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 AND KINGS AND STEVES' REPLY TO CLOSING ARGUMENTS ON REMAND

April 22, 2022

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

PORT ARANSAS CONSERVANCY'S AND KINGS AND STEVES'
REPLY TO CLOSING ARGUMENTS ON REMAND

In their initial written closing arguments, the Port of Corpus Christi Authority of Nueces County (Port) and the Executive Director (ED) of the Texas Commission on Environmental Quality (TCEQ or Commission) repeatedly assert statements as "facts" or "undisputed" which are not only disputed, but for which the preponderant evidence shows the opposite to be true. Consider just a few examples:

- The ED says "[t]here is no legitimate dispute regarding the location of the outfall, the depth of the outfall, the depth of the discharge, or the velocity in the channel."[1] Yet, the Port's own evidence is contradictory on these items: (1) the Application provides a latitude and longitude of the outfall, but the Port's rebuttal testimony says the diffuser latitude and longitude have not been set; (2) the Application materials indicate the depth of the channel at the outfall is 90 feet, yet the bathymetry map in the Application shows the depth as 65 feet at that location; and (3) the Application indicates the outfall will be 25 feet above the channel bottom, but the Port's rebuttal testimony indicates it may be 4 to 6 feet above the channel bottom. There is no legitimate dispute? Really?

- The Port and the ED assert their experts simply followed the CORMIX User Manual when doing the modeling, yet their selection of the DISTB (the "wall" that is necessary to determine mixing) for the CORMIX modeling does not comply with the CORMIX User Manual. The Port's expert also indicated that it is appropriate to adjust the "wall" location for CORMIX modeling to account for the shallower water at the shoreline,[2] yet the Port made no such adjustment.

- The ED says its staff considered the weight of the evidence, including Protestants' testimony, when conducting the antidegradation review, yet on cross-examination the ED's antidegradation witness testified he discounted the Protestants' evidence to "zero" because it was not from sources he knew well.[3] That is hardly "consideration" of the entire body of evidence.

These are just a few examples of the many misrepresentations and distortions the Port and the ED present in their closing arguments.

[1] ED's Closing Argument on Remand, at 14.

[2] Remand Tr. Vol. 2 at 307:9-308:10 (*esp.* 308:2-12).

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

PAC has presented testimony from many different, eminently-qualified scientists who have demonstrated errors in the Port and ED's modeling and review, and testified that this permit has not been shown, with any level of confidence, to be protective of the marine environment. The TPWD has expressed concerns about this proposed permit and its representative has testified that he doubts the modeling presented by the Port is reliable and that the discharge, if permitted, will increase mortality among aquatic life in the bay. The EPA has lodged interim objections to this proposed permit and indicated that unless its concerns are properly addressed, the permit sought will not be a validly issued one under the Clean Water Act. Under the record in this case on remand, the Administrative Law Judges (ALJs) should find that the Port has failed to satisfy all of the required criteria to show that this permit, if issued, will be protective of aquatic life. Accordingly, this permit must be denied.

I. THE COMMISSION'S REFERRED ISSUES ON REMAND

PAC presents the following reply arguments regarding the Commission's referred issues on remand. Generally, PAC's response, especially in regard to Issues A and C, tracks the organization used by the Port and responds to such arguments. Responses to the arguments of the ED are included as well.

1. 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.

A. Red Drum Will Be Adversely Affected by the Discharge.

There are many reasons that so much evidence has been offered regarding red drum. It is sensitive to changes in salinity. Its larvae rely on the Aransas Pass and Corpus Christi Ship Channel (CCSC)[4] to get to the estuary. It is a species of great economic value to the State. Red drum is also a well-researched animal, meaning that our understanding of its life cycle makes it a "model species to make predictions."[5] However it is grossly overly simplistic to say, as the Port does, that red drum is *the* most sensitive of the thousands of species in the CCSC or that if red drum will not be adversely affected by the desalination discharge, then nothing will.[6] Among other things, this ignores the established fact

[4] The term Corpus Christi Ship Channel and (CCSC) have been used to describe the entire channel from Harbor Island to Mustang Island for convenience. As the top figure in Ex. PAC-53R BW 4 shows with blue dotted lines, the official ship channel, the main area that is dredged, is only about one-half of that channel.

[5] Ex. PAC-52R at 15:10-16:1.

[6] Ex. PAC-70R at 9 of 64 (Bates PAC_LM_002810) (Vulnerability Assessment of Coastal Bend Bays, Abstract: "The most sensitive species to salinity increases were blue crab, Atlantic croaker, and white shrimp.").

that at different life stages, marine organisms' sensitivity, to salinity and other environmental conditions, changes dramatically.[7]

1) The Sensitivity of Red Drum.

While red drum are very sensitive to salinity changes, and they are certainly a species of importance, it should not be overlooked that there are many other species of economic and ecological importance that occur at much higher densities near the outfall. Red drum are "just a very small portion of the marine life using the waters at the outfall."[8] For example, the testimony of Dr. Stunz establishes the following:

> Well, blue crab would also be a keystone species, as well as a sentinel species. So they're very specific definitions. Maybe I'll start with sentinel species. We've used blue crab, as well as red drum, as sentinel species. They're kind of like the canaries in the coal mine. They – they – we can study what happens to them and maybe make predictions about what would happen to other things. That doesn't necessarily mean they're the most sensitive. It doesn't mean they're the most important to the ecosystem. In the case of red drum or blue crab, for example, we have a lot of scientific information regarding those species, and so they make good study subjects because we know a lot about them. . . .
>
> A keystone species, blue crab is one of, and several species that would be moving through this tidal inlet, . . .
>
> The definition of a keystone is a species that has a disproportionate effect on the what you would consider in this discussion a homeostasis of the balance of a marine ecosystem. So we are particularly concerned about keystone species because of the relative role they play in ecosystem.[9]

New information on remand regarding the likelihood of a hypersaline plume forming within the "deep hole" and along the channel floor also gave rise to new concern for benthic organisms. Dr. Fontenot revealed a shocking degree of ignorance about this ecosystem when he testified that there is no "functional benthic community present" in the CCSC.[10] To the contrary, only about half the channel is dredged and Dr. Stunz identified the areas along the CCSC as "historical shrimping grounds for a variety of economically important shrimp species that burrow in the sediment (benthos) and are

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[7] Remand Tr. Vol. 8 at 1955:21-23 ("one hour at one development stage is very different than one hour at another developmental stage").

[8] Ex. PAC-52R at 16:1-2; Ex. PAC-47R at 11:14-18 (species of concern are red drum, blue crab, and shrimp); Ex. PAC-46R at 10:17-25 (one must be concerned about all species in the CCSC, especially those with a planktonic life stage).

[9] Remand Tr. Vol. 5 at 1057:18-1058:6, 1058:14-16, and 1058:21-1059:2.

[10] Remand Tr. Vol. 2 at 404:25-405:6.

part of the functional benthic community."[11] Dr. Esbaugh – who the Port describes as an authority on fish physiology[12] – explained that when a bottom plume forms, the benthic and other bottom dwelling life will consume the oxygen within the non-mixed layer. "Eventually the oxygen in the non-mixed layer will decline below that required to sustain life."[13]

This is just one inconsistency (among many) in the Port's position. Ironically, the Port simultaneously contends that red drum is "the most sensitive species" and ***the*** proxy for adverse effects on ***every other*** species, but that red drum should not—even cannot—be the subject of WET testing.[14] Thus, while red drum, and especially red drum larvae, are certainly the aquatic life that has gotten the most attention in this case, the focus and analysis cannot be solely on that species, but all aquatic life that would come into contact with the proposed discharge.

2) Red Drum's Survivability in the Corpus Christi Bay System With Existing Fluctuations in Salinity is Not the Issue.

It is not disputed that the salinity levels in the CCSC fluctuate daily and yearly. It is also agreed that many species and life stages of marine organisms, including red drum, are abundant in this dynamic environment. But there is a huge analytical gap between those facts and the Port's conclusions that (1) red drum are "thriving;" and (2) salinity changes caused by the discharge will be experienced by marine organisms in the same way they experience naturally occurring salinity changes (i.e., caused by hurricanes or high temperatures). Dr. Fontenot makes these pronouncements without any serious scientific analysis or consideration of voluminous evidence to the contrary.

Any references to "Red Drum" generally should be viewed with skepticism. Red drum can "live" in fresh water of virtually zero salinity and in Laguna Madre which is up to 60 ppt. But red drum cannot reproduce in either fresh water or Laguna Madre.[15] So any broad statements about the salinity tolerance of red drum (or other species) are virtually worthless. Any meaningful information must be tied to specific life stages and to the manner in which the salinity levels change.

If anything, red drum show us the heroic efforts required – millions of hours and millions of dollars over more than 4 decades – to maintain the status quo.[16] While red drum are no longer at risk

[11] Ex. PAC-52R at 27:6-13.

[12] Port's Closing Argument on Remand, at 26.

[13] Ex. PAC-45R at 14:1-8.

[14] *Compare* Port's Closing Argument on Remand at 21 *with* 62.

[15] Remand Tr. Vol. at 845:24-846:2 (red drum are found in fresh water); Remand Tr. Vol. 5 at 1098:18-1099:7 ("we've shown scientifically there's no reproduction going on in these hypersaline lagoons").

[16] Ex. PAC-60R, at 7 (Bates PAC_TPWD_000629) (FY 2021 Stocking Report TPWD – 19 MM red drum), Ex. PAC-61R (TPWD stocking data for 1975-2021).

due to over-fishing, there are a host of other factors that imperil their survival.[17] And "naturally" occurring conditions actually do sometimes kill significant numbers of marine organisms.[18] But the ability of marine organisms to navigate and survive in this sometimes quickly changing natural environment is not comparable to the introduction of a static and constant stream of up to 68 ppt brine that will require an average 191 million gallons of ambient water daily (and in perpetuity) to achieve dilution.[19]

3) Red Drum Adults and Juveniles are Not the Focus of Concern.

As PAC stated in its Closing Argument, adult red drum are not the cause of significant concern in this case. Thus PAC will not waste space or time responding to the Port's contentions regarding adults. The same is true for juveniles, which pass through the CCSC at 3 to 5 years of age, on their way from the estuary to the Gulf of Mexico.[20] Rather, the primary life stage of concern with red drum is the larval stage.

4) The Discharge Will Harm Red Drum Eggs and Early Life Stages.

The Port continuously lumps red drum "eggs" and "larvae" together without distinction, yet the scientific literature on which the Port relies certainly draws distinctions between eggs and larvae, and even among larvae of different ages.[21] It is difficult to believe that this incorrect grouping together is unintentional and due to a lack of comprehension regarding basic facts about the red drum life cycle, especially given what we see in some of the Port's other assertions.

The Port's Introduction and Statement of Facts make a number of assertions "supported" by citations that are misleading, or that say the exact opposite, or by no citation at all. Page limits make it impossible to respond to every instance. But in regard to red drum eggs and larvae, the Port has invented a number of arguments that are particularly dangerous, confusion on which would be a material obstacle to arriving at a correct result.

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[17] Ex. PAC-70R at 9 of 64 (Bates PAC_LM_002810) (Vulnerability Assessment of Coastal Bend Bays, Abstract: increasing temperature increases evaporation, reduced freshwater inflow that provides less seawater dilution potential, industrial brine discharges, high annual average wind speeds, temperatures, and salinities, and sluggish circulation in the region).

[18] Tominack SA, et al. (2020) An assessment of trends in the frequency and duration of *Karenia brevis* red tide blooms on the South Texas coast (western Gulf of Mexico). PLoS ONE 15(9): e0239309. https://doi.org/10.1371/journal.pone.0239309, (offered by Pro Se Protestants, admitted without an exhibit number).

[19] Ex. PAC-75R.

[20] Ex. APP-55-R at 119 (red drum juveniles and sub-adults remain in estuaries 3-5 years before migrating offshore).

[21] Dr. Fontenot relied on Ex. PAC-85R (the "Thomas" study) to create Ex. EFA 1-3. It is clear Dr. Fontenot recognized that the "Thomas" study distinguished between larvae that are one-day, three-days, five-days, seven-days, and nine-days old. Ex. EFA 1-3 at 2. In fact it reported dramatically different salinity tolerances for larvae of different ages. *Id.*; Ex. PAC-85R at Figure 19 (Bates Port Authority 041400) (LD50 of 33 ppt for 3-day old larvae and LD50 of 45 ppt for 7-day old larvae).

The Port states that red drum eggs "are substantially impermeable" and cites to the hearing transcript.[22] At the cited page, we find Audubon cross examining Dr. Stunz regarding the density of red drum and shrimp. He does not discuss the qualities of eggs at all. The word "impermeable" does appear in the cited volume one time on a different page. In his cross examination, Mr. Allison asserts that eggs have "impermeable membranes" and Dr. Stunz responds "No. They can exchange things across that membrane. That's how they regulate the buoyancy."[23] Thus, the Port's representation in its brief and its cite to the evidence is comparable to stating that "the witness testified the light was red" when the witness actually testified "the light was green."

Then the Port asserts that Dr. Nielsen "acknowledges that red drum eggs are not adversely impacted by higher salinity concentrations."[24] But Dr. Nielsen said no such thing at the pages cited by the Port (or anywhere). The Port actually tells the ALJs that "Dr. Nielsen focused her concerns upon 2-day old and 3-day old red drum larvae, ***only***."[25] It is impossible for the Port to think that is true when Dr. Nielsen's subjects for Test 1 and Test 3 (24 hours) were eggs, and one of the things she measured was successful hatch.[26] In court, this conduct is sanctionable. The Port goes on to quote and cite sources on larval development, culminating in the following, supported by no citations at all:

> More simply stated: 2-day old and 3-day old red drum larvae that might pass near the proposed Harbor Island discharge location are "precompetent," and will not be able to settle. . . . these "precompetent" red drum larvae are unable to settle – and thus likely to be rejected offshore by the subsequent ebb tide (forever lost to recruitment). Only the two to three week old larvae (or older) are competent to settle in the available nursery habitats (and these osmoregulate with great success).[27]

The Port is indicating that 2-3 day old and 2-3 week old larvae will encounter the discharge. But, while the 2-3 day olds are more vulnerable to salinity, the fact they are not yet ready to settle into the seagrass beds means they are the ones that will get swept out to the Gulf on the ebb tide – they are goners regardless. In contrast, the 2-3 week olds that will encounter the discharge will be fine because they have a greater tolerance for salinity. This paragraph has no citations because it is a fiction written by lawyers. One cannot so casually dismiss the young larvae that make it to the area of the discharge because, as the reliable evidence from the knowledgeable experts shows, the larvae that make it as far

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[22] Port's Closing Argument on Remand, at 15 (citing Remand Tr. Vol. 5 at 1071).

[23] Remand Tr. Vol. 5 at 1095:3-7.

[24] Port's Closing Argument on Remand, at 15 (citing Remand Tr. Vol. 7 at 1841-42).

[25] Port's Closing Argument on Remand, at 15 (emphasis added).

[26] Ex. PAC-48R KN-3 at 1, 3 ("Percent survival was calculated by dividing the number of surviving larvae at each time point by the number of eggs at test start."). *Id*. at 12 (Table 3) (LC50 of 50.4 ppt for red drum eggs).

[27] Port's Closing Argument on Remand, at 16.

as the discharge are the "lottery" winners: "These individuals have already matched. There's no mismatch here. They made it into the inlet."[28] The ALJs should completely discount these arguments by the Port regarding the 2-3 day old larvae.

The Port also goes to lengths to make a rather simple point – that Stillmeadow is accredited under section 5.134 of the Water Code[29] and used EPA standard species and methods (kind of) for testing,[30] but that Dr. Nielsen is not accredited and did not use EPA standard species. PAC previously addressed the accreditation issue in its response to the Port's pre-hearing challenge to Dr. Nielsen's testimony and testing, and will not restate all of those arguments here. PAC believes the law is clear, and the plain language of the applicable rules makes it clear that only "environmental testing laboratory data" is subject to the accreditation requirement, and an "environmental testing laboratory" is one which "performs analyses to determine the chemical, molecular, or pathogenic components of environmental media for regulatory compliance."[31] That is not what Dr. Nielsen did here, nor is it what she ordinarily does as an academic researcher. Thus, Dr. Nielsen is not an environmental testing laboratory and her test data are not "environmental testing laboratory data." The Office of Public Interest Counsel's Closing Argument very ably addresses the criticism regarding accreditation, and PAC agrees with and incorporates that briefing herein.[32]

Moreover, the logical conclusion of the Port's argument would exclude much of the other evidence in the record. Dr. Fontenot relied on over 200 literature sources rather than personal or professional experience in the CCSC or with relevant estuarine-dependent species.[33] Were all of the tests reported in those articles performed by facilities accredited under section 5.134? If not, should Dr. Fontenot's opinions be inadmissible? Or given no weight? One would expect the Port to answer those questions negatively. On what logical basis, however, could one argue that Dr. Nielsen's testing cannot be used in this case, but once her results are published (as it appears they will be),[34] then it may

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[28] Remand Tr. Vol. 5 at 1234:22-24 (Dr. Stunz).

