those of the centerline of the plume for most tidal conditions. [224] These sides of the cove block the paths of the plume from reaching the mixing zone boundaries in the way that CORMIX otherwise predicts, straight lines east and west.[225]

In their testimony and exhibits, Dr. Socolofsky and Mr. Osting show this condition. Dr. Socolofsky's exhibit PAC-51 SS-6 depicts how the sides of the cove extend further out and above the discharge location on both the east and west sides. The figures on pages 7 and 9 of that exhibit show how the sides of the cove at 82 feet east and west of the discharge location extend southward and above

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[220] Ex. PAC-49R at 22:8-12.

[221] Ex. PAC-51R at 35:1-3.

[222] Remand Tr. Vol. 1 at 201:14 – 202:7 (emphasis added).

[223] Ex. AR-R4 (Admin Record – Remand Tab I) 00254. The above water part of the cove is also shown clearly in PAC-49R TO-3.

[224] Ex. PAC-51R at 10:11-15, 13:7-16, 15:7-15.

[225] *Id*. at 13:14-16.

the discharge location. The distance to the ZID boundaries to the east and west is 92 feet. Thus, these paths of the plumes are blocked by the sides of the cove before they even reach the boundaries of the ZID and of the other two mixing zones to the east and west. Essentially, the modeling used by the Port and the ED to show effluent limits at the ZID and mixing zones pretend as if the discharge plume could go right through the land as if it did not exist.[226] This is clearly not modeling that can be relied upon. Even the Port's own expert acknowledged that modeling that predicts the plume underground is not reliable.[227]

As Ms. Cunningham testified, her modeling showed that for the channel velocity of .8 meters per second (m/s) the centerline of the plume turns to go east or west with the current within one meter or about 3 feet of the discharge ports.[228] The side of cove on the east of the discharge is 25 feet further south than the centerline of the plume. To the west, the cove side is 15 feet farther to the south. The plumes cannot go through these banks, as the CORMIX predicted path would require. For incoming tides, that blockage extends on the west for more almost 500 feet.[229]

The plumes cannot go underground; they will interact and "attach" to these bathymetric features slowing their movement and reducing their mixing.[230] If there is no water on one side or the bottom, there is no water with which the plume can mix. And the dense plumes will be pulled into the hole by gravity.[231] The centerlines of these plumes are in the hole. The CORMIX model assumes the vertical and horizontal boundaries continue east and west unchanged, but the reality is that there are significant changes along both the vertical and horizontal boundaries to the east and west. And those changes must be considered in the evaluation of whether the predictions from the CORMIX modeling are reliable for permitting purposes.

F. The Port Failed to Consider Other Site Conditions.

There are other bathymetric features that the Port and ED not only failed to consider but also urge the ALJs and Commissioners to ignore. There is the 95-foot hole in the near field in which effluent will fall. The bathymetry from the Port shows other, smaller depressions in the far field into which the

[226] *See* Ex. PAC-51R SS-7 at 11, 14.

[227] Remand Tr. Vol. 1 at 205:12-16.

[228] Remand Tr. Vol. 9 at 2313:7-23.

[229] PAC 51-R SS-6, pages 4 – 7 show the sides of the cove to the west, extending well out into the channel, at least 492 feet. At the mixing zone the plume is blocked even if the discharge was 60 feet further south into the channel than the location at the latitude and longitude in the Application.

[230] Ex. PAC-51R at 8:15-24.

[231] Ex. PAC-51R at 9:15.

denser brine effluent could pool. For the hole, the Port argues that the current constantly flushes the dense brine effluent out and fully mixes as if there were not a hole. The Port's experts express opinions but have not presented any scientific analysis to support such opinions.

In contrast, Dr. Socolofsky performed an evaluation based on scientific methods, supported by peer-reviewed journal articles.[232] His analysis is represented by the figure in his prefiled testimony at page 27 and shown below. It explains that there is mixing above the interface of the ambient water and saline effluent pool below. That allows mixing at the top of the hole as the lighter ambient water flows over the denser water from effluent plumes in the bottom. That is not flushing. The hole is almost continually fed by the water from the effluent plume entering the hole due to its higher density, maintaining the dense pool at the bottom.[233]

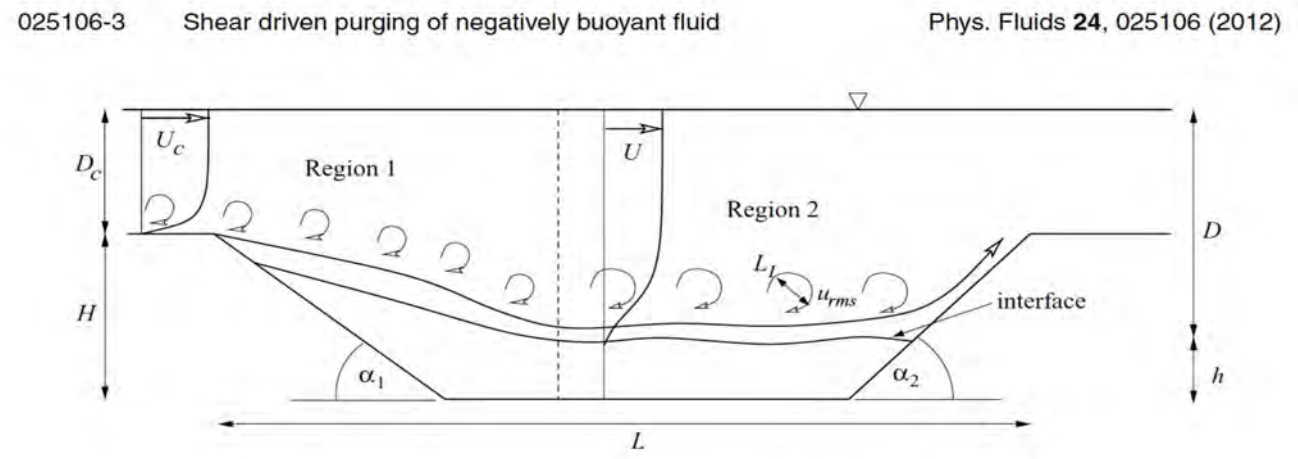

FIG. 1. Schematic of purging flow in a cavity of general shape.

And the CORMIX model predicts high concentrations of saline-rich plumes, with very high salinity concentrations, as high as 50 ppt, interacting with the bank.[234] Once there is such boundary interaction, the plumes will be slowed and pulled by gravity into the hole. And Dr. Socolofsky's analysis shows that the 95-foot hole will not only fill up with concentrated saline water, but also overflow, just like a bathtub when the water is left running.[235] That overflow will have high salinity concentrations, and those overflows will then move along the bottom of the channel as "density

[232] This analysis is explained in Dr. Socolofsky's' prefiled testimony at Ex. PAC-51R at 26:4 – 28:24.

[233] Ex. PAC-51R at 26:7-15, 27:4-17.

[234] *Id*. at 8:15-24, 22:1-12.

[235] *Id*. at 26:5-15.

currents," or bottom saline plumes, flowing downhill with gravity to low spots in the bottom of the channel or across flatter areas, pushed by gravity and the channel currents.[236]

In fact, such bottom plumes are predicted for the far field in all of the CORMIX modeling done by the Port, the ED, and PAC's experts. The salinity concentrations will depend on a number of factors, just as they do in the near field plumes. And while the SUNTANS model predicted no bottom plumes, even the Port's witness Dr. Jones agrees with PAC's experts that the CORMIX predictions are more reliable than those of that SUNTANS modeling in the far field, at least for a kilometer or so from the discharge.[237] Despite this, the Port asks the ALJ to ignore such difficulties.

G. The Port Failed to Consider the Eddy and Non-Uniformity of Flow Conditions.

Besides the bathymetric conditions at or near the discharge location, there are local flow conditions the CORMIX model does not directly address but which have significant impacts on mixing. The two most obvious are eddies and the different flow velocities to the north and south of the discharge location. These add to the uncertainty of any modeling results.

Dr. Socolofsky, an expert in identifying eddies from satellite photos, has found the existence of an eddy or eddies in such photograms in the area of the discharge.[238] Moreover, he has seen such eddies on his visit to the site. Dr. Austin found evidence of an eddy in the Port's own ADCP data.[239] And there is a 1956 photograph with a clear image of a large eddy over the hole.[240] Finally, Dr. Tischler's own Diffuser Design Memo on remand refers to an "eddy-generated hole" at the site of the discharge. At the Commission's open meeting, the Port's counsel was willing to openly and vigorously discuss the benefits of the eddy upon mixing, and requested a remand to provide proof of such. But, on remand the Port did no such thing. Instead, it now disavows the existence of any eddy. The ALJs should ask themselves, "Is this because no such eddy exists, or because the presence of an eddy creates problems for the Port?" Given the evidence, PAC asserts it is clearly the latter.

To now argue against the presence of an eddy, the Port relies solely on four days of data during a single month at a site where flow conditions clearly change from time to time, especially with storms. Does any reasonable person really believe that this "disproves" what the Port's own

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[236] *Id*. at 27:10-17.

[237] Remand Tr. Vol. 1 at 226:9-227:15.

[238] Ex. PAC-51R at 29:13-22.

[239] Ex. PAC-44R at 6:23-28.

[240] *Id*. at 24, Figure 9.

staff has previously claimed was "common knowledge." And it was Dr. Tischler who relied upon the existence of the eddy to argue that there would be better mixing in the hole. He still referred to the hole as "eddy created" in his June 24, 2021 memo to Ms. Garza that is part of the Port's Amended Application. Another Port expert, Mr. Furnans, and the ED's Mr. Michalk, testified that eddies could trap whatever is in the water and recirculate it, not mix it and move it out of the area.

Despite being given the opportunity on remand to provide better evidence of the site specific conditions at the location of the discharge, the Port has not done so. Instead it has created more confusion by collecting only four days of data and, on that basis alone, reversing course and contending that no eddy exists at the discharge location. Ironically, even the data collected by the Port tends to show the presence of an eddy. As Mr. Austin noted, and as can be seen in the data itself, the data point closest to the discharge appears to show an eddy at the location of the discharge.[241] The Port argues that this is just "one data point" and should be disregarded. But, it is the one data point that would actually detect an eddy in that location. Moreover, it is not PAC's fault that the Port collected only four days of data, rather than collecting additional data to rule out what that data point showed regarding an eddy. The Port intentionally does not see what it has chosen not to see. But do the ALJs genuinely believe that the evidence before them rules out the presence of an eddy? Especially in light of the ADCP data for that location and Dr. Tischler's reference to the "eddy-generated hole?" It is not PAC's burden to conclusively prove the existence of the eddy; it is the Port's burden to provide accurate and reliable site-specific data so that accurate modeling and analyses can be done. Do the ALJs genuinely believe they have that based on this record?

There is another relevant site-specific condition found in the data collected by the Port, and it is evidence the Port wants ignored. Mr. Osting's Exhibit PAC-49R TO-5 clearly shows non-uniform velocity in the Port's data. Specifically, page 3 of that exhibit shows the change in velocity for an ADCP transect close to the discharge location. At the discharge location, which is just above the red line, flow velocities change dramatically, with velocities to the south, shown in shades of green and yellow, twice that of those to the north, shown in blue. The other figures in that Exhibit show this condition for other transects, as Mr. Osting explains:

> Near the north bank closest to the proposed outfall location, the velocity was observed to be approximately one-half of the velocity in mid-channel farther from the outfall location. Because of this, the CORMIX model results, which were developed by the ED and which rely upon an ambient velocity based upon using

[241] Ex. PAC-44R Revised at 10:4-11:2.

> 0.8 meters per second as a median velocity across the channel, are not a suitable assessment of the ambient velocity within the ZID . . .[242]

As discussed above regarding the CORMIX User Manual instructions for DISTB, the velocity for determining the DISTB is not the mean across the channel, but the mean in the area of the discharge where the velocities change greatly. Once again, the Port and the ED ignore the site-specific data that was a significant purpose for the remand. Neither has identified this flow pattern as a factor to be considered in evaluating the reliability of predictions from their CORMIX modeling, yet the condition clearly exists based on the Port's evidence. And the CORMIX User Manual says it is relevant. So, while the Port on remand was supposed to "clean up" its errors from the first hearing, it instead changed the location and created a whole new set of errors/deficiencies.