[29] This provision of the Water Code is substantively the same as the regulation found at 30 Tex. Admin. Code § 25.6.

[30] The EPA standard testing protocols had to be altered because as written they cannot be used to test for salinity.

[31] 30 Tex. Admin. Code § 25.2(6).

[32] OPIC's Closing Argument at 11-12 ("OPIC concludes that the Port's interpretation of 30 Tex. Admin. Code § 25.2(6) runs afoul of the plain language of the rule which clearly seeks to regulate laboratories analyzing components of environmental media rather than toxicity on selected organisms.").

[33] Fontenot's Appdx 2, Ex. REF 1 (Reference List Compendium); Ex. APP-LFR-10 (References).

[34] Dr. Nielsen testified that she has "published many papers, all of them in Q1 journals." Remand Tr. Vol. 8 at 2115:19-20. Dr. Nielsen has published in *Environmental Science & Technology*, a very elite journal in the field (Remand Tr. Vol. 8 at 2116:7-16) and submitted her red drum toxicity testing to *Estuaries & Coasts*, the Coastal and Estuarine Research Federation's scientific journal. Ex. PAC-48R at 6:20-22.

be relied upon and used (as Dr. Fontenot relied on and used testing from published articles)? Such an approach finds no support in the statute or rule and would be an odd result indeed. There is simply no rational reason or basis in the law for such a contorted result. If the ALJs were to adopt the broad reading of the accreditation requirements, then the ALJs would have to discount all other testing evidence, or testimony derived from such, in this case—including all testing and results relied on by experts, EPA, TCEQ, or any other entity—that has not been shown to come from an accredited environmental testing laboratory. This is an absurd result, but it is required if one adopts the Port's arguments.

Moreover, EPA actually provides for the testing of non-standard species (such as red drum) "subject to application and approval."[35] If the Port and ED have simply decided to ignore that option, they should at least admit it, rather than pretend that only standard species can be used under all circumstances. The parties' competing contentions regarding the appropriateness of the silverside and mysid shrimp, and especially 7- to 11-day old subjects, are already well briefed. But it is worth repeating that WET test methods are designed for toxicants ***other than*** salinity. The Draft Permit requires the use of EPA Method 1006 for silverside and 1007 for mysid shrimp. As written, these Methods require that the lab ***control for salinity*** and preclude the use of water with salinity of 33 ppt or greater:

> 13.6.13.1 Saline test and dilution water – the salinity of the test water must be in the range of 5 to 32 ppt. The salinity should vary by no more than +/-2 ppt among the chambers on a given day. If effluent and receiving water tests are conducted concurrently, the salinities of these tests should be similar.[36]

On cross examination, Randy Palachek admitted that the requirement to control for salinity in the WET tests required by the Draft Permit ***does not*** "make sense in this context where the constituent of concern is salinity."[37] In fact, the test protocols would actually defeat the very purpose of the testing in regard to salinity.

The Port continues its assault with volume over substance. The Port cites the Pillard paper, stating that it found an LC50 of 43.03 for mysid (3-6 day old) and 44 for silverside (7-11 day old), "roughly the same" as red drum, in order to assert that testing these species is a reliable indication of how red drum will be affected by salinity. Assuming for argument's sake that mysid and silverside

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[35] Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms, Third Edition, October 2002 (EPA-821-R-02-014), at 2 § 1.9.

[36] *Id.*, at 160 § 13.6.13.1 (Test Method 1006.0 for Inland Silverside); Ex. Kings-Steves-17R at § 13.6.13.1; *see also*, Ex. Kings-Steves-23R at § 14.6.11.1 (Method 1007.0 for Mysid).

[37] Remand Tr. Vol. 4 at 827:1-25.

were good surrogates, these seven- to eleven-day-old silverside larvae and seven-day-old mysid juveniles are not the most appropriate age for testing when compared to the age of red drum larvae that will encounter the discharge.[38] Putting that aside, there is literally not one single instance that PAC has found in which the Port truthfully represents the substance of any of the papers it cites. In fact, the Pillard paper would tell the ALJs that the silverside is a terrible choice for WET testing in this case:

> In some test chambers, there was 100% survival at 48 h in salinities up to 50 ppt. However, at 31 ppt, 40% mortality was observed in some test chambers and increased with increasing salinity. The wide range in survival of silverside minnows at salinities between 35 and 50 ppt ***suggests that survival predictions based on salinity are likely to be less reliable*** than for the other two test species.[39]

The Port has told the ALJs that this paper supports the use of silverside to test for salinity – when the paper itself says the opposite. This is the standard modus operandi for the Port.

The Port quotes the Kesaulya paper (twice), as stating that "red drum ***eggs*** can hatch within a wide range of salinities with best hatch-out and growth rates occurring between 33 – 43 ppt" and uses it to support the proposition that "mysid shrimp and inland silverside may be more sensitive to higher salinity concentrations than red drum ***larvae***."[40] It is incomprehensible how anyone who read the Pillard paper, discussed above, could write that sentence. Moreover, there is a big analytical gap here because the quote regarding ***eggs*** cannot support the Port's conclusion regarding ***larvae***. They are two very different life stages:

> So at 24 hours, really what we're looking at is hatch, and we already know that embryos are much more resilient in terms of salinity stress for several different reasons. The first is that they have a chorion that helps mitigate the flow of water in and out of the embryo, and the other reason has to do with maternally transferred cortisol. . . .
>
> However, just before hatch in red drum specifically, that cortisol level drops to non-detect, and it doesn't pick up – it doesn't pick back up until five days post hatch so during that time, the red drum larvae are unable to osmoregulate.[41]

Moreover, Kesaulya acknowledged a number of sub-lethal effects on red drum caused by excess salinity. The paper does not lump all "young" red drum together, but rather notes the following: "Early

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[38] Ex. Kings-Steves 17R at 155; Ex. Kings-Steves 23R at 214.

[39] Pillard, D.A., et al.., Response of Mysid Shrimp, Sheepshead Minnow, and Inland Silverside Minnow to Changes in Artificial Seawater Salinity, Environmental Toxicology & Chemistry, Vol. 18, No. 3, p. 430 at 432 (May 19, 1998) (emphasis added). This paper is not cited by the Port by Exhibit or Bates number. It is not readily available to the public. This is true of several papers the Port discusses in its Closing Brief. PAC's experts provided PAC's counsel with copies.

[40] Port's Closing Argument, at 28-29, 30.

[41] Remand Tr. Vol. 7 at 1801:17-24, 1802:4-8 (Dr. Kristin Nielsen).

life stages (*age/size dependent*) of red drum vary in their ability to tolerate shifts in environmental variables. Conditions beyond the environmental thresholds of tolerance may cause deformities, low hatching rates, reduced growth, and a decreased larva survival."[42] With all due respect, this science should not be so glibly dismissed by the Port – but rather should inform its decisions.

The Port cites to the Robertson (1988) study regarding a NOEC for red drum *eggs*. But as PAC stated in its Closing Argument, eggs are not a primary concern because generally they hatch before they reach the area of the outfall.[43] Very young larvae (1 to 5 days old) will potentially come into contact with the discharge plume, and impacts upon such larvae must be considered to evaluate the impacts of the discharge upon aquatic life.[44]

The Port cites Brauner et al. (2013), and a discussion of the Laguna Madre for the proposition that "at higher salinities few species [of red drum] dominate and only larger individual fish are found, indicating a lack of recruitment."[45] Agreed. There are no larvae in Laguna Madre, making it pretty irrelevant to any discussion regarding a brine discharge in the CCSC. But, the Brauner paper does also helpfully note that in Laguna Madre "fish biodiversity is lower than in nearby non-hypersaline areas such as Corpus Christi Bay."[46] Thus, Laguna Madre is not a proper surrogate for the area of the discharge proposed in this case.

The Port references Dr. Stunz's desalination "siting study" for the proposition that red drum *larvae* can tolerate salinities from 28 to 42 ppt. In fact, red drum larvae are not discussed in this paper at all, and the 2015 paper is entirely consistent with Dr. Stunz's testimony in this case:[47]

> . . . However, *brine plumes can create hypoxic or anoxic zones which disturb benthic communities* and organisms in the water column. It is known that there is an interaction between salinity and dissolved oxygen (DO) concentration in Corpus Christi Bay, such that *benthic communities decline dramatically as salinity increases to around 42 ppt* and DO decreases to around 3 mg/L. This effect could be heightened due to *depressions in Corpus Christi Bay*, which constrain mixing of bottom water, leading to hypoxia. . .
>
> . . .

[42] Ex. APP-55-R at 119 (emphasis added).

[43] Eggs are not irrelevant; they are simply present in fewer numbers than larvae. And Dr. Nielsen found that at 50.4 ppt, half of red drum eggs did not hatch. Ex. PAC-48R-KN-3 at 12, Table 3 (Bates PAC-KN-004484).

[44] Ex. PAC-46R at 10-11 (Testimony of Dr. Esbaugh).

[45] Port's Closing Argument, at 29.

[46] Brauner, C.J., Gonzalez, R.J., Wilson, J.M., Extreme Environments: Hypersaline, Alkaline, and Ion-Poor Waters, Euryhaline Fishes: Vol. 32, Fish Physiology, Ch. 9, p. 435 at 454.

[47] The following quotes are taken from the 2015 paper, found in the record as Ex. APP-56-R at 9-12 (citations omitted and emphasis added). Again, note that in this paper Dr. Stunz recommended a discharge salinity at least 26 ppt less than the Port's predicted 68 ppt discharge salinity.

> The Corpus Christi Bay system has natural salinities ranging from 28-42 ppt, with an average around 35 ppt. We know that the resident marine species can tolerate salinities within this range; however, further studies are needed to determine the effects of a localized salinity increase ***greater than 42 ppt***.
>
> . . .
>
> The ***target acceptable discharge salinity should be 35-42 ppt***, just above the average salinity of the bay system. . . .The concentration of copper, calcium, chlorine, and anti-scalants in the brine concentrate needs to be determined before its impact can be assessed. Fish, plankton, and benthic fauna can experience toxic effects from the bioaccumulation of metals. Research is needed to verify the potential impacts of brine concentrate mixing with seawater. . . .
>
> . . . ***Brine discharged at a high velocity*** would promote more mixing but ***could negatively impact flora and fauna***. We estimate the maximum velocity at the edge of mixing zone safe to aquatic life to be no more than 0.5 m/sec. . . .
>
> The acceptable discharge salinity should be close to 35 ppt, and no higher than 42 ppt. . . . A brine plume at this site would probably lead to hypoxia.

The Port used this paper to argue, ad nauseum, that Dr. Stunz is racist and classist because he allegedly "recommended" a desalination discharge in a poor and minority neighborhood. To the contrary, Dr. Stunz was not hired to make a recommendation about where best to locate a desalination discharge. The paper speaks for itself: "Specifically for this study, five candidate discharge assessment locations ***were chosen by Freese and Nichols, Inc***. The Harte Research Institute, more specifically the Ecosystem Studies and Modeling Lab was contracted ***to identify potential environmental impacts*** of specific discharge structures to the surrounding environment."[48] The Port continuously implied in the hearing that Dr. Stunz "recommended" the sites in the 2015 paper, but the evidence is clear that is not what occurred. Again, the Port shows a great willingness to distort the evidence.

The Port spent a lot of time at hearing trying to show that Dr. Nielsen is just plain incompetent. But the Port also hedges its bets in case the ALJs reject that contention and tries to show that Dr. Nielsen's test results support the Draft Permit. The Port states that at "50.4 ppt, red drum larvae demonstrated LT50 for 24 hours."[49] ***But no such LT50 test was conducted***. Dr. Nielsen did perform LT50 testing, which determines how long it takes half the subjects to die at a particular concentration. But Dr. Nielsen's LT50 tests ***all*** used 68.7 ppt. She did not perform any LT50 test using 50.4 ppt.

[48] Ex. APP-56-R at 9 (emphasis added).

[49] Port's Closing Argument on Remand, at 30. Among other things, this sentence makes no grammatical sense.

The Port may be referencing the 24 hour "follow up" test, which had an LC50 of 50.4 ppt.[50] This test commenced with eggs (four to eight hours post fertilization).[51] At the end of 24 hours, "percent successful hatch" was determined by the number of larvae alive, relative to the number of eggs at test start.[52] In that test, half the eggs did not hatch at 50.4 ppt.[53] Yet again, the Port treats eggs and larvae as though they are interchangeable when it is well established that eggs can tolerate higher salinity than larvae.[54] The results at 48 hours and 72 hours reflect results for the larvae that had hatched. For those time steps, the LC50 (death of half the larvae) was 44.8 ppt and 37.7 ppt respectively.[55]

The Port also states that Dr. Nielsen "found that red drum eggs and early-stage larvae had the same hatch and survival success" at several salinities, with a NOEC (no observable effect concentration) of at least 45 ppt.[56] But again, the Port is wrong and is confusing (intentionally) the significance of the "range-finder" with the follow-up "definitive" test. The "range-finder" at 24 hours produced a NOEC of 45 ppt (eggs), while at 48 and 72 hours, the NOEC was 40 ppt (larvae).[57] In the definitive test, in which a narrower range of salinity levels and a high survival rate in the control groups led to higher confidence in NOEC and LOEC,[58] Dr. Nielsen reported only a NOEC of 35 ppt for 24-h (did the eggs hatch?), 48-h (larval survival), and 72-h (larval survival) tests.[59]

The Port is very proud of the "tremendous amount of new information" and new experts that it has presented on remand.[60] But in fact there are a lot of inconsistencies and unknowns in the Port's case on remand. In 2020, the Port's witnesses testified under oath, and lawyers argued to the Commissioners – apparently based on rumor and speculation, but not the scientific method or even

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[50] Ex. PAC-48R KN-3 at 12, Table 3 (Bates PAC_KN_004484).

[51] Ex. PAC-48R KN-3 at 10, Table 2 (Bates PAC_KN_004482).

[52] Ex. PAC-48R KN-3 at 12 (Bates PAC_KN_004484).

[53] Ex. PAC-48R KN-3 at 12, Table 3 (Bates PAC_KN_004484).

[54] *See* Ex. PAC-48R KN3 at 14 ("During preliminary testing, it was found that embryos were more resistant to hypersaline conditions than larvae, with an embryonic LT50 value of 6-h and 36-min (95% CI 6.4, 6.9) relative to a larval LT50 of only 47.7 minutes (95% CI 34.7, 60.7; Figure 7) for larvae spawned at 28 ppt.").

[55] Ex. PAC-48R KN-3 at 12 (Bates PAC_KN_004484). It is worth pointing out that Dr. Nielsen performed confirmatory statistical analyses in response to criticisms of Dr. Kirk Dean, and the results showed similar (if not slightly more conservative) results: 50% of red drum embryos will fail to hatch at salinity around 46.6 ppt, while at test hour 48 and 72, 50% of larvae will be dead at a salinity of 43.3 ppt and 37.9 ppt, respectively. The LOEC for all timepoints remained at 37 ppt. Ex. PAC-48R at 14:17-24.

[56] Port's Closing Argument on Remand, at 30.

[57] Ex. PAC-48R KN-3 at 5 (Bates PAC_KN_004477).

[58] Ex. PAC-48R KN-3 at 9. A LOEC and NOEC can only be salinity levels that were tested, e.g. 35 ppt, 37 ppt, etc.

[59] Ex. PAC-48R-KN-3 at 12, Table 3 (Bates PAC_KN_004484).

[60] Remand Tr. Vol. 1 at 17:3-18:4.

personal observation – that there was an eddy that would clearly improve mixing above and beyond what was demonstrated by modeling.[61] On remand, the Port takes the position that it has actually disproved the existence of an eddy.[62] Or perhaps that confirming the existence of an eddy is just "irrelevant."[63] The Port and its witnesses do not know why there is zero dissolved oxygen in some areas near the outfall, but they are still willing to speculate about the cause, and are not at all concerned about it.[64] The Port does not know within an order of magnitude how many species are even in the CCSC.[65] And the Port has not conducted any analysis of the impact on aquatic organisms from the hydrodynamics of the 8.2 m/s discharge.[66] Despite this, the Port believes it can accurately predict the maximum time that any living thing will be exposed to elevated salinity from the discharge.[67] According to the Port, its predications trump the accepted scientific method for determining the numeric limits in the TSWQS and the standard EPA WET testing protocols.[68] The ALJs should decline the Port's invitation to (1) speculate about what exposure duration may actually occur in the real world, and (2) dismiss data that is based on standard test protocols for time exposure.