As Dr. Socolofsky explains, it is the location in the cove that cause the channel velocities to drop north of the discharge location going both east and west, due to the cove walls.[243] This can clearly be seen in one of Dr. Socolofsky's photographs, Exhibit PAC-51R SS2. On page 3 of that exhibit, the sign with the bird on it warning "Danger Submerged Objects" is out on the side of the cove. That sign can be seen as the fourth dot coming off that point of land in the water by enlarging the area of Figure 1 from Dr. Tischler's memo to Ms. Garza. This underwater extension of the point of land calms the flow on the side with the discharge with an incoming tide.

H. Conclusion on Modeling.

The failure by the Port and ED to perform their modeling with the type of accurate inputs identified by the CORMIX User Manual, e.g. the correct schematization that allows consideration of boundary interactions, should be enough to prove that the draft permit cannot be protective. The Port argued that the CORMIX User Manual dictates that they use the shoreline as the DISTB, but the CORMIX User Manual definition and graphic contradict that. The CORMIX User Manual graphic clearly shows that the plume-bank interaction boundary (the DISTB) is NOT the place where the water meets the shoreline. Rather, it is an average distance based upon the sloping bank away from the diffuser to the shoreline. But that is not how the Port and the ED calculated it, contrary to the CORMIX User Manual.

Moreover, the decision by the Port and the ED to place the discharge in the back bank of a cove results in much greater uncertainties in predicting mixing. The location in the cove must be

[242] Ex. PAC-49R at 26:8-13

[243] Ex. PAC-51R at 9:11 – 10:25.

considered when relying on the predictions from the modeling by the ED or Port at the mixing zones for the higher channel velocities, because the sides of the cove will force the plume to take different paths to the mixing zone boundaries than those the CORMIX model predicts. Yet, neither the ED nor the Port attempted to account for these conditions, despite the Port's own expert's prior opinion that such site-specific conditions must be accounted for. The evidence proves that some of those plume paths will be through a 95-foot hole, where the concentrated salinity will be subject to an entirely different set of mixing processes, with the concentrated salinity and any marine species trapped for longer than if flushed out. That water (with high salinity) will then spill over into bottom plumes that do not easily mix and can travel significant distances in the ship channel according to CORMIX modeling. That will create longer exposure times for aquatic organisms than either the ED or the Port currently consider.

PAC's experts agree that the CORMIX model provides important information at the discharge location and in the far field. They disagree that the results of the modeling by the ED for the mixing zone boundaries can be relied upon as conservative or are reliable for evaluating the impacts of the discharge on the marine environment. And there are the non-uniform flow conditions, eddies and changes in flow near the discharge due to the cove wall, which have not been considered by the ED or the Port in their modeling.

The ED's modeling predicting up to 2.5 ppt and 7% salinity concentrations over ambient at the mixing zone boundary should be considered the floor for that location (although the ED's modeling also showed higher numbers under other conditions, as noted above). These increases in salinity are above the limits recommended by GLO and TPWD. And the 50% range of error takes those figures to 3.75 ppt and 10.5%. The modeling performed by Dr. Socolofsky and Mr. Osting show that, with reasonable schematization, a change of 16 ppt over ambient at the ZID boundary and 12 ppt at the ALMZ is reasonably expected. That means the actual salinity levels at the ZID and ALMZ boundary are both over 50 ppt, a level clearly shown to be harmful by the literature and evidence in this case. Unless the ALJs simply believe the Port's evidence is clearly conclusive and Dr. Socolofsky and Mr. Osting simply do not know what they are talking about, the evidence at a minimum demonstrates the Port has not met its burden to show that the modeling complies with applicable regulations ***to ensure the Draft Permit is protective of water quality, utilizing accurate inputs.***

6. Issue H: Whether the Executive Director's Anti-Degradation Review was Accurate.

In the initial hearing, the ALJs' found that TCEQ's antidegradation expert, Dr. Wallace, anchored her antidegradation analysis to the CORMIX-modeled effluent percentage at the boundary of the aquatic life mixing zone.[244] This also seems to be the anchor for the antidegradation analysis of Mr. Schaefer, the agency's antidegradation expert on remand. He repeatedly relies on the effluent percentage of 8.9% remaining at the boundary of the aquatic life mixing zone, as determined by the CORMIX modeling of Ms. Cunningham and the Port..[245] He testified that, if the 8.9 remaining effluent percentage from the CORMIX modeling were not accurate, he would want to revisit the antidegradation analysis.[246]

As demonstrated by Dr. Socolofsky and Mr. Osting, the CORMIX modeling on remand was not accurate. Thus, the 8.9% effluent concentration at the boundary of the mixing zone is not accurate, and the agency's antidegradation analysis on remand cannot stand. It bears re-emphasizing that the percentage effluent at the edge of any of the mixing zones is not, alone, a good guide to water quality degradation, because it is a metric that disregards the contribution to salinity or to the salinity gradient of the salt in the ambient water.

The clearest legal standard for water quality related to salinity is set out at 30 TAC § 307.4(g)(3):

> "Salinity gradients must be maintained to support attainable estuarine dependent aquatic life uses. … [C]areful consideration must be given to all activities that may detrimentally affect salinity gradients."

In his live testimony on remand, Mr. Schaefer could not offer a clear definition of what a salinity gradient is, and he does not know if a unit of time is a component of the definition of a salinity gradient.[247] He also does not know how much change in the salinity gradient "near" the outfall (say, within the aquatic life mixing zone boundary) would lead to a gradient that undermines support of attainable estuarine dependent aquatic life uses in that area.[248] It is hard to imagine how one can find that a legal standard has been maintained when that person cannot even say what the legal standard is (i.e., what "salinity gradient" means). Yet that is what the ED asks the ALJs to rely on. The EPA rightly asked TCEQ to justify its antidegradation review with more detail, noting:

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[244] 02/05/2021 Proposal for Decision at 40.

[245] Ex. AR-R5 (Admin Record – Remand Tab J) at 104-105; Ex. ED-PS-1R at 11:29-31, 12:6-9, 12:20-25, 27:24-26, and 29:11-12; and Remand Tr. Vol. 9 at 2385:16 - 2386:6.