The Port also doubles down on the Zone of Passage theory it raised in the first hearing. Here is a fact that has not changed in two years: "The existence of a zone of passage also does not ensure protection of aquatic life given that the earliest life stages, including embryos and larvae, lack the ability to swim and, therefore, cannot avoid the ZID and mixing zones."[69] But moreover, the Port is willing to misrepresent the evidence regarding the importance of the CCSC to larval migration.[70] The Port cherry

[61] Ex. PAC-56R (Redacted) at 105:19-22; Ex. PAC 57-R at 47 of 78.

[62] Port's Closing Argument on Remand, at 40.

[63] Ex. PAC-56R (Redacted) at 106:1-24 (Sarah Garza asked the experts "is there an eddy?"; they said "it's irrelevant").

[64] Remand Tr. Vol. 3 at 636:6-637:23 (Kirk Dean testifying that he is "not an expert in the actual effects of low dissolved oxygen on aquatic life" but under TCEQ standards, dissolved oxygen should be above 2 milligrams per liter at all times, and on average 4 to 5 milligrams per liter in CCSC. He has no idea what is causing DO to drop to zero.). Remand Tr. Vol. 4 at 842:14-843:6, 843:22-844:1 (Randy Palachek has no idea why DO drops to zero in the area of the discharge).

[65] Remand Tr. Vol. 2 at 390:17-391:18 (Lance Fontenot thinks there are a total of 60-80 species of aquatic organisms in the CCSC). There are at least hundreds, probably thousands. Ex. PAC-46R at 11:1-23 (Scott Holt).

[66] *See e.g.*, Remand Tr. Vol. 2 at 485:13-23 (Lance Fontenot). Dr. Nathan Knott is one of the authors of a six-year study that concludes the Sydney, Australia desalination plant caused a reduction in several species "driven by changes in hydrodynamics caused by the diffusers." Ex. PAC-87R. The Sydney facility's discharge exits the diffuser at 5 m/s. *Id*. at 764 (Bates: Port Authority 046725).

[67] Port's Closing Argument on Remand, at 4, 16, 17, 30, and 32.

[68] Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms, Third Edition, October 2002 (EPA-821-R-02-014), at 155 § 13.1.2 ("Daily observations on mortality make it possible to also calculate acute toxicity for desired exposure periods (i.e., 24-h, 48-h, 96-h LC50s)"). Ex. PAC-45R at 10:5-21 (when developing water quality standards, "exposure duration is not part of the decision making equation").

[69] Initial PFD, at 65.

[70] Port's Closing Argument on Remand, at 31.

picks data from 2012 (during a record drought), and ignores data from the same study using 2019 conditions (a normal year for riverine inflows). The data Dr. Fontenot ignored shows that the majority of larvae entering the Aransas Pass Tidal Inlet use the CCSC to reach the estuary.[71] And apparently the Port continues to remain unaware that Dr. Fontenot has testified that red drum larvae "are distributed throughout the water column in the Aransas Pass."[72] Furthermore, the applicable regulations require a specific consideration of impacts occurring within the zone of initial dilution and Mixing Zone.[73] No "zone of passage" can offset impacts specifically prohibited within these areas explicitly identified in the regulatory requirements.

While PAC agrees with Dr. Fontenot regarding the presence of red drum larvae being distributed throughout the water column, this does not change the fact that Dr. Fontenot is not a reliable witness. Dr. Fontenot created a large number of exhibits that the Port relies on heavily. At the hearing, in PAC's Closing Argument, and herein, Dr. Fontenot's literature sources have been discussed in great detail to show that he fails to acknowledge material distinctions (eggs and larvae are different life stages with different tolerances), relies on materials related to life stages that are not in peril here (Martin & Esbaugh studied juveniles, which have gills and can avoid the discharge), and simply ignores data that is unfavorable to his client's position (CORMIX modeling by the ED shows salinity increases up to 4.11 ppt and 12% at edge of ZID). In response to the exhibits on page 33 of the Port's Closing Argument, PAC will offer the following.

The chart below shows the ***increase*** in salinity at the edge of the ZID reported by the TCEQ in ten CORMIX runs[74], compared to the LD50 for 3-day old red drum larvae in the Thomas article that Fontenot relies on very heavily (increase of 1 ppt killed half of 3-day olds), plus the TPWD/GLO recommended limit of 2 ppt.

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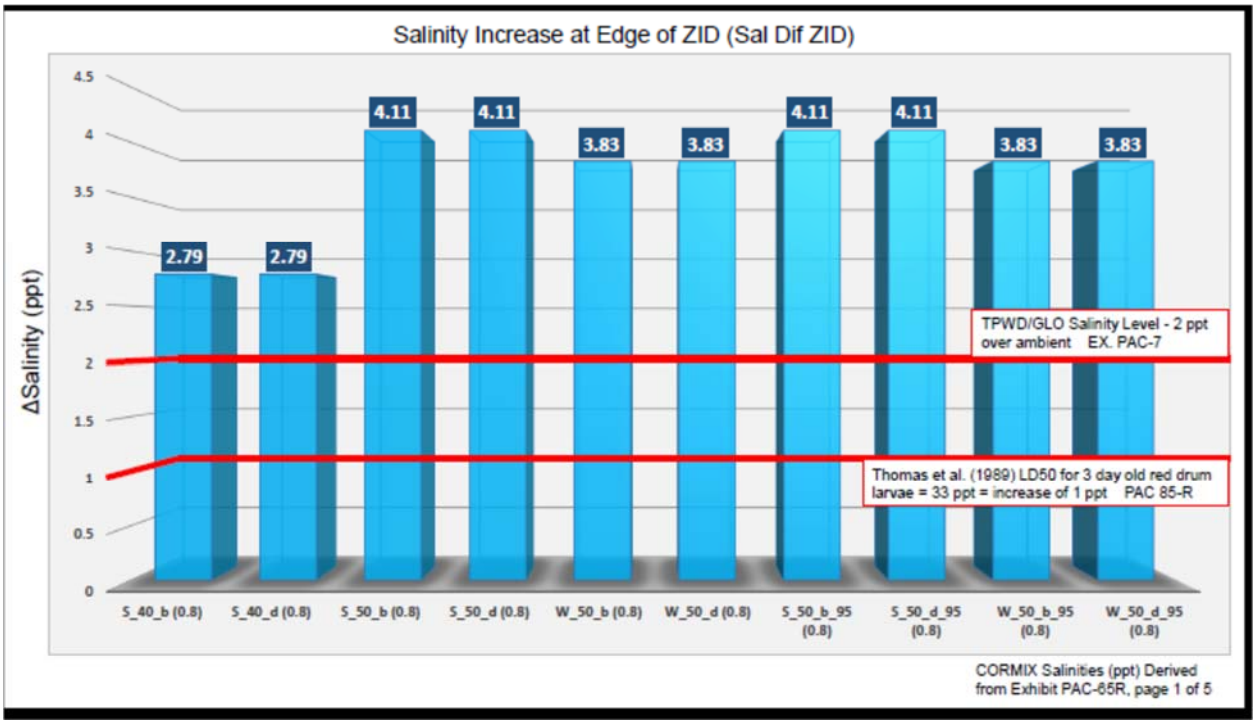
[71] *Compare* Lance Fontenot's Appdx 5, Ex. EA 1-2 (Assumed Percent CC Ship Channel Transport = RB2 + CB to conclude only 10.6% of larvae use the CCSC to reach the estuary in Initial Condition I - Current), *with* Ex. PAC-81R at 12, Table 4 (Initial Condition I- Current shows RB2 + CB = 203/285 = 71% of larvae using CCSC to reach estuary). These two exhibits reflect data for different years from the same study. Dr. Fontenot elected to ignore one set of data.

[72] Ex. APP-LF-1-R Rebuttal at 10:28-30.

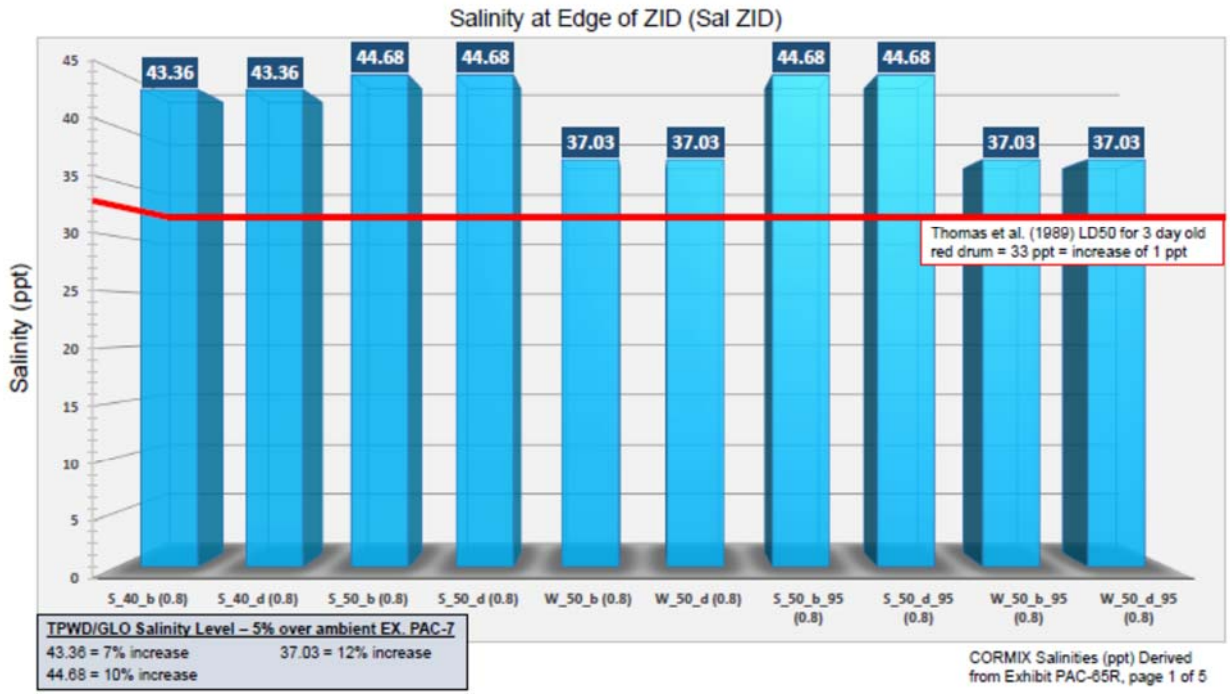
[73] *See, e.g.,* 30 Tex. Admin. Code §§ 307.6(e)(1)("[T]here must be no significant lethality to organisms that move through a ZID"), 307.3(a)(40) ("Acute toxicity to aquatic organisms is not allowed in a mixing zone, and chronic toxicity to aquatic organisms is not allowed beyond a mixing zone."), and 307.6(e)(1) ("[T]here must be no significant sublethal toxicity to aquatic organisms that move through the mixing zone.").

[74] Ex. PAC-65R at 1. These results are not the ED's "critical conditions" because they are not the runs that resulted in the highest percent of *effluent* at the edge of the ZID. But they do reflect the largest increase in *salinity* at the edge of the ZID.



The chart below shows the ***total*** salinity at the edge of the ZID for the same ten CORMIX runs,[75] compared to the LD50 for 3-day old red drum larvae in the Thomas article. The folly of adopting Fontenot's "EPA Gold Book" standard of 10% increase in salinity has already been well briefed by PAC. But even if this standard were accepted, it is exceeded in this case. The chart shows that TCEQ predicts increases of 7% (when salinity reaches 43.36 ppt), 10% (when salinity reaches 44.68 ppt), and 12% (when salinity reaches 37.03 ppt).

[75] Ex. PAC-65R at 1.



5) Dr. Nielsen's Testing is Valid and Can be Used in Determining Issues on Remand.

As previously discussed, it is telling that the Port argues that Dr. Nielsen's testing should not be considered in ruling on the Draft Permit because her laboratory is not accredited by TCEQ or the National Laboratory Accreditation program, but then simultaneously attempts to cherry-pick certain results to support its position. A key word here is "attempts," because, as previously explained, the Port regularly provides unsupported or incomplete assertions about Dr. Nielsen's testing,[76] does not distinguish between the "range-finder" test and the "follow-up" test or the significance of either,[77] and confuses the LC50 for the LT50 test.[78]

It is also telling that the Port relies on criticisms from Dr. Dean, who is not a toxicologist or a biologist, but who makes such unfounded criticisms that they themselves call into question the reliability of his own testimony. For example, he and the Port continue to insist that the larvae could

[76] Port's Closing Argument on Remand, at 22 (Alleging "Dr. Kristin Nielsen conducted her testing upon red drum, presumably because she determined that it was the most sensitive species to salinity changes from the Outfall" when Dr. Nielsen provided in direct testimony her reasons for testing on early life stage red drum. *See* Ex. PAC-48R at 15:23-17:15).

[77] Port's Closing Argument on Remand, at 30 (providing a NOEC of 45 ppt, when this was for the 24-hour "range-finder," whereas the 48-hour and 72-hour "range finder" NOEC was 40 ppt, and more importantly, the "follow up" test NOEC for 24-hour, 48-hour, and 72-hour times was 35 ppt).

[78] Port's Closing Argument on Remand, at 24-25 (confusing LC50 for an LT50: "Protestants assert that when the salinity in the CCSC rises above 37.7 ppt, one-half (LT50) of all early-stage red drum larvae die."); *Id*. at 30 (again, confusing LC50 for an LT50: "At 50.4 ppt, red drum larvae demonstrated LT50 for 24 hours.").

have died from elevated DO (i.e. gas bubble disease),[79] even though, both tests have "exceptionally high survival" of the control groups, which is the most important factor in determining whether the treatment (in this case, salinity) or some other factor (such as DO or gas bubble disease) was the cause of mortality.[80] During the hearing, Dr. Nielsen provided several other reasons she "knew that [the larvae] didn't have gas bubble disease."[81]

Relying only on Dr. Dean's initial prefiled testimony, the Port continues to speculate that *if* randomization was improper and *if* the two cohorts were treated differently, this could have compromised Dr. Nielsen's study.[82] Dr. Nielsen thoroughly explained that the study "was sufficiently random" and that the two cohorts "were treated the same."[83] Like many of the Port's other criticisms of Dr. Nielsen's work, there is no real basis for this one.

The remainder of Dr. Dean's criticisms appear to be—in some paltry attempt to merely compile a list as long as possible—simply extensions of his first complaint, that Dr. Nielsen's testing deviated from EPA methods,[84] which she thoroughly explained were necessary deviations in order to conduct reliable toxicity testing on early life stage red drum. For example, because she selected early life stage red drum, Dr. Nielsen also altered the duration of the test, [85] the way in which she measured growth,[86] and the manner in which control survivability was determined to be acceptable.[87]

Dr. Fontenot's only additional critique seems to be that Dr. Nielsen's work is at odds with other published literature on early life stage red drum. However, for the reasons explained more completely above, it is actually the Port that attempts to compare Dr. Nielsen's work to studies that are incomparable: Robertson, et al (1988) is in reference to red drum embryos, not larvae; Brauner, et al

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[79] Port's Closing Argument on Remand, at 35.

[80] Remand Tr. Vol. 8 at 2126:20-2127:1.

[81] Remand Tr. Vol. 8 at 2127:9-24 (because the larvae were not dead, the larvae were uploading when being counted, and there were no bubbles in the images, which would have been obvious).

[82] Port's Closing Argument on Remand, at 36.

[83] Remand Tr. Vol. 8 at 2129:5-2131:9.

[84] *See* Port's Closing Argument on Remand, at 35-36.

[85] Remand Tr. Vol. 8 at 2117:2-2119:21 (explaining that a 72-hour test on red drum is a chronic test because of the life cycle, and that if she had run a test on red drum to 96 hours, they would have starved, she would have had to start feeding them (introducing another variable), or they would have eaten each other).

[86] Ex. PAC-48R KN-3 at 2 ("EPA-821-R-02-014 evaluates growth using a dry weight approach; however, it can be difficult to detect statistically significant differences in such small tissue masses. Thus, body area, length, and eye size were used as surrogates for growth.").

[87] Remand Tr. Vol. 8 at 2119:22-2120:17 (using these acute/chronic testing distinctions, Dr. Nielsen's control survivability met EPA's acceptability criteria).

(2013) is in reference to Laguna Madre, where red drum larvae are not found;[88] Stunz, et al (2015) does not discuss red drum larvae; and Kesaulya, et al (2018), which lumps together conclusions about embryos and larvae.

The Port discusses Dr. Nielsen's LT50 tests and her "range finder" LC50 test, but not her definitive LC50 test. Also notably missing from the documents cited by the Port is the Texas Water Development Board study published in 1989 (commonly referred to in this hearing as "the Thomas paper").[89] Dr. Esbaugh, in forming his opinion that "the most sensitive species found in proximity to the planned desalination discharge have salinity tolerances between 36 and 38 ppt," relied on the Thomas paper and found that Dr. Nielsen's data (i.e. a 72-hour LC50 of 37.7 ppt) confirmed the prior work published in the Thomas Paper.[90] Her work is consistent with other published literature, just not the literature the Port likes.

B. The Port's CORMIX and SUNTANS Modeling Does Not Demonstrate There Will be No Adverse Effects to Marine Life From the Proposed Discharge.

PAC has addressed the many deficiencies in the Port's CORMIX and SUNTANS modeling in its initial closing arguments, and also addresses them further below in regard to Issue G in this reply brief. But, PAC also wishes to address a few of the Port's ancillary arguments here.

In numerous places throughout its Closing Argument, the Port argues that because the CCSC does not maintain the same salinity all day every day – and things live there – the increase in total salinity the Port predicts "would not cause adverse effects on the environment or marine life."[91] The Port's argument is overly simplistic: basically the Port simply asserts that 0.625% (the increase in salinity predicted by the Port's SUNTANS modeling) is a really small number so this predicted salinity increase is not a concern. However, as noted in regard to Issue G below, this number is wrong and is based on a math error by the Port's witness, who miscalculated the discharge volume by a factor of 10. As explained on page 41 of this reply brief, there is a conversion error in Dr. Furnans' calculations and the correct percentage is actually 6.25%.

Moreover, the Thomas article cited by Dr. Fontenot deals in detail with red drum larvae of different ages,[92] and that paper found that an increase in salinity of only 1 ppt killed half of 3-day old red drum larvae. Thus, the Port's overly simplistic assertion of the change in salinity being so small

[88] Remand Tr. Vol. 9 at 2154:13-15.

[89] Ex. PAC-85R.

[90] Ex. PAC-45R at 8:9-21.

[91] Port's Closing Argument on Remand, at 37.

[92] Port's Closing Argument on Remand, at 33 (Dr. Fontenot's exhibits cite to Thomas et al. (1989)).

and, therefore, insignificant should be disregarded because (1) the number is wrong; and (2) small changes can have outsized effects, as shown by the Thomas paper and the testimony of PAC's experts.[93]

The Port quotes Mr. Palachek's discussion of salinity increases of 2 ppt and brief exposure times, even during slack tide. But the TCEQ modeling shows the following:

- Effluent with salinity as high as 68.7 ppt;
- Salinity at the edge of the mixing zone as high as 43.07 ppt (increase of 2.50 ppt) for some CORMIX runs and an increase of up to 7% for other runs; and
- Salinity at the edge of the human health mixing zone as high as 42.0 ppt (increase of 1.43 ppt) for some runs and an increase of up to 4% for other runs.[94]

Despite all the new information the Port has amassed, its witnesses do not offer hard data to support its assertions that slack tide happens rarely and briefly – according to Mr. Palachek for only 6 minutes at a time, and it is "unlikely" that any larvae would get caught in slack tide and exposed to elevated salinity more than once.[95] Mr. Palachek's assertion is unsupported and directly refuted by the evidence. Dr. Greg Stunz testified that, based on his personal observation and almost daily review of tide tables for his work, the Port is wrong when it says slack tide occurs for only a few minutes per day.[96] Moreover, as Dr. Stunz testified, every abrupt change – up or down – requires very demanding osmoregulation and can cause injury or death.[97] Accordingly, the presence of slack tides, and the Port's failure to properly account for them presents an additional area of significant concern as it presents the likelihood of much higher exposure times than the Port asserts.

The Port cites to Dr. Tischler's testimony, which depends in part on the premise that "the existing tidal current structure at this location in the CCSC" created and sustains the deep hole.[98] In fact none of the Port's witnesses were tasked with determining what created the hole, or when. And

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[93] When the Port relies on "common sense" instead of science, it is often wrong. For example, the Port previously hypothesized that higher velocity in the receiving waters would improve mixing. Wrong. In this instance, the Port asks the ALJs to assume that because the CCSC is salt water – a little more salt can't hurt. Yet, the Port ignores the precarious nature of salinity levels in the receiving waters. *See, e.g.,* Ex. PAC-47R at 10. ("As it now stands, the bay system, including Nueces and Corpus Christi Bays from the mouth of the Nueces River to Aransas Pass inlet, is salinity stressed at least 53% of the time.") (Testimony of Dr. Larry McKinney), and Ex. PAC-48R KN-3 at 13 (Dr. Kristin Nielsen).

[94] Ex. PAC-65R at 1.

[95] Port's Closing Argument on Remand, at 38.

[96] Remand Tr. Vol. 5 at 1202:2-1203:5 ("Over the last 24 hours, it's occurred six to seven hours that has been, you know, less than .1, you know, basically no water movement through there.").

[97] Remand Tr. Vol. 5 at 1184:18-1185:9; 1239:5-15; and 1240:13-22.

[98] Port's Closing Argument on Remand, at 39.

they have no idea if it is static or changing.[99] Regardless, they are describing only an agreed upon phenomenon. Any particular molecule of salt will not reside in the deep hole forever. But a molecule of salt that is flushed out will be replaced – all day, every day, forever – by an endless flow of new salt molecules. One sting from a honeybee causes the bee to die, and is a nuisance to a person who is not allergic. But if that sting is followed by one dozen, one hundred, or one thousand stings by new bees, anyone would experience an adverse effect.

As Dr. Socolofsky testified, the discharge will continue to refill the deep hole: "It's flushed out the same as if you would turn the water on in your bathtub and just keep running. That's the diffuser. And then it overflows as you exceed the top."[100] The Port moved to exclude the opinions of Dr. Socolofsky, and also objected to his pre-filed testimony. The motion was denied and, with one small exception, the objections were overruled. He was permitted to appear and testify at the remand hearing. Of course PAC's other experts certainly can rely on information they received from him and conversations they had with him to support their own opinions.[101] But even if they could not, each PAC expert has relied on a multitude of sources as the bases for their opinions, including the TCEQ's CORMIX modeling results.[102]

Further, PAC presented additional evidence and testimony regarding the multiplicity of other stressors that exist in the CCSC and will impact marine organisms' ability to tolerate salinity.[103] While the Port (and ED) assert that all will be cured by WET testing, the EPA explicitly disagrees and says that WET testing cannot evaluate the multiple stressor affect. The EPA test methods also rebut the Port's arguments regarding the relative value to be given WET testing, as well as the novel "exposure duration" argument that test results should be disregarded because the Port speculates that any organism's exposure will be shorter than the duration of standard tests (i.e. 18-, 24- , 48- or 72- hours):

> 2.1.3 As exposure periods of acute tests were lengthened, the LC50 and lethal threshold concentration were observed to decline for many compounds. By lengthening the tests to include one or more complete life cycles and observing the more subtle effects of the toxicants, such as reduction in growth and reproduction, more accurate, direct, estimates

[99] *See e.g.*, Remand Tr. Vol. 4 at 848:10-15 (Randy Palachek).

[100] Remand Tr. Vol. 7 at 1659:18-24.

[101] Tex. R. Evid. 703.

[102] *See e.g.*, Ex. PAC-52R at 5:21-23, 11:4-10 (Dr. Stunz testified that Katie Cunningham's modeling results indicated that "the likelihood of population-level impacts is great, along with direct immediate mortality, delayed mortality, sublethal effects, and compounding multiple stressors affecting the survival of the marine animals exposed.").

[103] Ex. PAC-52R at 10:21-11:3 ("having to simultaneously deal with salinity adaptation, avoiding predators, and food procurement are compounded causing impairment or death"); Ex. PAC-52R GS-4 (paper by M. Waldichuk); Ex. PAC-52R GS-5 (Dazed, confused, and then hungry: pesticides alter predator-prey interactions of estuarine organisms).

> of the threshold or safe concentration of the toxicant could be obtained. However, laboratory life cycle tests may not accurately estimate the "safe" concentration of toxicants because they are conducted with a limited number of species under highly controlled, steady state conditions, and the results do not include the effects of the stresses to which the organisms would ordinarily be exposed in the natural environment.[104]

Is it really possible the Port does not know it is repeatedly telling the ALJs things about the merits of WET testing with which the EPA disagrees? Put simply, WET testing is not a cure for the significant potential harm presented by the proposed discharge, shown by the evidence in this case.[105]

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

The Port cannot demonstrate that it presented evidence on this issue and does not make a serious attempt to do so. Literally all it has is the extraordinarily brief, and circular, pre-filed testimony of Randy Palachek.[106] His testimony has been crystal clear and very consistent for over 3 years. Essentially it is this – the TSWQS were developed to be protective. TCEQ only issues a Draft Permit that will comply with the TSWQS and thus any Draft Permit is protective. The existence of a Draft Permit is, by definition, protective in Mr. Palachek's opinion. Despite the previous Proposal for Decision and the fact this is an issue that was remanded, both of which make it abundantly clear that the TCEQ issued a Draft Permit that is not protective *in this case*, Mr. Palachek will not be dissuaded. And he has nothing else of actual substance to offer on this issue.[107] Thus, the Port has not met its burden of proof.

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

In perhaps one of the most patently incorrect statements made throughout this entire proceeding, the ED in closing argument actually states "[t]here is no legitimate dispute regarding the location of the outfall, the depth of the outfall, the depth of the discharge, or the velocity in the channel."[108] It is inconceivable the ED could make this statement in light of this record, considering that:

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[104] Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms, Third Edition, October 2002 (EPA-821-R-02-014), at 3 § 2.1.3; s*ee also,* Ex. PAC-50R DS-3 (EPA Technical Support Document for Water-Quality Based Toxics Control) at 32 (noting potential existence of environmental stressors not reflected in laboratory conditions) and 42 (noting the limited value of WET testing due to potential differences between ambient conditions and test conditions).

[105] *See, e.g.,* Ex. PAC-50R at 16-21.

[106] *See* Port's Closing Argument on Remand, at 44 citing APP-RP-1-R at 6:27-29.

[107] Ex. AP-RP-1-R at 27:8-25.

[108] ED's Closing Argument on Remand, at 14.

- Dr. Tischler's rebuttal testimony indicated the latitude and longitude location of the diffuser ports has not been established yet, despite the Application indicating a precise outfall location by latitude and longitude;

- Dr. Tischler's rebuttal schematic shows the diffuser ports' height above the bottom as 4 to 6 feet from the channel bottom (essentially 1.2 to 1.8 meters), yet his diffuser design memo in the amended application has the diffuser ports 7.9 meters above the channel bottom (roughly 26 feet);

- Dr. Tischler's rebuttal schematic has a channel depth of 21.3 meters (roughly 68 to 70 feet), yet his diffuser design memo in the amended application has the channel depth at 27.4 meters (roughly 90 feet).

- The amended application identifies the channel depth as 90 feet at the outfall location, yet the Port's own bathymetry map shows it as 65 feet.

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."[109] 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.[110] The diffuser ports are the discharge point, or outfall, as that is the place where the wastewater will discharge into the receiving waters, the channel. Thus, the outfall location is to be the location of the diffuser ports.

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."[111] 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.[112] 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.[113]

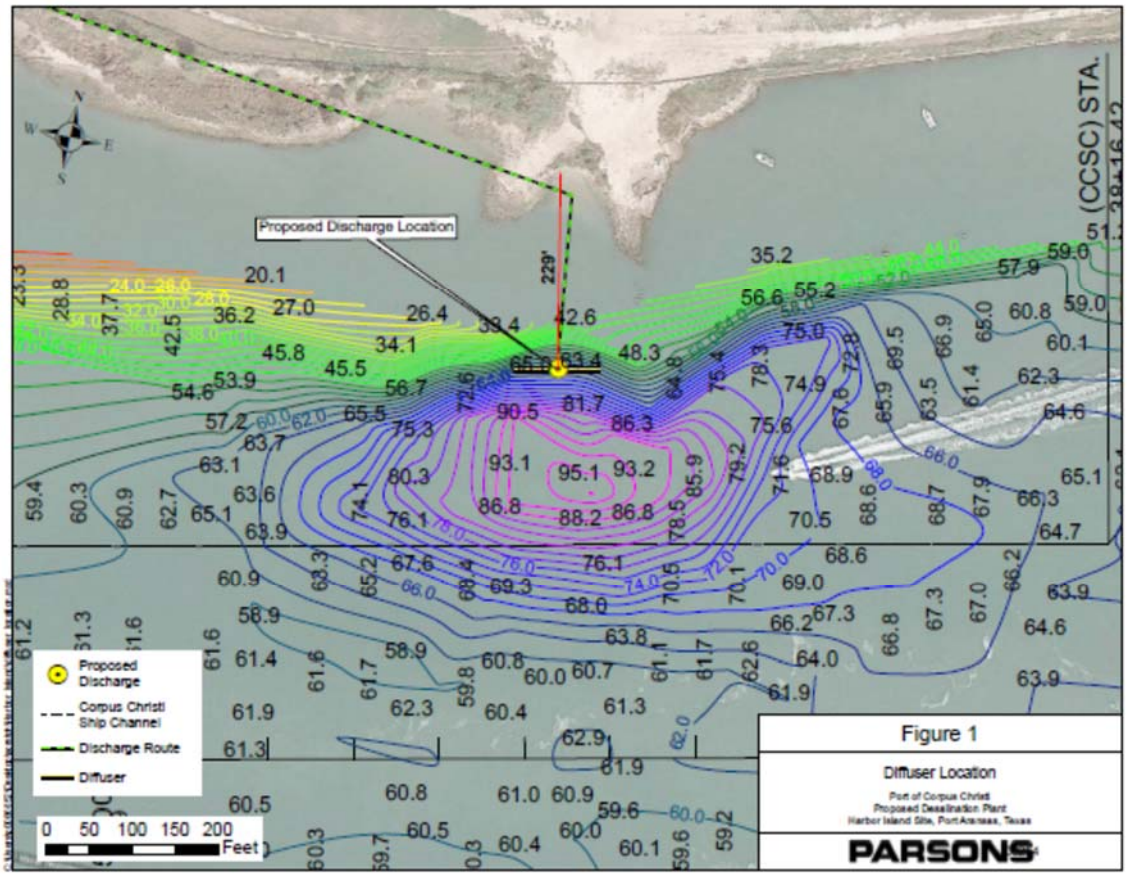
[109] Ex. AR-R 4 (Admin Record – Remand Tab I) at 231 (Section 4 Outfall/Disposal Method Information).

[110] Ex. AR-R 4 (Admin Record – Remand Tab I) at 245 (Figure 2).

[111] Ex. AR-R 4 (Admin Record – Remand Tab I) at 247-48.

[112] Ex. AR-R 4 (Admin Record – Remand Tab I) at 248 (Table 1).

[113] Ex. AR-R 4 (Admin Record – Remand Tab I) at 254 (Figure 1).



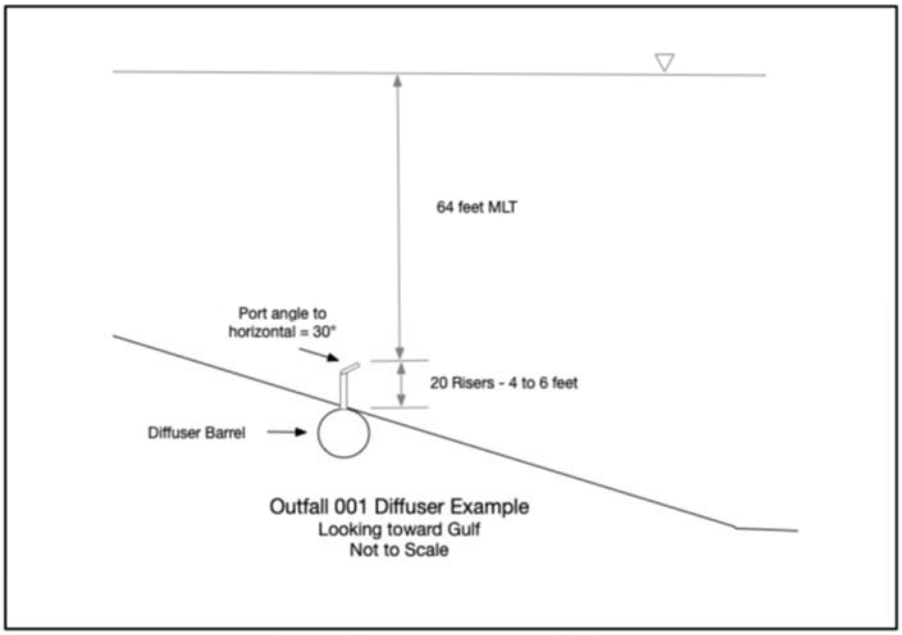
This inconsistency caused the ED to ask for clarification, and the Port responded:

> 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.[114]

On rebuttal, however, Dr. Tischler provided an exhibit[115] that shows the diffuser barrel buried beneath the side slope of the channel floor, north of the deep 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:

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

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



Thus, we have an Application contour map (Figure 1 above) showing 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 the discharge 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. In the face of this, the ED says there is "no legitimate dispute regarding the location of the outfall, the depth of the outfall, or the depth of the discharge." Really?