[246] Remand Tr. Vol. 9 at 2385:16 - 2386:6.

[247] Remand Tr. Vol. 9 at 2349:12 - 2350:6.

[248] Remand Tr. Vol. 9 at 2352:11-15.

> The statement of basis documents that "A Tier 2 review has preliminary determined that no significant degradation of water quality is expected in Corpus Christi Bay . . ." In response to the TCEQ Executive Director's request for clarification and the Interim Order of May 26, 2021, POCC submitted additional updated information (relocation of the outfall and design of the diffuser) for a revised Tier 2 Antidegradation review. **However, the TCEQ should include in the statement of basis, the acknowledgement of this additional information provided by the POCC *and confirm and/or address how this complies with the TCEQ's Tier 2 antidegradation review policy*.**[249]

Basically, EPA was dissatisfied with TCEQ's bald assertion of the conclusion and is currently seeking an explanation of how it was reached. While how the conclusion was reached need not be predominately quantitative, it has to be based on factors one can articulate. To date, TCEQ has not done so. Rather, it relies on a summary conclusion by a person who does not understand the meaning of basic terms in the rule. This does not qualify as a proper antidegradation review.

If the requirement is that the standard not change in a manner as to undermine support of attainable estuarine dependent aquatic life uses in an area of water and one does not know how much change is too much change, then how can one say that, post-discharge, "salinity gradients [will] be maintained to support attainable estuarine dependent aquatic life uses." With all due respect, the TCEQ analysis in this case does not show that the antidegradation standard[250] will be met post-discharge. The EPA has recognized the deficiencies in the TCEQ antidegradation review, and the ALJs should as well.

The Tier 2 antidegradation standard[251] allows (without social and economic analyses) only *de minimis* degradation. But, when asked in his direct testimony what the definition of *de minimis* is, Mr. Schaefer had none to offer.[252] In his live testimony, he acknowledged he had no definition for *de minimis* when he undertook his antidegradation analysis.[253] He cannot reasonably be believed when he says "I don't really know what this standard means, but believe me when I say it's been satisfied."[254]

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[249] Ex PAC-59R.

[250] 30 TAC § 307.5(b)(1).

[251] 30 TAC § 307.5(b)(2).

[252] Ex. ED-PS-1 Remand at 24:28 - 25:2.

[253] Remand Tr. Vol. 9 at 2384:9-11.

[254] This is the same witness who has never recommended that a Tier 1 or Tier 2 antidegradation standard would be violated if a permit were issued because "the applicant would have to provide a justification that degradation is necessary for important economic or social development" and "applicants don't want to do that. They don't want to go that route and we don't want them to go that route either." Remand Tr. Vol. 9 at 2372:16-2373:16. Even if one had a definition for *de minimis*, one would still need a definition for "salinity gradient" in order to see if the change in a salinity gradient was more or less than *de minimis*. As noted, TCEQ and Mr. Schaefer have not articulated what a salinity gradient is.

Protestants criticized Dr. Wallace's antidegradation analysis for the discharge proposed pre-remand ("like trying to look in a gazing ball"[255] and "review on a new facility is a feeling"[256]) as arbitrary. On remand, Mr. Schaefer has simply put lipstick on the pig for his antidegradation analysis. He has labeled it a "weight-of-evidence" analysis and he used it in making, on behalf of the agency, his negative Tier 1 and Tier 2 degradation findings; indeed, for the influence of salinity and salinity gradients on those findings, he relied exclusively on weight-of-evidence analysis.[257] His *de minimis* degradation finding also relied on a weight-of-evidence analysis.[258] Many of his underlying findings, i.e., those findings that presumably were weighted (i.e., assigned some degree of importance) and then, weighed with other underlying findings to arrive at the ultimate findings, were also made by a weight-of-evidence methodology. Consider the following:

> (1) He concluded, based on a weight-of-evidence analysis, the discharge of brine as proposed by the Port would not constitute degradation of the receiving waters with respect to salts.[259]
>
> (2) He used a weight-of-evidence approach to determine that the salinity gradient would not be impacted by the discharge.[260]
>
> (3) He employed a weight-of-evidence analysis to determine the fate of organisms passing through and beyond the ZID.[261]
>
> (4) He weighed unspecified evidence from the Port to determine that the various aquatic life and life stages present in the ship channel would not face more than a *de minimis* impact from the proposed discharge.[262]

Nowhere in his testimony[263] or in the record memos he authored[264] is the methodology he used for his "weight-of-evidence" analyses explained. In response to a question about whether there is agency guidance on how one goes about conducting a weight-of-evidence analysis, he answered only

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[255] Ex. PAC-16 at 30:7-10; and Tr. Vol. 5 at 186:20.

[256] Ex. PAC-16 at 34:14-19.

[257] Remand Tr. Vol. 9 at 2358:16 - 2359:11.

[258] Remand Tr. Vol. 9 at 2350:14-18.

[259] Ex. ED-PS-1R at 26:29-32 and 27:29-31.

[260] Ex. ED-PS-1R at 34:33 through 35:3.

[261] Ex. ED-PS-1R at 35:5-7.

[262] Ex. ED-PS-1R at 37:11-16.

[263] Ex. ED-PS-1R and Remand Tr. Vol. 9 at 2339-2402.

[264] Ex. AR-R5 (Admin Record – Remand Tab J) at 101-102 (the WQS implementation memo) and 103-105 (the WQS implementation worksheet).

that there is little guidance in that regard, and he did not identify or summarize any of it.[265] When asked how he knew he had used the correct process in his analyses, he acknowledged "it's a difficult process," but he never actually explained what the process was.[266]

Mr. Schaefer is correct that there is a little TCEQ guidance on the methodology that one should follow to conduct a good weight-of-evidence analysis. However, there is rather extensive guidance from EPA on this methodology—a fact of which Mr. Schaefer seemed unaware. In 2016, EPA produced guidance entitled *Weight-of-evidence in Ecological Assessment*.[267] This was the work of a nine-person panel and was peer reviewed both within EPA and by external peer reviewers. It is a methodological reference Dr. Fontenot cited and, one infers, tried to use.[268]

At its highest level, a weight-of-evidence analysis is straightforward. It is a three-step process: gather the evidence that logically could be relevant, weight the evidence and, finally, weigh the entire body of evidence to reach some qualitative conclusions.[269] The EPA guidance recognizes that within each of these steps there may be different levels of depth or sub-tasks. But these three steps are the bedrock minimum for any weight-of-evidence analysis. Each of these steps is discussed below.