The Port argues the latitude and longitude of the outfall location in the Application is only needed for purposes of notice.[116] This is clearly wrong, as the ED's own witnesses have indicated that the outfall location is what drives the entire analysis of the impacts of the proposed discharge.[117] It is not simply for notice purposes, but rather for the entire environmental review of the proposed discharge. Even the Port seems to recognize this with its very next sentence in its closing brief: "Information regarding the depth of the channel at the discharge and the overall depth of the channel are needed for input to the CORMIX model."[118] Yet, how can one know the "depth of the channel at the discharge" if one does not have a precise discharge location? One can't. So, clearly the discharge location is necessary for the CORMIX modeling and the environmental analysis resulting from such modeling.

[116] Port's Closing Argument on Remand, at 45 (citing to the Original Proposal for Decision in this case).

[117] At the first hearing, TCEQ witness Shannon Gibson was asked about moving the location of the discharge. In response, she testified "I believe that would require a whole new application. I would need to double-check. But because our reviews are site specific, if they move the outfall, that would, basically, be going back to the beginning." Tr. Vol. 5 at 70:7-12.

[118] Port's Closing Argument on Remand, at 45.

The Port argues that "a few yards" difference in the discharge location will not make a difference in the modeling. But, there is no evidence in the record as to the specific distance the Port would move the diffuser, so it may be a few yards or it may be a 100 feet or more. Who knows? As it is now, the Port has represented the depth at the discharge location is 90 feet, but that depth does not occur until you reach approximately 60-70 feet from the location of the diffuser identified in the Application. This is not simply a typographical error like some of the inconsistences in the discharge location from the first hearing; this is the Port acknowledging that it does not have a precise location yet for the diffuser ports, which are the outfall.[119] There is no rule or standard that allows the Port to decide that later, nor a rule or standard that would set a reasonable distance in which the Port has discretion. As it is now, all we know with certainty is that the actual latitude and longitude for the outfall location specified in the Application cannot be relied on, by the Port's own admission.

As the evidence is clear, all of the modeling depends on the location of the diffuser. That is why PAC's experts were dumbfounded by the Port's data in the Application showing the discharge location literally resting on the bottom of the channel, according the bathymetry at the discharge point of 65 feet and the Port's representation that the discharge would occur 65 feet below the water surface. The representations in the Application matter. They must matter, because all of the analysis depends on them. The Port cannot have it both ways—it cannot ridicule PAC's modeling assumptions based on the Port's specifications in the amended application for the diffuser and the discharge location,[120] and then say "it doesn't make a difference." It does make a difference, as the Port has shown in trying to challenge PAC's experts' modeling based on the Port's own representations. And that is why the Port had to present rebuttal testimony backing away from those representations. But it cannot do so at this point in time, as it is bound by the representations in the Application. And the evidence shows those representations are not accurate. For these reasons, the Port has failed to satisfy its burden to prove that the Application, and representations contained therein, are complete and accurate.

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

A. Introduction.

The closing arguments by PAC make it clear that the modeling of the ED and the Port was not done with accurate inputs or with any evaluation of the local conditions that must be considered individually, because local conditions cannot be represented adequately in the CORMIX model. The

[119] Ex. APP-LT-1-R Rebuttal at 2:4-8.

[120] Ex. APP-LT-1-R Rebuttal at 1:13-15 (alleging PAC has "consistently misrepresented the location of the diffuser").

modeling and evaluation of the discharge by the ED and Port were not done with "careful consideration" of the interactions of the plume with the bank, and other local bathymetry to ensure the draft permit is protective of water quality, and the closing arguments of the ED and the Port did not provide any credible counter arguments. In fact, the Port did not even argue that the draft permit meets the specific water quality standards for salinity.

To protect water quality, a draft permit has to, at least, ensure that the specific state's water quality standards (WQS) are met. Those WQS include:

> (g) Salinity. . . (3) **Salinity gradients in estuaries must be maintained** to support attainable estuarine dependent aquatic life uses. . . . **Absence of numerical criteria must not preclude evaluations and regulatory actions based on estuarine salinity, and careful consideration must be given to all activities that may detrimentally affect salinity gradients**.[121]

It should be noted that the rule is "**in** estuaries" not "**of** estuaries." The WQS do not require ignoring changes in the salinity gradients in significant areas of estuaries, including the ship channel which is part of the estuary.[122]

The closing arguments of the Port do not even mention this section of the WQS. The Port also does not argue that there has been any "careful consideration" of the impacts of the brine discharge. The Port made one reference to salinity gradients, but that reference is based on the ED's antidegradation review.[123] And as discussed in PAC's arguments on the ED's antidegradation review, that review ignores the changes in gradients in the mixing zones and in the far field where the CORMIX model predicts concentrated salinity plumes on the bottom of the ship channel. It is the resulting salinity gradients (between the ambient water and the bottom plumes below) that the modeling for the ED, the Port, and PAC show are one of the reasons the permit must be denied.

The closing arguments of the ED do not mention Section 307.4 (g), although the ED's argument does claim "careful consideration"[124] and maintenance of salinity gradients.[125] However, the related arguments assume that the WQS require looking only at the large bay system, not in the mixing zones

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[121] 30 Tex. Admin. Code § 307.4.

[122] EPA's definition of an "estuary" is:

> a partially enclosed, coastal water body where freshwater from rivers and streams mixes with salt water from the ocean. Estuaries, and their surrounding lands, are places of transition from land to sea. **Although influenced by the tides, they are protected from the full force of ocean waves, winds and storms by land forms such as barrier islands or peninsulas.** https://www.epa.gov/nep/basic-information-about-estuaries.

[123] Port's Closing Argument on Remand, at 58.

[124] ED's Closing Argument on Remand, at 12.

[125] *Id*. at 10, 21, and 23.

or the ship channel. Moreover, the ED simply relies on the SUNTANS modeling, ignoring the salinity gradients that the CORMIX model shows in the near and far fields.

B. The SUNTANS Modeling

It is hard to believe that the Port or ED are still arguing that the SUNTANS modeling provides a reliable prediction that there will be no bottom plumes or significant changes in the salinity gradient **anywhere** in the far field. The Port's own witness, Dr. Jones, who has used the model, even disagrees.[126] And PAC's expert, Dr. Socolofsky, who is well-versed in SUNTANS and related models, has explained why Dr. Jones, he, and other PAC experts accept the CORMIX predictions of such plumes that change the salinity gradient in the far field at least a kilometer[127] from the discharge and why they reject the predictions from the SUNTANS model.[128]

First, in 2019, Dr. Furnans was told by the Port to assume that the Port's CORMIX modeling predicted almost complete mixing at the edge of the near field as the input for his modeling:

> The SUNTANS model assumes the discharge diffuser will produce a 1% increase in salinity relative to ambient conditions at 400' from the discharge as **per the modeling performed and detailed in the representative permit application**.[129]

Of course, once you set **as input for the maximum salinity at the start of the far field a 1% salinity increase over ambient**, then the predictions at greater distances from the SUNTANS modeling are set as well. The ED's statement that "the SUNTANS modeling performed by POCC indicates no more than 1 ppt increase in far field (edge of the mixing zone)" is therefore correct.[130] And it is true simply because of the assumed input of 1% salinity increase over ambient at the start of the far field. Thus, the Port's input assumption basically limited the output, i.e. the predictions of mixing the SUNTANS modeling can produce. The salts are not going to reconcentrate into a denser brine plume that existed before the model starts to allow for further mixing in the far field. The input that Dr. Furnans was told to assume was essentially set up to prevent concentrations greater than 1 ppt. That 1 ppt for the start of the far field was based on the predicted mixing with the CORMIX model in the original application,[131] which predicted less than 1% of the effluent would remain at both the ALMZ and

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[126] Remand Tr. Vol. 1 at 226:9-228:4.

[127] *Id.*

[128] Ex. PAC-51R at 17:1-8.

[129] Ex. APP-JF-13 at 1. The report also says, "We added a new algorithm to SUNTANS to represent the diffuser inflow using the design specification that it always mixes to 1% above ambient. . ."

[130] ED's Closing Argument on Remand, at 10.

[131] Ex. APP-JF-13 at 1.

HHMZ.[132] But now, the ED's modeling shows 8.9% of the effluent at the ALMZ and 5.15% at the HHMZ. That modeling shows the resulting changes in salinity up to 7% and 2.5 ppt or higher over ambient in the ALMZ and 4% and 1.4 at the HHMZ.[133] The CORMIX model also shows the far field begins where the bottom plumes begin which are within the HHMZ, and at times within the ALMZ.[134]

Yet, no new modeling with the SUNTANS model was performed.[135] Moreover, the percentage and concentration over ambient will actually be much higher than the predictions from the ED's modeling. Dr. Socolofsky's modeling with plume bank interaction results in increases of salinity of 28% and 11 ppt over ambient at the ALMZ and 16.95% and 6.88 ppt over ambient at the HHMZ.[136]

Yet, without a cite to any evidence in the record, the ED claims in closing arguments that the SUNTANS modeling "indicates that the salinity gradient of the estuaries will be maintained."[137] And maintaining the gradient is one of the applicable water quality standards (WQS) that the Port must meet.[138] The ED's leap to the conclusion of compliance with the WQS is clearly wrong.

The ambient gradient is clearly not maintained in the near field, in the mixing zones. It can go from 68 ppt in the effluent at the discharge ports to 42 ppt all the way to the boundary of the **HHMZ,** and that is when the ambient concentration is only 40.7.[139] And the ambient gradient is also clearly not maintained in the far field, since it starts as high as 7% over ambient,[140] not 1%, in the bottom plumes in the far field and remains in a bottom plume well over the concentrations in the ambient for a significant distance. The CORMIX modeling shows that such bottom plumes will result in the far field up to a mile from the discharge,[141] yet the Port and the ED ignore the CORMIX modeling results. Instead, they rely on Dr. Furnans' modeling report, which claims:

> SUNTANS modeling results indicate that within the vicinity of the Harbor Island discharge, vertical mixing of the water column is sufficient to prevent the formation of a persistent high salinity water layer along on the channel bottom.[142]

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[132] Administrative Record, Tab D, at S-Application 000367.

[133] Ex. Kings-Steves-21R, Rows 11, 19, and 20.

[134] Remand Tr. Vol. 9 at 2336:10-15.

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

[136] Ex. PAC-51R SS-5 in native Excel format, Row 89, Columns W and Q.

[137] ED's Closing Argument on Remand, at 10. Again, this misstates the rule, which requires maintenance of salinity gradients "in" estuaries.

[138] 30 Tex. Admin. Code § 307.4(g)(3).

[139] Ex. Kings-Steves-21R, Row 19.

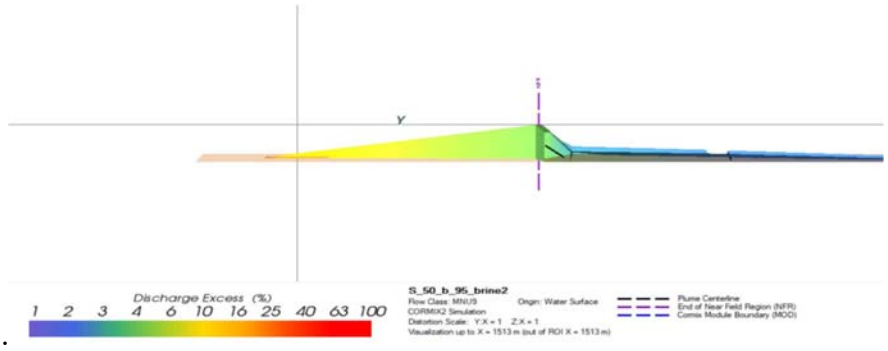
[140] Ex. Kings-Steves-21R, Column V, Row 20.

[141] Ex. PAC-51R at 16:1-23.

[142] Ex. APP-JF-13 at 2.

A "persistent high salinity water layer" is not defined, so it is difficult to know whether Dr. Furnans' modeling agrees with the CORMIX model. He may intend "persistent" to mean for a long period and far distances, but that is not clear. So, on its face, his statement conflicts directly with the CORMIX modeling. The modeling done for the ED, the Port, and PAC predicts salinity water layers on the bottom, density currents with concentrations significantly higher than ambient. The modeling predicts the bottom plumes, with significant salinity gradients above ambient, will form and **travel up to a mile** on the bottom of the channel.

The higher salinity in the plumes results in higher density, which is, of course, why the plumes collapse to form the stratified persistent layers for up to a mile on the bottom of the channel. That collapse starts in all cases before the farthest boundary, that of the HHMZ, and some conditions start within the ALMZ.[143] Then the bottom plume moves on the channel bottom at least up to a kilometer, if not a mile. An example of this plume collapse (or pancaking to the bottom) can be seen in the figure below, where the yellow and green plume in the near field collapses to the blue bottom plume in the far field after a short transition period. [144] All modeling by the ED, the Port, and PAC with the basic CORMIX model shows these same types of bottom plumes.



Dr. Socolofsky has worked extensively with the SUNTANS model and similar ones. He was involved with the initial use of the SUNTANS model in the only two places in Texas it has been used, the Galveston and Corpus Christi Bays.[145] In his opinion, the grid size used as the input for the model is too large to allow the model to predict the bottom plumes that the CORMIX model predicts in the ship channel. He testified:

> Because of the resolution used in the SUNTANS modeling, the formation and propagation of a dense plume of effluent on the channel bottom that, in my opinion will

[143] Remand Tr. Vol. 9 at 2336:10-15.

[144] Ex. PAC-49R TO-6 at 3. The collapsed plume is also shown on page 1 of this exhibit.

[145] Ex. PAC-51R at 35-39.

> occur, cannot be accurately evaluated. Such a density current is predicted by CORMIX . . . the predictions from the SUNTANS model provide no relevant information on mixing at the scale of the **channel width** near the discharge, including any areas within the mixing zones, **or in the region beyond the mixing zones and into the shipping channel.** . . .it is my opinion that the predictions in the area **from where the near field ends and a mile or so into the far field, there will be a density current moving along the bottom of the ship channel.**[146]

Just two of the grids used by Dr. Furnans not only span the entire channel, but they also include parts of Harbor and Mustang Island in those grids.[147] The plumes are smaller than the sides of the grids and they cannot be detected by the model because of the resolution set for the model.

The density currents predicted by the CORMIX model cannot be ignored nor can their impact on species living on the bottom of the channel. Yet the Port and the ED do ignore this, by relying solely on the SUNTANS model. The bottom plumes and related salinity gradients are not even discussed by Mr. Schaefer in his evaluation of impacts or degradation. And while the Port's counsel erroneously told the ALJs in his opening argument that the whole channel is dredged periodically to remove any life on the bottom,[148] it is only the official ship channel that is dredged, not the entire channel from Harbor Island to Mustang Island that has been called the ship channel here. Exhibit PAC-53R BW-4 shows the part of the full channel that is dredged, the official channel. It is just one half of the width of the entire channel. As much as half the channel is not dredged across from the outfall location and the areas not dredged have not had their benthic and other marine species living on or in it removed

The bottom plumes that CORMIX predicts, that the SUNTANS modeling cannot, clearly mean that the salinity gradient is not maintained by the mixing from the Port's proposed discharge out for a kilometer, if not a mile. As explained by PAC expert, Dr. Esbaugh, such plume would have significant impacts on bottom-dwelling species.[149] The Port and ED ignore that fact, providing no analysis of the impacts of these plumes.

C. The CORMIX Modeling

There are multiple reasons why the arguments of the ED and the Port on the CORMIX modeling are simply wrong, just like they are for the SUNTANS modeling. Their arguments are wrong for the following three key reasons for the CORMIX modeling:

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[146] Ex. PAC-51R at 16:1-23.

[147] Ex. APP-JF-13 at 11.

[148] Remand Tr. Vol. 1 at 26:9-27:19.

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

- Key inputs for the modeling were not accurate or appropriate; most importantly, the depth at the point of discharge and the DISTB.

- Neither the ED nor the Port did the analyses recommended by the CORMIX User Manual to determine if the plume interaction with the bank will affect mixing performance for the diffuser at the location.

- Neither the ED nor the Port evaluated whether their modeling is conservative or can be expected to provide reliable predictions given the local bathymetry, the cove and 95-foot hole, local flow conditions, the eddy or eddies, and other non-uniform flow conditions.

These three issues are covered thoroughly in PAC's closing arguments and will not be discussed in detail again here. The first issue is also discussed above under the discussion of Issue D.

It is important, however, to note that these same types of deficiencies in the modeling and evaluation by the ED and the Port also occurred in the first hearing. Then, as now, the Port and the ED used the wrong inputs for the CORMIX model. Then, it was the channel velocity for the critical conditions and the wrong depth of the channel at the location of the discharge. Now, it is again the wrong depth of the channel at the location of the discharge and the interaction of the dense falling plume with the bank in or on which the discharge ports are located.

Then, as now, the Port erred by not properly considering the impacts on mixing from local conditions, i.e., those conditions that cannot be evaluated by the CORMIX model. Then, it was the 90-foot hole and the eddy that created it. Even the Port's own witness admitted that the local eddy could trap and recirculate whatever caught in the eddy,[150] here the salinity and marine life caught in the plume. Now, it is again the impacts of an eddy, the hole, and the cove into which the discharge was moved.

And then, as now, the Port and ED argued they had the right inputs, yet the ED later admitted it did not in its exceptions to the PFD and its request for a remand. And they argued that the local conditions, namely the eddy, improved mixing. They made these arguments without the data or analysis to support their positions then, and now they make the unsupported arguments that the local conditions can just be ignored.

The ED and Port have no good responses to the positions of PAC's experts on the modeling, so the Port, with the support of the ED, instead does the following:

- attacks the PAC experts' credibility or claims the Port and the ED's experts are the true experts, when it is clear that PAC's experts have more experience and the detailed knowledge needed for the modeling here;

[150] Original Tr. Vol. 3 at 158:1-159:19.

- argues the modeling and evaluation of the local conditions by PAC's experts do not matter because the discharge can be moved anywhere, when PAC's experts were required to do their evaluation based on the site-specific conditions the Commission directed the Port to provide regarding its discharge location; and

- attempts to shift the burden of proof to Protestants on multiple issues, when it is the Port that has the burden of proof on remand, in light of the findings by the Commission of deficiencies on all issues remanded for additional evidence.

1. The Expertise and Credibility of the Modeling Witnesses

The ED states that "Ms. Cunningham is an expert in the CORMIX model and testified that she has reviewed 18 applications with diffusers that required a CORMIX evaluation and performed over 700 model runs."[151] She probably has done about a hundred of those runs for the two hearings on the Port's application. Presumably, Dr. Tischler has done many more diffuser evaluations and runs.

But running the model does not make one an expert. That was clear from the first hearing when Ms. Cunningham testified that she had reviewed 14 different diffusers and performed over 400 model runs.[152] Yet, the modeling of Mr. Trungale, PAC's expert on modeling at the time, *who had no prior experience with the CORMIX model*, was used to show Ms. Cunningham in her deposition that to find the critical conditions one needs to look at results at both the x- and y-axes, not assume the worst-case mixing only occurs at the x-axis.[153] And the Port learned then that its modeler had made the same mistake.[154] It was then, even before the preliminary hearing, that the ED reworked the draft permit to correct Ms. Cunningham's error.[155] Then Mr. Trungale showed both the ED and the Port that their modelers had made an even bigger mistake. They had assumed that the worst-case mixing conditions occurred when the velocities in the channel were near slack condition, at 0.05 meters per second (m/s).[156] Based on his sensitivity analysis for the full range of velocities in the channel, Mr. Trungale showed that the worst-case mixing was at the higher velocities, over 0.25 m/s.[157] Table 1 in PAC's closing arguments shows how wrong both the ED and the Port were in their initial modeling results.

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[151] ED's Closing Argument on Remand, at 16.

[152] Ex. ED-KC-1 at 5:19-24.

[153] Ex. PAC-13 at 50:24-52:22.

[154] Ex. PAC-21 at 69:11-16.

[155] Administrative Record, Tab F (2020 revised draft permit).

[156] Ex. PAC-2 at 12:23-13:5 and 16:17-26.

[157] *Id.*

Mr. Trungale proved that the right input velocity was not 0.05 m/s, but 5 or 10 times that velocity,[158] and both the ED and the Port acknowledged that Mr. Trungale was correct.[159]

And there is no evidence that Ms. Cunningham **or** Dr. Tischler understand how the CORMIX model works and why the model needs to be run with different modules and a range of conditions. There is no evidence that Ms. Cunningham **or** Dr. Tischler has 1) studied the inner workings and experiments used to develop the model or any of its modules, 2) developed his or her own CORMIX type models, or 3) followed the guidance of the CORMIX User Manual to determine how the model should be set up for discharges sitting on a sloping bottom (as here).

Dr. Socolofsky has done all of these and more. He took a post-doctoral position with Professor Gerhard Jirka who led the development of the CORMIX model for EPA.[160] And while that work was ongoing, Dr. Socolofsky worked with Dr. Doneker, the current owner of MIXZON, the distributer of the CORMIX model. At that time, Dr. Doneker was developing some of the internal hydraulics and brine modules for the CORMIX model.[161] Moreover, Dr. Socolofsky has developed his own models to study plumes in the marine environment. One of those models is based on an inner core module of CORMIX, the CorJet, which is the component of the models that predicts the buoyant dynamics of entrainment and dilution of a discharge in the marine environment.[162] And in his testimony, Dr. Socolofsky points to many places in the CORMIX User Manual that provide the basis for his determination of the proper schematization and accurate inputs for the modeling of the proposed diffuser and at the proposed discharge location.

Mr. Osting also has past CORMIX experience, and even took a multi-day refresher course with MIXZON at the very time he was working on his modeling for this case.[163] He independently used a modeling approach similar to Dr. Socolofsky's. His qualifications to properly set up and run the CORMIX model have not seriously been challenged, and he was not even cross examined by the Port.

There should be no question which modeling experts the ALJs and the Commission should rely upon. Ms. Cunningham is clearly still learning the details of the model, and she apparently had to rely on information provided by the Port and modeling recommendations by Dr. Tischler, including, incorrectly, his interpretation of the input for the DISTB as 229 feet, his claim that the discharge was

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[158] *Id.*

[159] Orig. Tr. Vol 6 at 37:8-38:7, Ex. APP LT-1 at 36:4-11.

[160] Ex. PAC-51R at 17:15-20.

[161] Ex. PAC-51R at 18:1-16.

[162] Ex. PAC-51R at 18:17-22.

[163] Ex. PAC-49R at 6:11-15.

effectively at a 90-foot depth, and his argument that the brine module in CORMIX is not appropriate to use for this amended application.

And Dr. Tischler's testimony should be viewed skeptically. Remember, at the first hearing, Dr. Tischler only admitted during cross-examination, and clearly reluctantly, that the Port's proposed diffuser in the original application could not meet the limits for the percent of effluent at the ZID in the draft permit. [164] Yet, he was well aware of that when the ED changed the draft permit three months before he testified in July 2020. And he was well aware of the results of Mr. Trungale's sensitivity analysis on channel velocities when Mr. Trungale's prefiled testimony was filed in September. The Port had to know from Dr. Tischler well before the hearing that the mixing by its diffuser at the proposed discharge location would not comply with the draft permit. Yet, it did nothing. And it likely would never have admitted this problem, had Mr. Wayne for OPIC not forced Dr. Tischler to do so on cross-examination in the original hearing.[165]

In fact, in hindsight, it is clear that Dr. Tischler tried to dance around this problem in his direct testimony prior to the original hearing. He stated in his prefiled testimony that the Port could make "refinements to the design" of the Port's diffuser after the permit was issued. He followed that testimony with a presentation of a completely new diffuser design, as proof that the design in the application could be "modified" and meet the permit limit on the percentage of effluent at the ZID boundary.[166] He presented the results of the modeling for his whole new diffuser. He did show that his CORMIX modeling predicted 14.8% of the effluent remaining at the ZID, as compared to the 18.4% in the permit.[167] However, he had to also admit that, for the other boundaries, his new diffuser resulted in higher effluent levels than those predicted by the ED, 9.79%, rather than the ED's critical conditions of 1.34% at the ALMZ, and 6.79%, rather than the critical conditions of 1.20% at the HHMZ. With such "refinements" to the diffuser design, he argued that the Port had proven that the permit should be issued, as if the mixing in the mixing zone and human health zone do not matter. Interestingly, that diffuser design would have resulted in 3.71 ppt and 9.2 % salinity concentration over ambient.[168]

He added other unbelievable testimony in the first proceeding. He testified that Dr. Wallace's antidegradation review was valid and proved the diffuser in the application, the one that he knew could

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[164] Dr. Tischler stated that the Port "may have difficulty meeting the 18.5 [sic] percent in the ZID, unless they make revisions to the [diffuser] design. . . . They may not meet it. . . . Under the condition of high flow rates, the modeling would suggest that they couldn't meet it." Orig. Tr. Vol. 3 at 264:20-265:3.

[165] *Id.*

[166] Ex. APP-LT-1 at 35:26-30, 36:4-11.

[167] Ex. APP-LT-9.

[168] *Id.*

not come close to complying with the permit limit on mixing at the ZID, would meet the antidegradation requirements.[169] And with no showing of biological expertise—certainly none related to salinity toxicity for any aquatic life or other living organism—he was willing to give the following opinion:

> The discharge from the Proposed Facility if in compliance with the Draft Permit will not adversely affect: i) the marine environment, aquatic life, wildlife, including birds and endangered or threatened species, spawning eggs and larval migration; ii) fish and other seafood; iii) human consumption of fish and other seafood; and iv) recreational activities, commercial fishing, fisheries in Corpus Christi Bay and the ship channel.[170]

Now in his prefiled testimony in this remand proceeding, he wastes everyone's time arguing that PAC's experts intentionally distorted their drawings of the area of the discharge to mislead the ALJs to believe that the slope of the hole is steep.[171] The Port's closing arguments also discuss this absurd criticism.[172] Yet, the supposedly misleading figures that PAC experts presented were based on a nearly identical graphic the Port used in its application to show the same thing PAC was showing—the bathymetry near the diffuser and the slope of the channel.[173] Mr. Wiland, for example, used the same scales. He simply added his information on the 90-foot hole to the Port's figure in the original hearing to show the comparison.[174] And he does so again, with the same scales for his figures in this hearing to help compare what the Port had presented as the channel bottom profile and what the new 95-foot deep bathymetry shows now.[175] Mr. Wiland even provided a drawing with the same scales on the x- and y- axes so there could be no confusion as to the slope of the channel.[176] Still when he used the Port's scaling for the cross section and other PAC's witnesses used similar scales and showed those scales clearly on their figures, Dr. Tischler argued on rebuttal they were being dishonest and essentially lying to the ALJs about the slope.[177] Given Dr. Tischler's willingness to provide such an outrageous opinion, his credibility should be seen for what it is. He will say what the Port wants him to say, or at least provide opinions that he knows to be wrong, incomplete, or misleading.

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[169] Ex. APP-LT-1 at 31:22-32:14.

[170] Ex. APP-LT-1 at 23:17-22.

[171] Ex. APP-LT-1-R Rebuttal at 4.

[172] Port's Closing Argument on Remand, at 53-54.

[173] *See* Administrative Record, Tab D, at S-Application 000354 (Port's Figure 3).

[174] Ex. PAC-3 BW-5.

[175] Ex. PAC-53R at 16:19-17:3; Ex. PAC-53R BW-4.

[176] Ex. PAC-53R BW-5.

[177] Ex. APP-LT-1-R Rebuttal at 4.

The Port and the ED also lose credibility claiming that the brine module (DHYDRO) in the CORMIX model is not appropriate to use now. Both Ms. Cunningham,[178] and the Port, [179] as well as PAC's expert, used the brine module for the CORMIX modeling they relied on in the first hearing. Yet now, the Port and the ED say it shouldn't be used—even though the two discharge locations are only 70 feet away from each other! And, the results of the brine module for the diffuser in the amended application at the mixing zone boundaries are worse than the results for the modeling done by the ED with the standard CORMIX 2 module.

Dr. Tischler said in his memo to Ms. Garza in the amended application, "the brine module limitations on the slope of the near shore bank did not permit its application to this location and diffuser design because the side slope of the channel is **too steep**."[180] But, of course, he does not explain how steep is too steep. And despite also using the brine module for the discharge in the original hearing, Ms. Cunningham testified in this hearing that the "brine option in CORMIX is more suitable for an offshore discharge scenario." [181] She then admitted:

> . . . the CORMIX model **does recommend that the user run the brine option for any discharge that has a greater density than any of the water body's density**. It's a default statement that CORMIX will provide.[182]

And, on cross, she appears to forget temporarily that she used the brine option for her modeling for the **near field mixing** in the initial hearing:

> Q. . . . it recommends you do run the brine model for, you know, at least to see what you can learn from that when you're trying to evaluate how well the model shows the mixing, correct?
>
> A. It does, but I believe it's specifically for the mixing **in the far field.**[183]

Here is what the CORMIX User Manual says:

> CORMIX contains four core hydrodynamic simulation models and two post-processor simulation models. The simulation models are:
> . . .
> 2. Simulation models for submerged multiport diffusers (CORMIX2).

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[178] Remand Tr. Vol. 9 at 2337:5-8.

[179] The Port's original application said, "CORMIX analysis for brine discharge requires" and described the set up for the brine option, inputs with slopes for the channel bottom. Administrative Record, Tab D, at S-Application 000353.

[180] Ex. APP-LT-5-R at 4, fn 4.

[181] Remand Tr. Vol. 9 at 2334:16-18.

[182] Remand Tr. Vol. 9 at 2334:25-2335:3. (Emphasis added).

[183] *Id*.

> 4. Simulation models for **dense brine . . .discharges from single port, submerged multiport**, . . . in laterally unbounded coastal environments (DHYDRO).
>
> DHYDRO is for brine and/or sediment discharges from single port, multiport diffusers, . . . in laterally unbounded coastal environments with sloping bottoms.[184]

Here, all modeling assumed unbounded conditions. There is a sloping bottom. Ms. Cunningham agreed there is nothing in the CORMIX User Manual to suggest the brine module is limited to offshore discharges.[185] PAC's experts followed the Manual's directions and ran the brine module, with results showing worse mixing (7% higher effluent at the mixing zones) than in the CORMIX 2 modeling, the option used for all other modeling by the ED, Port, and PAC.[186] With the ED's modeling showing 2.5 ppt and 7% salinity concentration over ambient, any worse mixing puts marine life at greater risk.

In any case, the willingness of Dr. Tischler and Ms. Cunningham to say the brine module is not appropriate here, when the ED and the Port used it for the modeling in the first hearing, show either lack of credibility or their lack of expertise in using CORMIX. There are many more examples of why the ALJs should disregard the opinions of Dr. Tischler and Ms. Cunningham on the issue of accurate inputs and proper modeling, some of which are discussed below.

2. The Port May Not Move the Point of Discharge.

The most significant of Dr. Tischler's opinions that must be ignored is his opinion expressed in his rebuttal testimony that the discharge location can be moved[187]—this after all parties have modeled the discharge at the specific location in the amended application. He argues that once the permit is issued, the Port is allowed to move the location anywhere needed for the Port's desired diffuser design.[188] Neither he nor the Port provides alternative locations or puts any limits on the distance the discharge can be moved. Why the discharge location can be moved is not explained or legally justified by Dr. Tischler in his testimony or by the Port in its closing arguments.[189]

Given that the application puts the discharge ports on (if not in) the sloping bank, the Port would have to move the discharge (diffuser barrel, risers, and ports) considerably closer to the original location

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[184] Ex. ED-5 Remand at 0029, 0049.

[185] Remand Tr. Vol. 9 at 2335:23-24.

[186] Ex. PAC-49R at 16:1-10; Ex. PAC-51R at 21:1-22:12.

[187] Ex APP-LT-1-R at 2:10-24 and 3:4-6.

[188] *Id.*

[189] This position is really egregious considering (1) no new modeling would be done for the new location; and (2) the Draft Permit does not contain any requirement that the Port prove the actual diffuser performance matches the predicted mixing from CORMIX. The testing required by the Draft Permit is end of pipe only.

to even get close to having room for 4 or 6-foot risers, the only ones that Dr. Tischler presents as options.[190] And, if either of those riser heights is used, the dense, heavy plume will still fall and attach or interact with the sides of the cove, thus reducing the mixing further.[191]

The ED's argument does not address the claim that the outfall can be moved. OPIC does address the issue and agrees with PAC that the latitude and longitude in the application set the discharge location.[192] In fact, if the discharge location is moved, there would be no modeling and no evaluation of the local conditions at the new site as well as none of the site-specific data required by the Commissioners as the basis for their remand order. The Port's argument that the modeling done by PAC or the ED shows the discharge can be moved is clearly wrong.[193] The ED used inaccurate inputs. The sensitivity analysis done by PAC's witnesses was for the specific location, one with the discharge on the bank, with the vertical wall moved to the north. As PAC's closing arguments explain, the right of the Port to move the discharge location clearly prejudices the requirement for due process for public participation. Such would violate state law.