First, you gather the evidence that is logically relevant. In gathering relevant evidence, you also may have to eliminate some evidence. The EPA guidance is that there should be elimination criteria developed in advance of actual elimination, which is done to avoid bias.[270] That was not done for Mr. Schaefer's antidegradation weight-of-evidence analysis. In fact, Mr. Schaefer chose to rely solely on the Port's information and consider nothing from PAC's experts. This alone flies in the face of the EPA guidance. For example, Dr. Austin presented facts supporting his opinion that ambient water flows around the discharge point are significantly slower than in the main channel and are not uniform.[271] Mr. Schaefer's weight-of-evidence analysis considered the significance of ambient water velocity in the channel, but he did not address at all velocities at the site of the discharge.[272]

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[265] Remand Tr. Vol. 9 at 2359:13-20.

[266] Remand Tr. Vol. 9 at 2359:21 - 2363:10.

[267] *Weight-of-evidence in Ecological Assessment* (EPA/100/R-16/001) ("EPA (2016)").

[268] Ex. APP-LF-1R at 66 (Ex. RE 1-9, also found in Appx. 7 to Dr. Fontenot's remand direct testimony).

[269] EPA (2016), p. xii.

[270] *Id.* at p. 23.

[271] Ex. PAC-44R at 6:16–22.

[272] Ex. ED-PS–1 Remand at 12:1–9.

Dr. Esbaugh presented an extensive discussion of the risk to aquatic life posed by a saline effluent layer accumulating on the floor of the channel.[273] Mr. Schaefer's analysis did not discuss Dr. Esbaugh's evidence of salinity layers or sumps at all. Mr. Osting explained that CORMIX modeling predicted one or more concentrated saline plumes that will develop at the beginning of what is referred to as the "far field."[274] Mr. Schaefer's weight-of-evidence analysis does not consider this information at all. Indeed, the modeling results of Dr. Socolofsky and Mr. Osting are not even acknowledged.[275]

Throughout his explanations of the TCEQ's antidegradation review, Mr. Schaefer cited to the 8.9% effluent percentage predicted by some ED and Port modeling to remain at the down-current edge of the aquatic life mixing zone specified in the critical conditions memo, i.e., to remain at 84.5 meters from the discharge.[276] He never acknowledged remaining effluent percentages predicted at the down-gradient edge of that mixing zone by Dr. Socolofsky's CORMIX modeling, which percentages ranged up to 41.4%.[277] Similarly, he never acknowledged remaining effluent percentages predicted at 100 meters down-current by Mr. Osting's CORMIX modeling, which percentages ranged up to 37.6%.[278]

The fact is that the TCEQ's antidegradation analysis gave zero credence to evidence presented by parties other than the Port and the TCEQ staff:

> Q. Well, isn't that [i.e., whose data has value] just another way of saying you have discounted the value of the data from the opposing side? You discounted it to zero, right?
>
> A. That's right. I'm just -- I'm going with the information from sources that I -- that I know well.[279]

This is arbitrary decision-making and can, as it did here, lead to clearly biased decision-making.

Second, EPA guidance dictates that you weight the evidence. Since some pieces of evidence will almost always be more influential to a decision than others, step 2 of a weight-of-evidence analysis is to assign weights to individual pieces of evidence or, perhaps, to categories of evidence.[280] Certainly, the weighting of evidence can be implicit, but by expressing the weights explicitly, as by scores or by

[273] Ex. PAC-45R at 14–16.

[274] Ex. PAC-49R at 9:19–21, 18:7–15, and 19:12-16.

[275] Remand Tr. Vol. 9 at 2360:25 - 2361:5.

[276] Remand Tr. Vol. 9 at 2385:16 - 2386:2.

[277] Ex. PAC-51R-SS-5 at 12.

[278] Ex. PAC-49R at 15 (Table 1).

[279] Remand Tr. Vol. 9 at 2361:20-24.

[280] EPA (2016), pp. 27-38.

percentages of importance to the end decision, the person conducting the weight-of-evidence analysis transparently marks the influence that particular pieces of evidence will have, when the entire body of evidence is weighed.

Nothing like a formal weighting of evidence occurred in the ED's weight-of-evidence analysis. The Water Quality Implementation memo contains no information at all about the relative values of any pieces of evidence or categories of evidence to the task of determining if degradation would occur.[281] The underlying worksheet[282] can fairly be read to say that WET test results bear on the degradation determination, but how important that category of evidence is in comparison to other categories is not explained in the worksheet or in Mr. Schaefer's testimony. He apparently weighted the Applicant's WET testing evidence much more heavily than he did any similar evidence from Dr. Nielsen, but he did not explain the relative weights in numerical or qualitative terms, and he apparently based the relative weights of the two lines of evidence on a belief the salinity at the down-current edge of the aquatic life mixing zone will never exceed 35 ppt,[283] which conclusion he arrived at without considering the many, many examples offered by Dr. Socolofsky of salinities at that boundary of ppts in the 40s and 50s.[284]

It is clear Mr. Schaefer and his team attributed some decisional weight to the fact there will be post-operation effluent samples submitted by the Port and that analysis of those "may" lead to a permit modification, but how significant that piece of evidence was or how, even, it was tied to the degradation decision is not stated. The worksheet and Mr. Schaefer's direct testimony apparently give weight to Dr. Furnans' opinion that the mass of salt discharged in a day by the Port at the diffuser will be less than 1% of the mass of salt that passes through the entire ship channel in a day.[285] But, the decisional weight of this line of "evidence" is not explained, nor is why the evidence should have any weight explained. That is, the relationship, if any, of the salt mass passing in a day through the channel to either salinity concentrations at the aquatic life mixing zone or to salinity gradients near the aquatic life mixing zone is not obvious and is simply not explained.