As Dr. Socolofsky's testimony shows, the local conditions—be they the relationship of the discharge to the bank, to the cove, to the 95-foot hole, and to other depressions or irregularities in the bathymetry—would have to be either included as part of the inputs for the modeling of a new location or included in the evaluation of whether the modeling results are conservative or reliable at the mixing zone boundaries.[194] In fact, if it were true that the Port could move the discharge and, as the Port claimed in the first hearing, design a whole new diffuser, both after the permit is issued, the final decision would simply be a minor amendment to the permit or modification where there could be no meaningful input from EPA, other state agencies, local governments, or the public. Here, even a 70-foot move of the discharge onto the channel bottom and in a cove, with much worse mixing shown by CORMIX at the ALMZ and HHMZ than for the original or revised draft permits, did not trigger the ED to find a major amendment or even allow TPWD, the City of Port Aransas, or others who had commented on the original application the chance to supplement or revise their comments.

Moreover, because the Port has now admitted it needs to move the discharge, it is essentially admitting, as it did in the initial hearing, that its diffuser design cannot meet the limitations in the permit or comply with its representations in its application that are incorporated into any permit that is issued.

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[190] Ex. APP-LT-16-R Rebuttal.

[191] Ex. PAC-49R at 13:12-22 and 15:1-19.

[192] OPIC's Closing Argument on Remand, at 21-22.

[193] *See* PAC's Closing Argument on Remand, at 29-32.

[194] Ex. PAC-51R at 9:6-9 and 15:5-16.

3. The Port Has Not Meet its Burden of Proof.

The Port and the ED failed to use accurate inputs, set up the schematization correctly, or evaluate the local conditions that negatively affect the mixing of the effluent. Their modeling experts are not credible. The SUNTANS modeling is meaningless in the ship channel. All of this means:

- the Port has not met its burden of proof on Issue G, and
- the Port has not met its burden of proof to show its discharge will comply with the WQS.

The Port and ED do not really address most of these issues in their closing arguments. Instead, they argue PAC's experts are attempting to mislead the ALJs and they attempt to shift the burden of proof. They misrepresent the positions of PAC and its experts. The Port argues, "Protestants have not presented any evidence that the TCEQ and the Port Authority have failed to comply with the rules applicable to the use of the CORMIX model for the discharge."[195] PAC does not have to present any evidence, but, of course, it did so extensively anyway. PAC could have simply relied on the CORMIX User Manual, which both the Port and ED put into their evidence. Neither the Port nor the ED complied with its guidance, such as the proper evaluation of the DISTB, as discussed in PAC's initial closing arguments on remand. The ED also says:

> While the Protestants offered testimony critical of the model's limitations, they failed to offer any evidence showing that the TCEQ could have used alternative models to evaluate the diffuser.[196]

Protestants do not have the burden to present alternative models, even if they knew of one. **But no Protestant is arguing there is a better model to use than CORMIX**.

Rather, PAC argues that the model must be used with "careful consideration" of the local conditions. A different model is not needed if the CORMIX model is used consistent with its User Manual, which includes the use of professional judgment.[197] Expertise on plume flows and interaction with barriers is what is needed here, in addition to the results from the model. The ED uses this approach for other issues. In its closing argument, the ED acknowledges that when it does not have a clear answer from its modeling or from the application, it has to rely on such expertise and judgment:

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[195] Port's Closing Argument on Remand, at 47.

[196] ED's Closing Argument on Remand, at 16.

[197] Ex. ED-5 Remand at 0072. Where, for example, the Manual states: "For highly irregular cross-sections, it may require more judgment and perhaps several iterations of the analysis to get a better grasp on the sensitivity of the results to the assumed cross-sectional shape.

> Ms. Gibson described that she used Best Professional Judgement and the requirements in 30 TAC § 307.9(a), (b), and (c) to justify including reporting limits for total suspended solids, total dissolved solids, chloride, and sulfate.[198]

PAC's experts have made their position clear from the start of this process. It is not what Dr. Tischler takes three pages to claim. He claims that PAC's experts say that CORMIX cannot be relied upon at all in this case.[199] But it is clear from their testimony that their position actually is:

- The CORMIX model should be used.
- The model can accurately predict what happens to and in the plume until it contacts a boundary—the bank, the side of the cove, or the side of the 95-foot hole.
- The model should be used to evaluate the likelihood of bottom plumes, the extent of their travel, and the potential salinity concentrations in those plumes in the far field.
- The results of the modeling after the plume interacts with a boundary have to be evaluated in light of the local conditions, a point that Dr. Jones has argued in his prior work.[200]

The last point goes to the requirement of careful consideration of the causes of changes in salinity gradients. It means considering the changes in salinity concentrations, gradients, and total concentrations, not just the % of effluent at the mixing zone boundaries predicted by the model.

There is no basis to ignore the local conditions just because the model cannot consider those conditions. There is no basis to ignore local conditions just because those conditions are difficult to evaluate, or because the analysis might show worse mixing predictions. Yet that is what the Port and the ED have done. Their modeling is not reliable nor accurate for predicting the potential harm from the proposed discharge.

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

The experience of the witness does not establish, itself, a fact. The ED's closing argument touts the experience of the ED's staff 10 times in the first three pages. It bears remembering that "it is the basis of the witness's opinion, and not the witness's qualifications or his bare opinions alone, that can settle an issue as a matter of law; a claim will not stand or fall on the mere *ipse dixit* of a credentialed witness."[201] Years of expertise and many reviewed permit applications do not compensate for fact-finding that is not reasoned or is arbitrary. And, as discussed above and in PAC's initial closing

[198] ED's Closing Argument on Remand, at 25.

[199] Ex. APP-LT-1-R at 52:1-23.

[200] Remand Tr. Vol. 1 at 201:14-202:7.

[201] *Burrow v. Arce*, 997 S.W.2d 229, 235 (Tex. 1999).

arguments on remand, the ED's witnesses have made many mistakes and demonstrated a lack of knowledge on fundamental issues throughout this proceeding.

The Furnans Mass Flux of Salt Analysis. Among the arguments presented in the ED's closing argument on remand[202] to support the ED's antidegradation analyses is the Furnans' "mass flux of salt analysis."[203] This analysis was cited by Mr. Schaefer in his direct testimony as producing a fact ("at the most extreme conditions, the mass of total salt would increase by less than 1% at the diffuser location") he weighed in his weight-of-evidence antidegradation decision.[204] He had previously cited this purported fact in his Water Quality Standards worksheet as influencing his antidegradation decision.[205]

This particular piece of purported evidence does not logically inform an antidegradation analysis. It was never intended by Dr. Furnans to do so. He undertook the analysis "so as to provide a means of validating the conclusions from the SUNTANS modeling, namely that the brine discharge is not likely to cause a large, cumulative increase in salinity levels within the Corpus Christi Ship Channel."[206] He was not analyzing impacts at or near the aquatic life mixing zone, which is the focus of Mr. Schaefer's antidegradation analysis.

Moreover, Dr. Furnans' analysis, whether for his initial direct testimony or as modified for his remand direct testimony,[207] actually provides almost no information germane to the antidegradation analysis. **First, his analysis is fatally flawed by a math error**. Specifically, there is a factor of 10 error in his conversion from millions of gallons/day to cubic meters/day of discharge through the diffuser. The volume of 95.6 MGD is 361,781 meters^3/day, not the 36,219 meters^3/day that Dr. Furnans calculated.[208] Correcting this error results in a ten-fold increase in the flow from the diffuser, compared to the flow Dr. Furnans' calculations assumed.

Second, his calculation of the mass of ambient salt to which the mass of diffuser discharge salt is compared includes ambient salt that is miles from the discharge point. His "model" for calculating

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[202] ED's Closing Argument on Remand, at 23.

[203] Ex. APP-JF-1 at 21:23-23:25, and Ex. APP-JF-14.

[204] Ex. ED-PS-1 Remand, at 26:24-29.

[205] Ex. AR-R 5, (Admin Record – Remand Tab J), at 105.

[206] Ex. APP-JF-1 at 23:5-8.

[207] In his remand testimony, Dr. Furnans enlarged the cross-section area he assumed for the ship channel and dropped the assumed salinity of the discharge by 10 ppt. Ex. APP-JF-3R, red notations.

[208] This mistake is made in both the calculations for the initial testimony and for the remand testimony. *See* Exs. APP-JF-14 at 2, and APP-JF-3R at 2. Dr. Furnans' calculations equate 1 cubic meter to 2639.6 gallons, i.e., per the exhibits, 95,600,000 gallons = 36,219 cubic meters, so 1 cubic meter = 2639.5 gallons. Actually, per TCEQ guidance, RG-415 (*Surface Water Quality Monitoring Procedures*, Appendix C, Conversion Table), 1 cubic meter is 263.2 gallons. *Also see*, https://www.inchcalculator.com/convert/cubic-meter-to-gallon/.

the ratio of these two salt loads envisions a long box of ambient ship channel water that is 40 feet deep by 1200 feet wide by various feet long, the length depending on the velocity of the water in the channel; then, he calculates the weight of that much water and derives its salt's weight by saying "X" ppt of the total weight is salt.[209] (His remand direct testimony assumes a different, larger than 40'x1200' cross section for east and west ends of the box. That creates a fatter box, which increases the amount of ambient-water salt, but the criticisms presented here remain valid.)

So, for example, if one believed the average channel water velocity for the day to be 0.1 meters/second, then in one day a drop of water would move according to the following equation: (0.1 meters/sec) x (60 sec/min) x (60 min/hr) x (24 hr/day) = 8,640 meters/day or roughly 28,339 feet/day or 5.47 miles/day. If one believed the average channel water velocity for a day to be 0.8 meters/second, the imaginary box would be 8 times as long or, roughly, 42.9 miles long. All the drops of water in the box contribute salt to the total ambient salt that is the denominator of Dr. Furnans' ratios, and most of the drops are nowhere near the discharge point.[210] This makes his calculations unreliable, especially for the ED's antidegradation review.

Finally, there is the issue that the water velocities and directions in the channel are nowhere near uniform, making the average velocity numbers Dr. Furnans' model uses both unhelpful and unrealistic. Dr. Furnans' model relies on average flow rates through the end of the box, e.g., through the 40'x1200' side of the box (or, on remand, the side of the box that is 6,146 square meters[211]). Figure 1 below[212] shows the distribution of water velocities on June 8, 2021, in the ship channel along the transect running through the discharge point. (Harbor Island is to the left; the red arrow is roughly the discharge point; the colors represent water velocities; green is 2-3 times the speed of blue.) Clearly, the water velocities are not uniformly distributed. An average velocity will not accurately reflect how slowly water near the discharge point or along either shore moves, and slow-moving water means less ambient salt passing by.

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[209] "The mass flux of salt flowing through the channel is then calculated as the product of the rectangular ship channel area, a selected water velocity, and a selected ambient salinity concentration." Ex. APP-JF-1 at 22:11-13.

[210] Actually, the box is only about half as long as the distance a drop of water would travel in a day, because the ambient water reverses its direction of flow when the tide changes. Conceptually, at tide change, a new box is formed running from the diffuser in the direction of the new tide. The two boxes, together, contain the kilograms of ambient salt reflected in the upper table of Ex. APP-JF-14 at 2, because each molecule of salt is counted twice – once as it passes in towards the Bay and once as it passes out towards the Gulf.

[211] Ex. APP-JF-3R at 1, note 2.

[212] Ex. PAC-44R BA-3.

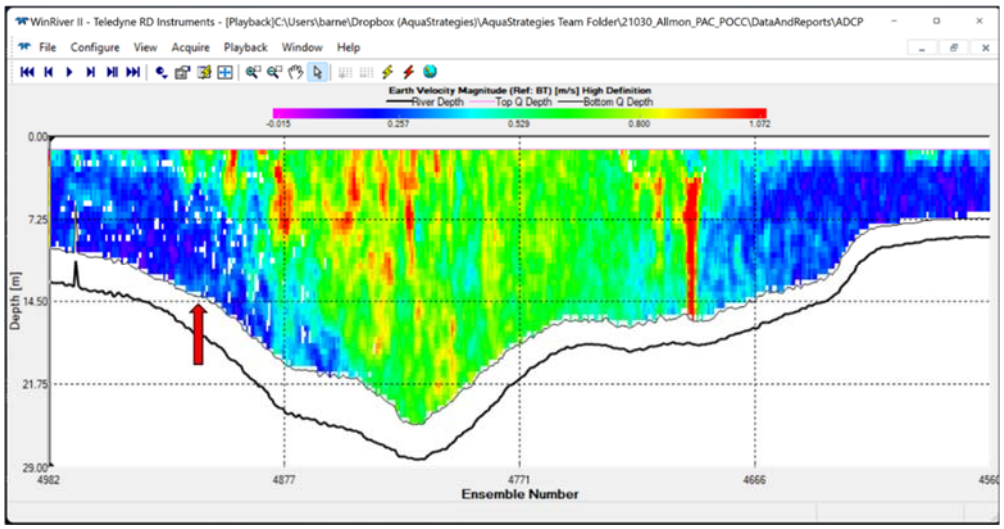

Figure 1

Figure 2 below[213] shows the non-uniformity of the directions of flow measured along the same transect on the same day. In the area of the discharge (pink and blue colors), the water flows southeast, while most of the water in the channel (shades of green) flows southwest or just west. Dr. Furnans' model does not account for any variation in the direction of flows, which clearly are not all parallel to the main channel tidal flows.

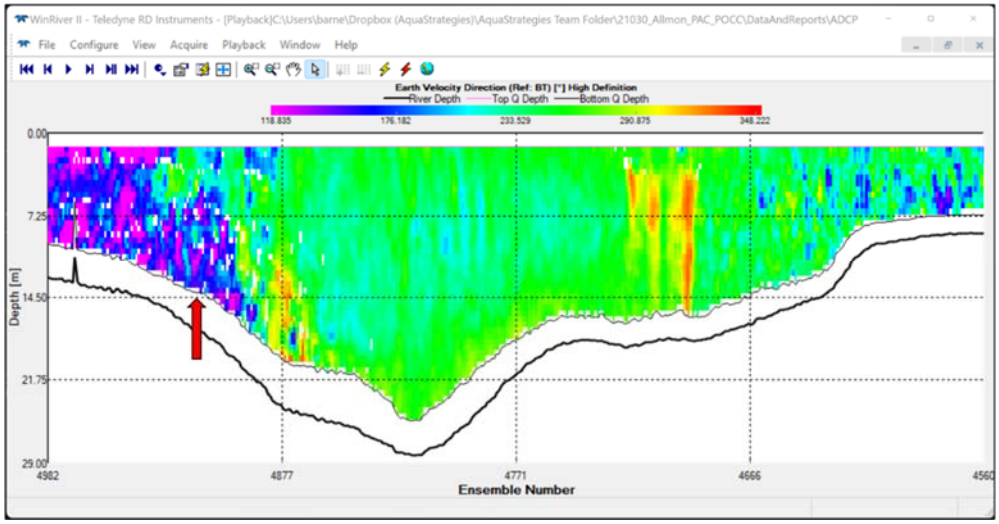

Figure 2

In light of these different considerations, it is clear that Dr. Furnans' "mass flux of salt" modeling, though cited frequently by Mr. Schaefer, is not credible. The modeling badly understates the mass load attributable to the diffuser discharge, it employs an analogy to a very long box of channel water that has no manifestation in the actual geography of the channel, it either ignores the fact of tide

[213] Ex. PAC-44R BA-4.

change or it requires double-counting of salt molecules (as they are carried back and forth in the reversing tidal flows), and it assumes that average water velocity in the channel or bay is knowable, uniform, and is informative of the impacts of the diffuser discharge, but it is not.

Biased inputs to the weight-of-evidence antidegradation decision. In closing argument, counsel for the ED states that Mr. Schaefer considered Protestants' testimonies in developing his antidegradation decision; record confirmation of counsel's statement is sparse. Mr. Schaefer testified, without explanation, that Protestants' testimonies did not alter his antidegradation decision. Mostly, he testified that "there is sufficient information available, including information provided by the applicant, to inform my antidegradation review. Unless the information provided by POCC was not accurate, the information provided by PAC did not change the outcome of my antidegradation review."[214] At note 83 of the ED's closing argument, there is a long, long string of citations to Mr. Schaefer's alleged consideration in his antidegradation review of evidence presented by not only the agency staff and the Port but, also, by the Protestants. However, on reviewing that string of citations, one sees that he considered Mr. Michalk's D.O. analysis, Ms. Gibson's TexToc work, Dr. Furnans' salt mass flux and SUNTANS work (alleged to show no salt layer accumulating in the far field), the Port's CORMIX modeling, and the Port's WET testing.[215] With the exception of Dr. Nielsen's work, Mr. Schaefer does not identify any consideration of particular evidence presented by Protestants' witnesses.