Finally, EPA guidance directs that you weigh the evidence to arrive at a decision. The final step in the EPA weight-of-evidence guidance is to weigh the evidence and present an explanation of the extent to which the evidence supports each hypothesis (e.g., the discharge meets the Tier 1

[281] Ex. AR-R5 (Admin Record - Remand Tab J) at 10-102.

[282] Ex. AR-R5 (Admin Record - Remand Tab J) at 103-105.

[283] Ex. ED-PS-1R at 26:26-31.

[284] Ex. PAC-51R SS-5 at 13-17.

[285] Ex. AR-R5 (Admin Record - Remand Tab J) at 04-105 and Ex. ED-PS-1R at 26:24-32.

antidegradation standard, the discharge does not meet the Tier 1 standard, etc.).[286] Clearly, there are many ways the result of the weighing process could be presented. The EPA guidance recommends a table, where the columns are the various possible determinations (i.e., hypotheses), perhaps augmented by a "comment" column, and the rows are various pieces or categories of evidence that to varying degrees support the determinations.[287] (Dr. Fontenot used a table (RE 1-R) to this end.) Tables are thought to help the reader understand, without pages of narrative, why the accepted determination is what it is. This is not to argue that TCEQ had to develop a table to support its ultimate decisions on degradation, but it is to argue that some linear explanation is necessary and that the burden of presenting a linear explanation is not that great.

The TCEQ degradation determinations are presented in this case, but only summarily and in a conclusory fashion. In fact, they are so summary and conclusory that EPA has asserted an interim objection asking TCEQ to justify its Tier 2 antidegradation analysis more fully.[288] It is not likely that TCEQ will be able to provide such, because only evidence favorable to the determinations (i.e., hypotheses) sponsored by the Port and the ED was accorded any weight at step 2 of the analysis – and because the various pieces of evidence cited for the determinations ultimately made were unweighted relative to one another and were frequently not tied logically to the determinations they were alleged to support. Thus, a third party cannot judge whether the determinations are rational or not.

A brief mention of Dr. Fontenot's over-papered environmental assessment is in order, as that assessment bears on the antidegradation issue. He deserves credit for actually having and mostly using a defined analytical method. But, he, like Mr. Schaefer, arbitrarily excluded from his categories of site-specific evidence nearly all pieces of evidence generated by anyone other than the Port or TCEQ or, in one instance, EPA. So, for his risk estimation scenarios for example, he looked only at CORMIX model inputs and outputs evaluated by TCEQ.[289] That leaves out all Protestant CORMIX modeling results. He adopted what he claimed to be an EPA guidance on how large a salinity change should be tolerable (4 ppt and 10%) at the boundary of the aquatic life mixing zone, but did not even mention the TPWD and GLO recommendation of 2 ppt and 5% at 100 meters.[290] In general, he only gathered and weighed evidence favorable to his client's perspective.

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[286] EPA (2016), pp. 39-50.

[287] EPA (2016), p. 40.

[288] Ex. PAC-59R, p. 7.

[289] Ex. APP-LF-1R at 17:25-27 and attached Ex. RE 1-6.

[290] Ex. APP-LF-1R at 17:4-7; *See also* Ex. PAC-37.

In sum, the agency's antidegradation review was not accurate, did not comply with EPA guidance, and did not provide a rational basis for finding it to be reliable. It turned on modeling that was inappropriate to the discharge site and, in any event, utilized inaccurate inputs and, thus, produced inaccurate results. It turned on an understanding of legal terms, particularly "salinity gradient" and "*de minimis* degradation," for which neither the agency nor the antidegradation reviewer had any working definition. And it was arrived at via a badly flawed implementation of a methodology that the reviewer simply did not seem to understand; one cannot just disregard evidence from highly qualified authorities because those authorities have not historically been within the realm of authorities to whom one has turned. Yet that is exactly what Mr. Schaefer did. In conclusion, the ALJs cannot conclude that the antidegradation review is reliable and satisfies all applicable regulatory criteria.

7. Issue I: Whether the Draft Permit Includes All Appropriate and Necessary Requirements.

The evidence clearly demonstrates the Draft Permit does not include all appropriate and necessary requirements, for many of the same reasons previously discussed in this brief.

A. Permit Conditions Not Based on What is Protective of the Environment nor Based on the Proposed Discharge Location.

As in the previous draft permit, the only permit limits are on the mixing performance, the percentage of effluent at the ZID. As the ALJs previously noted in the initial PFD, that effluent limit at the ZID boundary was not set based on what is protective of aquatic life.[291] Nothing has changed for the current Application. No standard or process was used that would set the effluent based on protection of aquatic life.[292] Instead, the Port simply proposed a new location for the discharge, which it then modeled using CORMIX. The ED evaluated that modeling, did its own, and set the effluent limits at the ZID based on the output of the CORMIX model.[293] Thus, even after the ALJs' previous findings, nothing changed about how the ED set the effluent limits in the Draft Permit. The effluent limits continue to be based solely on modeling outputs, not on what is protective of aquatic life, and are therefore not appropriate.

[291] 02/05/2021 Proposal for Decision at 66, noting "The ED's initial analysis concluded that the discharge would result in 1.95% effluent at the ZID boundary, but that was based on an error in interpreting the CORMIX modeling results. The ED's error was discovered after this case was referred to SOAH, and the ED simply revised the limit in the Draft Permit to allow 18.4% effluent at the ZID boundary."

[292] Ex. ED-KC-1 Remand, p. 3:13-15.

[293] Ex. ED-KC-1 Remand, p. 3:16-28.

As was discussed in the section on modeling above, the critical conditions from the ED's modeling do not even show the full extent of the change in salinity or maximum salinity that marine species will encounter, to allow Mr. Schaefer to consider the actual conditions he is required to consider for his impact evaluation.

What's more, the Port now admits that the location of the discharge identified in the Application, on which the all parties' experts based their modeling, is not the location where the Port intends to place the discharge.[294] The record clearly establishes that the effluent limits are based on the output of the CORMIX model.[295] We know that the modeling results are dependent on the distance from the shoreline and the depth of the water at a precise discharge location.[296] Neither the Port nor the ED have run the model for the final location of the discharge. This is problematic, because the permit specifically states:

> This permit is granted on the basis of the information supplied and representations made by the permittee during action on an Application, and relying upon the accuracy and completeness of that information and those representations.[297]

If the permit relies on the representations made in an Application and the accuracy and completeness of that information, an applicant cannot, just weeks before a contested case hearing, argue the discharge location in the Application is not to be relied on and then still claim that the permit contains all of the appropriate and necessary conditions for issuance. And a post permit move like that envisioned by the Port is not allowed under Texas law without an amendment to the permit, after modeling for the new location, public notice and potentially another hearing, because the effluent limits are based on the output of the CORMIX model, and the modeling results are dependent on the precise discharge location, especially when the discharge ports are on or near a bank or channel bottom.

Even without the legal restrictions, the changes in the modeling outputs from the original location and the amended location demonstrate that a move of the discharge can have dramatic changes on the CORMIX modeling and, thus the limits the ED puts in the permit. And neither the Port nor the ED have run the model for the final location of the discharge or even a range of locations that would meet permit limits. Further, the Port does not even know the final design of the proposed diffuser or

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[294] APP-LT-1-R Rebuttal at 2:4-5, stating, "the diffuser design memorandum does not specify an exact latitude or longitude for the diffuser barrel and ports as these will be determined for the final design."; APP-LT-1-R Rebuttal, p. 3:14-17, stating, "the precise latitude and longitude of the diffuser ports will not be determined until the final design of the diffuser is completed."

[295] Remand Tr. Vol. 9 at 2315:18-2316:13.

[296] Remand Tr. Vol. 9 at 2316:3-13.

[297] Permit Condition 1(b), Ex. AR-R5 (Admin Record - Remand Tab J) at 00072.

what cleaning chemicals, coagulants, and flocculants will be used in the desalination process and discharged.[298] The Port asks the ALJs and the public to just rely on the Port's judgment to do what is protective of the environment.[299] If this complies with the regulations, there is really no need at all for any contested case hearing.

B. EPA Objections

In a somewhat remarkable turn of events, the EPA has even weighed in with specific concerns regarding the Draft Permit, issuing a letter dated March 1, 2022, advising TCEQ that any permit issued without EPA's concerns being fully addressed "would not be a validly issued final NPDES permit."[300] Prior to the March 2022 letter, the EPA, which has oversight authority over the issuance of wastewater discharge permits under Section 402 of the CWA, issued an Interim Objection Letter on December 15, 2021. There, EPA notified TCEQ it had improperly classified the discharge as "minor" when it should have been classified as "major," and requested that TCEQ treat all desalination facilities as "major" due, in part, to the facilities' discharge of process wastewater.[301] The EPA also raised concerns about compliance with CWA § 316(b), CORMIX modeling results, permit conditions for total dissolved solids, sulfates, and chlorides, and the Tier 2 antidegradation review, and noted that WET testing "is not intended to take the place of any other biological assessment that is appropriate for water quality assessment of this receiving stream."[302]

One of EPA's concerns relates to the imposition of technology-based effluent limits. Pursuant to federal rules, incorporated into the TCEQ rules by reference, the TCEQ must incorporate technology-based treatment requirements into all permits.[303] For most facilities, EPA has established Effluent Limitations Guidelines (ELGs) which set forth the technology-based effluent limits applicable to a discharge, and setting technology-based effluent limits is just a matter of incorporating those. But, where EPA has not established ELGs, then the technology-based effluent limits must be established on a case-by-case basis using "best professional judgment."[304] For "conventional pollutants," such as total

[298] Remand Tr. Vol. 1 at 190:18-191:8.

[299] Remand Tr. Vol. 1 at 191:18-192:15.

[300] Ex. PAC-89R at 2.

[301] Ex. PAC-59R at 4.

[302] Ex. PAC-59R at 4-7.

[303] 30 TAC § 308.1.

[304] 40 C.F.R. § 125.3(c)(2)(i)-(ii)). In setting such limits, for all pollutants the agency is to consider: the appropriate technology for the category or class of point sources of which the applicant is a member, based upon all available information and any unique factors related to the applicant.

suspended solids (TSS),[305] the permit must require "Best Practicable Technology."[306] For pollutants that are not explicitly listed as toxic under the CWA, but are not considered conventional pollutants, the permit must employ "Best Available Technology Economically Achievable," considering the same factors for Best Practicable Technology and the cost of achieving effluent reduction.[307]

Because EPA has not issued ELGs for desalination facilities,[308] the TCEQ must develop technology-based effluent limits for the contaminants discharged on a case-by-case basis using best professional judgment. EPA has objected to the permit, in part, due to the ED's failure to provide a rationale for the ED's decision regarding technology-based effluent limits. The ED's Fact Sheet merely states, "Monitoring and reporting requirements for total suspended solids have been included at Outfall 001 based on BPJ due to the potential for total suspended solids to be present in the discharge."[309] EPA has also objected that the ED did not provide the rationale for the treatment of total dissolved solids, chlorides and sulfates with regard to the imposition of technology-based effluent limits.

The record demonstrates that limits for TSS, dissolved solids, chlorides and sulfates should be required in light of the factors set forth for the determination of technology-based effluent limitations. Furthermore, the record demonstrates that it is appropriate to impose a technology based effluent limit for chlorine as the Port's witness, Mr. Wesner, testified the total removal of chlorine would be technically and economically feasible.[310] Likewise, Mr. Wesner noted that the permit does not contain an effluent limit for iron or specific numerical limits for coagulants or chemicals contained in cleaning solutions.[311] Mr. Wesner also acknowledged that the permit did not contain a suspended solids limit or a salinity limit.[312]

While TCEQ did provide an initial response to EPA's Interim Objection Letter, EPA indicated the response fell short of demonstrating compliance with applicable federal regulations and in its March 1, 2022 letter stated:

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[305] 40 C.F.R. § 401.16.

[306] 40 C.F.R. §125.3(d)(1). In determining the Best Practicable Technology, the agency is to consider: the total cost of application of technology in relation to effluent reductions, the age of equipment, the process employed, the engineering aspects of the Application of various control techniques, any process changes, and non-water quality environmental impacts.

[307] 40 C.F.R. § 125.3(d)(3).

[308] Administrative Record Tab L at 4. The EGLs for "new sources" are in the form of New Source Performance Standards.