As to Dr. Nielsen's evidence, he criticized it as having been arrived at by "unclear" means.[216] He rejected her evidence of harm to early-life-stage red drum at a 2 ppt salinity increase with the logically unrelated observation that the Port's CORMIX modeling indicated 35 ppt or less at the edge of the aquatic life mixing zone and that some of Dr. Nielsen's information "was not directly translatable into TCEQ's regulatory definition of significant toxicity."[217] So, in the end, he did not acknowledge considering any of her work in his supposed weight-of-evidence antidegradation finding.

The real truth about the agency's actual use of evidence brought to it by Protestants is that none of it was used because, despite his prefiled testimony, Mr. Schaefer testified at hearing he gave no value to any of it:

> 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?

[214] Ex. ED-PS-1 at 9:19-33.

[215] Ex. ED-PS-1 at 25:33-27:31.

[216] Ex. ED-PS-1 at 37:3-9.

[217] Ex. ED-PS-1 at 36:28-33.

A. That's right. I'm just -- I'm going with the information from sources that I -- that I know well.[218]

So, despite the ED's assertions to the contrary, Mr. Schaefer did not give any fair consideration to the testimony and supporting data from 10 eminently qualified experts, simply because Mr. Schaefer apparently didn't know them well. Hardly a fair and objective review.

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

Both the Port and the ED argue that the Draft Permit contains all necessary and appropriate requirements, and in support thereof, cite to their own witnesses' review of the Application and the Draft Permit.[219] It is worth remembering that these same witnesses, Dr. Tischler and Mr. Palachek (on behalf of the Port) and Ms. Gibson (on behalf of the ED), are the same witnesses who said the last Draft Permit contained all necessary and appropriate requirements.[220]

Prior to the initial hearing, the Draft Permit included a requirement that the diffuser at the outfall be maintained to achieve a maximum effluent percentage of 1.95% at the ZID boundary.[221] PAC, however, discovered a major modeling error that had escaped both the Port and the ED. After PAC pointed out the error, the ED simply changed the maximum effluent percentage at the ZID to 18.4% – an almost 10-fold increase of the amount of brine at the ZID from the previous limit.[222] The ALJs concluded that the effluent limits in the original Draft Permit were not based on what is protective of the marine environment, but simply based on the outputs of the CORMIX model.[223] Both the ED and the Port argued that those limits were appropriate and protective of the marine environment.

In the initial hearing, the ALJs also concluded that both the Port and ED used incorrect modeling inputs, including the incorrect depth of the channel at the discharge location, incorrect bathymetric information, and incorrect current velocities,[224] and recommended denial, in part, on the incorrect inputs used in the Port's and ED's modeling. The effluent limits in the original Draft Permit were not based on what is protective of the environment, but to make matters worse, the non-protective limits that the Port and ED proposed were not even based on correct modeling inputs. Both the ED and the

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

[219] Port's Closing Argument on Remand, at 59-60; ED's Closing Argument on Remand, at 24-27.

[220] Port's Closing Argument for Initial Hearing, at 61; ED's Closing Argument for Initial Hearing, at 16-17.

[221] Initial PFD at 14-15, 56.

[222] Initial PFD at 14-15, 56.

[223] Initial PFD at 66.

[224] Initial PFD at 30-32.

Port continued to argue that modeling was conducted using appropriate inputs until after the ALJs issued the PFD.[225]

Having been given a second chance to provide an accurate Application and to develop a Draft Permit, the Applicant has again failed to provide accurate information and the resulting Draft Permit again fails to include all of the necessary and appropriate requirements. Despite the fact that salinity is the constituent of most concern in the proposed discharge, the Draft Permit contains no limit whatsoever for salinity.[226] The ED's witness, Mr. Schaefer, agreed that a salinity limit would actually be more protective.[227] Instead of setting an effluent percentage limit based purely on what CORMIX predicts will occur, the Draft Permit should include a salinity limit of 2 ppt or 5% above ambient salinity levels. This would be consistent with the TPWD/GLO recommendations[228] and the salinity limits recommended by the California State Water Resources Control Board.[229] In fact, the Port's expert witness, Dr. Knott, agreed that a limit in the range of 2-3 ppt at 100 meters would be "protective."[230] Dr. Knott has, however, suggested that we should not be so conservative and that TCEQ should throw caution to the wind and seek a less conservative limit[231] on this first of its kind discharge into a spawning area and migratory route for sensitive fish and crustacean larva. But, to be clear, even if such limit were included in the Draft Permit, the evidence does not demonstrate the discharge will meet it. PAC simply points this out to demonstrate another inexplicable area of deficiency in this whole process.

Furthermore, two of the ED's witnesses confirmed that the TCEQ has issued permits with effluent percentage limits at all three mixing zones, instead of just the ZID as done for this permit.[232] Ms. Cunningham testified that she saw no reason why such limits could not be included in this permit.[233] Such limits should not only be included in any permit that is issued, but should be subject to monitoring and enforcement; otherwise, it is a hollow requirement.

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[225] ED's Exceptions to PFD and Motion to Remand, at 11; Port's Reply to ED's Exceptions to PFD and Motion to Remand, at 2.

[226] *See* Draft Permit, Ex. AR-R 5, (Admin Record – Remand Tab J), at 00066-00099; Remand Tr. Vol. 9 at 2229:14-15.

[227] Remand Tr. Vol. 9 at 2381:12-16.

[228] *See* Ex. PAC-7 at 5; Ex. PAC-37 at 2.

[229] Ex. PAC-50R DS-2 at 6, noting that for most California open coastal waters that increment would actually be about 1.7 ppt.

[230] Remand Tr. Vol. 4 at 985:24-986:8, 1027:24-1028:2.

[231] Remand Tr. Vol. 4 at 1035:22-1036:20.

[232] Remand Tr. Vol. 9 at 2219:8-15, 2286:12-2287:6.

[233] Remand Tr. Vol. 9 at 2319:4-24.

In their Closing Arguments, neither the Port nor the ED substantively addresses the fact that the final location of the discharge has not yet been determined, according to the Port's own witness.[234] The record demonstrates how the change in discharge location from 300 foot from the shore line (18.4% at the ZID)[235] to 229 feet from the shoreline (14.6% at the ZID)[236] impacts the effluent percentage limits in the revised Draft Permit. The Port now suggests that a change in the discharge location from that proposed in the Application will have no effect on mixing or the applicable effluent limits, but no one has modeled the final discharge location. The Port's contentions in this regard are unsupported, and the ALJs have no reliable basis in the record for concluding that any change in the diffuser location would have no impact on the modeling. PAC certainly disputes the Port's argument in this regard.

The Port and the ED both shrug off the concerns raised by EPA about the Draft Permit and the fact that the EPA, who has oversight jurisdiction over permits issued under CWA 402, would not consider this a validly issued NPDES permit if the Draft Permit was issued "as is." But, EPA's concerns are supported by the evidence and demonstrate why the ED's review has not complied with applicable law and has not been shown to demonstrate that the Draft Permit would satisfy all applicable standards.

To begin, both the Port and the ED failed to get the most basic regulatory analyses correct. One of the first steps in the ED's application review process is to determine whether a permit is major or minor, because that determination dictates the type of review the ED conducts and what conditions are included in the draft permit.[237] This should be a relatively straightforward process, but according to the EPA, the ED miscalculated the points assessed under the EPA Permit Rating Worksheet by at least 35 points,[238] and incorrectly classified the discharge as minor, when it is major.

Instead of conceding this initial error, the ED dodges the substantive questions raised by EPA and argues that EPA's oversight was not one of the issues referred as part of the remand hearing.[239]

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

[235] Administrative Record, Tab F, ED-0052, ED-0059.

[236] Ex. AR-R 5 (Admin Record – Remand Tab J), at 00135-00136.

[237] Remand Tr. Vol. 9 at 2260:21-24 (Ms. Gibson testifying that "discharges of processed wastewater undergo a slightly heightened review with the water quality assessment and made sure there are additional permitting requirements.").

[238] To be deemed a major facility, the numeric rating must be 80 or more. Remand Tr. Vol. 9 at 2246:11-20. The ED gave the proposed facility a score of 44.5, Ex. ED-SG-8 (TPDES Permit Major/Minor Rating Work Sheet). It is also worth noting that in the ED's original major/minor worksheet, the ED failed to assign the additional 10 points for a facility located in an estuary in the National Estuary Protection Program. At the Remand Hearing, the ED's attorney suggested that the 10 points has been assigned for location in a NEP, and Ms. Gibson agreed that the 10 points had been assigned. In fact, the ED failed to even acknowledge the proposed facility's location in an estuary protected as part of the NEP Program and had assigned 0 points for this category. Ex. ED-SG-8 (TPDES Permit Major/Minor Rating Work Sheet).

[239] ED's Closing Argument on Remand, at 2-3.

The ED claims this evidence "could not have been reasonably anticipated,"[240] and that the EPA's objections are "not tangentially related to any of the referred issues."[241] The ED's position is entirely unsupported by the record in this proceeding.

First, the EPA letters were included in PAC's prefiled exhibits, which were filed two weeks before the ED's prefiled testimony and evidence was due. Thus, the ED was aware of PAC's evidence and had the opportunity to respond to it. Rather than do so, the ED waited until the eve of the hearing to ask to present additional evidence on the issue. The ALJs were right to deny the ED the opportunity to supplement its testimony when it had ample time to include any such evidence in its prefiled testimony, yet chose not to.

Furthermore, whether an application is "major" or "minor" directly impacts the type of review that TCEQ must conduct as part of its application review process; thus the EPA objections are related to referred issues. It should also be noted that EPA's stated concerns are not limited solely to whether the permit is a "major" or "minor" permit; EPA raised concerns about specific conditions in the Draft Permit regarding TDS, sulfates, and chlorides, the Tier 2 Antidegradation Review process, and WET testing requirements—each of which are clearly relevant to one or more referred issues.

The Port argues that the ED's staff has conducted a thorough technical review consistent with "state and federal regulations, guidance, and policies for protection of waster of the state."[242] Yet, the EPA objection letter belies the Port's position, noting that the ED's permit review fell short of compliance with applicable federal regulations and would "not be a validly issued NPDES permit" if issued by TCEQ without addressing EPA's concerns. Ms. Gibson testified that EPA does not agree with the ED's regulatory interpretation as to whether the facility is considered major.[243] She also testified that the ED does not plan to change its interpretation to comply with EPA's directives.[244] As noted previously, the definitions of "major" and "minor" come from federal regulations, developed and overseen by EPA, and the evaluation is made using an EPA-promulgated worksheet. So, basically, the TCEQ staff believe they better understand how to interpret and apply the federal regulations and worksheet than EPA. Again, that should tell the ALJs much about whether the ED is really acting as a neutral and objective regulator in this matter, or instead is simply an advocate for this permit.

[240] ED's Closing Argument on Remand, at 3.

[241] ED's Closing Argument on Remand, at 3.

[242] Port's Closing Argument on Remand, at 59.

[243] Remand Tr. Vol. 9 at 2255:25-2256:10.

[244] Remand Tr. Vol. 9 at 2256:21-2259:23.

In response to PAC's concerns that the types of chemical additives, coagulants, and flocculants that will be used in the desalination process have not even been identified, the Port notes that it is the "practice" to provide general descriptions in the Application and then provide additional information after the permit is issued, once the chemicals have been selected.[245] Once selected, the TCEQ can then determine if permit limits and reporting requirements should be added to the already issued Permit.[246] Waiting until after the permitting process to determine what chemicals will be used in the desalination process and will be discharged deprives the public of any participation in that portion of the permitting process. Furthermore, waiting until after the permit is issued and the facility is designed is simply too late. As the ALJs noted previously, "waiting to identify significant problems until after the discharge commences is not sufficient."[247] And it certainly cannot be said to be protective.

As it stands today, neither the Port nor the ED know exactly where the discharge will occur. The effluent percentage limits are not based on what is protective of the environment and they are not based on accurate modeling inputs. The Draft Permit does not even have a salinity limit. The EPA considers the Draft Permit to be insufficient and would not consider it a validly issued permit if issued today. The ED has not properly classified the discharge as major and thus neglected to conduct the heightened review or include the necessary permit conditions for a major permit. Neither the Port nor the ED know what chemicals will be discharged by the facility and suggest such conditions can be added after the permit is issued. In light of these facts, Port has not met its burden to demonstrate that the Draft Permit includes all appropriate and necessary requirements.

7. Allocation of Transcript Costs.

As an initial matter, there should be no allocation whatsoever of any transcript costs on remand. **It was the Port and the ED that requested a remand**. PAC and the other protestants did not seek a remand and, in fact, were generally opposed to it. Thus, because the ED and the Port were the ones seeking a remand, the Port should bear the sole responsibility for all transcript costs associated with the remand (because the ED is prohibited from bearing any such costs). The remand solely benefited the Port, by giving it a second opportunity to try to fix the deficiencies in its application. Thus, it should bear the costs of such.

Moreover, the amount the Port seeks to allocate is incorrect. In its closing arguments, the Port indicates it spent $51,106.50 for the court reporting and transcription costs associated with the

[245] Port's Closing Argument on Remand, at 61.

[246] Port's Closing Argument on Remand, at 61.

[247] Initial PFD, at 68.

prehearing conference and the hearing on the merits. It asks that these costs be allocated among the parties. **However, this amount includes charges that should not be subject to allocation**, because the vast majority of such costs include the costs associated with the Port's acquisition of its own copy of the transcript. PAC had to separately pay the court reporter for its own copies of the transcript and incurred $33,274.09 in such costs.[248] The cost was less to PAC because PAC chose not to expedite every day of the transcript, resulting in a lower cost per volume. But, no other parties should have to pay for the Port's copies of the transcript that it alone used. Only the court reporting fees should be subject to allocation.

The items on the bills submitted by the Port noted as "Hearing on Remand," "Expedite Fee," and "Rough Draft" are all costs associated with the Port's obtaining its own written copies of the transcript. None of these fees are properly included in the fees subject to allocation. Only the court reporter's hourly fee is a cost that is associated solely with the court reporter's preparation of the transcript of the hearing. These costs total $3,650.00 for the hearing on the merits, and $175.00 for the prehearing conference. Thus, to the extent that such costs are allocated among the parties, the total amount subject to allocation is $3,825.00.

But, as noted in PAC's initial closing arguments on remand, the Port has presented an Application that still 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 an application that the ED should never have allowed to get to this point. The parties have each paid for their own copies of the transcript. The remaining balance of $3,825.00 should be borne solely by the Port, which requested this remand.

II. CONCLUSION

WHEREFORE, PREMISES CONSIDERED, Protestant PAC respectfully requests that the ALJs recommend denial of the Port's amended permit application, because such fails to satisfy all applicable regulatory criteria and 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.

[248] PAC will provide copies of these invoices if the ALJs need them for verification purposes.

Respectfully submitted,

/s/ Craig R. Bennett

Kirk D. Rasmussen
State Bar No. 24013374
krasmussen@jw.com
Benjamin Rhem
State Bar No. 24065967
brhem@jw.com
Craig R. Bennett
State Bar No. 00793325
cbennett@jw.com
Susan Dillon Ayers
State Bar No. 24028302
sayers@jw.com
Jackson Walker LLP
100 Congress Avenue, Suite 1100
Austin, Texas 78701
(512) 236-2000
(512) 691-4427 (fax)

ATTORNEYS FOR PORT ARANSAS CONSERVANCY

Richard Lowerre
State Bar No. 12632900
rl@txenvirolaw.com
David Frederick
State Bar No. 07412300
dof@txenvirolaw.com
Eric Allmon
State Bar No. 24031819
eallmon@txenvirolaw.com
Lauren Ice
State Bar No. 2409260
Lauren@txenvirolaw.com
Perales, Allmon & Ice, P.C.
1206 San Antonio
Austin, Texas 78701
512-469-6000 (t)
512-482-9346 (f)

ATTORNEYS FOR PORT ARANSAS CONSERVANCY AND INDIVIDUAL PROTESTANTS JAMES KING, TAMMY KING, SAM STEVES, AND EDWARD STEVES

CERTIFICATE OF SERVICE

I certify that a copy of this document was served on all parties of record on this date, April 22, 2022, in accordance with the applicable service procedures.

/s/ Craig R. Bennett
Craig R. Bennett