[309] Administrative Record Tab L at 4.

[310] Remand Tr. Vol. 1 at 108:16-22, 114:20-115:1.

[311] Remand Tr. Vol. 1 at 110:1-113:4.

[312] Remand Tr. Vol. 1 at 117:10-16, 119:1-4.

> It would be a material failure to comply with the required permitting procedures if the TCEQ does not submit: (1) the additional information requested in the Interim Objection letter, (2) the PFD prepared by the ALJ following the upcoming contested case hearing, or (3) the proposed permit prepared by TCEQ after the contested case hearing but before it is forwarded to the Commission for action.
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> * * *
>
> Finally, if the TCEQ were to issue TPDES Permit No. TX0138347 (WQ0005253000) to the POCC without responding to the EPA's Interim Objection in violation of the provisions of CWA Section 402, the implementing regulations at 40 C.F.R. Part §123, and the MOA, then *it would not be a validly issued final NPDES permit*.[313]

The ED's witnesses acknowledged that its responses have not satisfied EPA's concerns and that issuance of a permit at this point would not be viewed by EPA as a validly issued permit.[314] Thus, the current Draft Permit fails to include the necessary permit conditions to demonstrate technology-based effluent limits have been properly adopted and implemented in the Draft Permit.

C. Failure to Include Water Quality Based Effluent Limits.

The Draft Permit not only fails to include technology-based effluent limits, it also fails to include water quality-based effluent limits. TCEQ's rules at 30 TAC § 305.531(4) incorporate by reference the EPA's regulations at 40 C.F.R. § 122.44(d), which requires that all permits must include conditions ensuring compliance with water quality standards. The Draft Permit does not include limits to maintain applicable water quality standards, as the resulting salinity is too excessive, and concentration of coagulants, flocculants, and chemicals used in the desalination process have not even been addressed. As the ALJs previously explained in the initial PFD:

> However, a key issue in this case is that the TSWQS do not contain numeric criteria for salinity. As a result, effluent testing does not address the concerns about salinity. Furthermore, even if there were numeric criteria for salinity, given the discharge location's pivotal role in the life cycle of estuarine-dependent species and the sensitivity of early life stages to salinity changes, waiting to identify significant problems until after the discharge commences is not sufficient.[315]

Nothing has changed that would affect these findings since the initial PFD was written. Thus, the Draft Permit continues to be deficient with respect to the necessary permit conditions.

While PAC could identify permit terms and conditions that would be appropriate, part of the problem is that the evidence does not demonstrate that the Port's current proposed design and

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[313] Ex. PAC-89R at 2 (emphasis added).

[314] Remand Tr. Vol. 9 at 2233:16-2234:21.

[315] 02/05/2021 Proposal for Decision at 67-68.

operations could satisfy such permit conditions. Thus, adopting the appropriate conditions does nothing to ensure that the proposed discharge will be protective of the environment. It is akin to pinning a badge on an untrained person and calling that person a police officer. Merely wearing the badge does not ensure one can safely protect the public.

However, to highlight some of the deficiencies in the Draft Permit, PAC points to permit terms and conditions which would be necessary for an applicant to have a protective permit, provided the evidence also showed it could comply with such terms. These terms include:

- The latitude, longitude and depth of the discharge.
- Limits on the increase in salinity at appropriate measuring points within the ZID or ALMZ.
- Mixing limits, i.e. percentage of effluent at the boundaries of all three mixing zones.
- Effluent limits for total dissolved solid concentrations and/ flow volume that would limit any increase of salinity to 2 ppt over ambient at the critical conditions for salinity.
- All chemical additives used at the facility must comply with NSF-60, whether water is provided for potable use or non-potable use.[316]
- Applicant must conduct before and after biological surveys similar to those in the Carlsbad Desalination Plant, NPDES Permit No. CA0109223.[317]
- WET Testing must use Sea Urchin (EPA Method 1008.0), as modified to evaluate changes in salinity.
- Salinity constraints of EPA Methods 1006.0 and 1007.0 do not apply to WET testing required by the permit.[318]
- The critical dilution for WET testing should be set to the salinity concentration that best represents dilution at the mixing zone boundary.
- A monitoring plan for 1) validating the CORMIX modeling predictions and 2) compliance with the receiving water that has to be presented by the Port in its application and therefore can be evaluated by experts with the ED, TPWD, EPA, and the public.
- Operation of the proposed discharge facility is dependent on the location, design and operation of the intake structure. Yet, the Port gives only a general location for the intake over one-half a mile wide[319] and states that it will use "common sense" in building and design of intake

[316] Remand Tr. Vol. 1 at 178:4-23.

[317] *See* Kings-Steves Ex. 11R, Section C(2), pp. 18-23.

[318] *See* Testimony of Randy Palachek noting that EPA Method 1006 would need to be modified to achieve any meaningful results for salinity, Remand Tr. Vol. 4 at 827:21-828:12.

[319] *See* Ex. AR-R4 (Admin Record - Remand Tab I) at S-Application 000252.

structure.[320] The Draft Permit should require that the Port submit the information required by 30 TAC §308.91 prior to construction of the intake structure, obtain approval prior to construction, and require that design and construction comply with requirements of 30 TAC § 308.91.

8. Allocation of Transcript Costs.

Again, the Port has presented an Application that does not satisfy the applicable regulatory requirements, and the ED has turned a blind eye to the deficiencies. PAC has had to spend significant time and money in fighting a potentially disastrous permit that the ED should never have allowed to get to this point. The parties have each paid for their own copies of the transcript. Any remaining costs, including for the court reporter's fees, should be borne solely by the Port.

III. CONCLUSION

WHEREFORE, PREMISES CONSIDERED, Protestant PAC respectfully requests that the ALJs recommend denial of the Port's permit Application, because such fails to demonstrate that the facility to be operated will be protective of public health and the environment. Further, PAC requests such other and further relief to which PAC may show itself justly entitled.

Respectfully submitted,

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[320] Remand Tr. Vol. 1 at 191:18-192:15.

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CERTIFICATE OF SERVICE

I certify that a copy of this document was served on all parties of record on this date, April 12, 2022, in accordance with the applicable service procedures.

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