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**

EXCEPTIONS TO THE PROPOSAL FOR DECISION OF JAMES KING, TAMMY KING, SAM STEVES AND EDWARD STEVES

July 11, 2022

TABLE OF CONTENTS

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OF JAMES KING, TAMMY KING, SAM STEVES AND EDWARD STEVES

I. SUMMARY

The permit must be denied. The Port has not met its burden of proof. It did not in the first hearing. It has not in the second. The ED's own modeling shows the ALJs' salinity standard cannot be met for the Port's new proposed location and diffuser design. And the ED's modeling is not conservative.

As the PFD on remand acknowledges, there is again significant uncertainty regarding the conditions at the site, the value of the CORMIX model for this unique site, and short and long-term impacts on marine species.[1] The problem is the outfall location, not the CORMIX model. The Port moved its outfall to a location that is not appropriate for the use of the CORMIX model to set permit limits. The model cannot predict the extent of mixing of the brine effluent **at** the mixing zones boundaries with reasonable certainty.

The ALJs' proposed solution is a recommendation that the permit be issued with additional permit conditions. They recommend 1) limits on increases of salinity concentration over ambient levels and 2) monitoring for those limits in the ship channel.

While the additional modeling must be included for the salinity standard if the permit is issued, the additional permit conditions cannot resolve the failure of the Port to meet its burden of proof. Resolution of the uncertainties in the modeling results cannot be postponed until after the permit is issued any more than future WET testing can substitute for proof of compliance with water quality standards or provisions.[2]

[1] PFD on Remand, p. 39.
[2] That is also true for the Other Provision 9 in the draft permits. As noted by the ALJs on page 28 of their PFD and elsewhere, the ED added Other Requirement No. 9 requiring the permittee to complete a study of ambient water

II. THE SALINITY STANDARD

The ALJs recommend the salinity standard identified in the 2018 joint report on desalination by the General Land Office (GLO) and the Texas Parks and Wildlife Department (TPWD), which was required under HB 2013, enacted by the Legislature in 2016.[3] That limit on salinity increases - 2 parts per thousand (ppt) at 100 meters - was also recommended by TPWD in its 2018 comments specifically for the Port's application.[4]

In making this recommendation, the PFD, however, does not adequately explain:

- the underlying need for the salinity limit, or
- the fact that the ED's modeling shows that the Port cannot even meet that standard.

A. THE NEED FOR THE SALINITY LIMIT

The GLO/TPWD recommendation for limits on the increase in salinity over ambient is appropriate and needed. As Dr. Schlenk's testimony explained, most international standards use such a 2 ppt limit on the increase in salinity to protect marine species.[5] And Dr. Jones, one of the Port's experts, has argued in a similar desalination discharge permitting case that the 2 ppt standard is actually too high.[6] Finally, another of the Port's experts, Dr. Knott, has previously agreed that the 2 ppt standard was a "sound and scientifically based standard."[7]

In 2019, the ED responded to the salinity limit recommendation in TPWD's 2018 comments that the agency's modeling showed the mixing would result in 1.34% of the effluent remaining at the boundary of ALMZ.[8] That modeling also reveals that the increase in salinity would therefore be in the range of **0.2 ppt**! With the 50% range of error for CORMIX modeling, that puts the salinity level at most at 0.3 ppt. The ALMZ boundary is close to the 100 meters distance in the GLO/TPWD recommendation. Thus, the ED

velocity at the outfall location to, among other issues, identify whether there are eddies or other conditions that were not identified for the new outfall location.

[3] Ex. PAC-7.
[4] Ex. PAC-37.
[5] Ex. PAC-50R, p. 14:9.
[6] Ex. PAC-78R, p. 10
[7] Tr. Vol. 4, 956:2-20.
[8] Ex. PAC-8, pp. 109 – 110.

correctly took the position that such a change was not large enough to require a salinity standard.[9] Salinity limits were not an issue in the first hearing.

However, they are now, but the ED did not go back and re-evaluate the recommendation for salinity limits. The ED did not reevaluate its earlier position when considering the revised application. Yet, the ED's modeling for the amended application shows that the figure for percentage of effluent at the ALMZ for the amended application is 8.9%. As will be shown below, that poorer mixing results in increases in salinity up to 2.5 ppt, according to the ED's own modeling. That is over ten times as high as what the ED assumed in responding to the TPWD comments, which, of course, is what was also assumed in its antidegradation review.

The ED's own modeling shows the need for the salinity limit. Moreover, it shows that the discharge can, if not will, exceed that 2 ppt limit.

B. THE ED'S MODELING SHOWS THAT THE PERMIT MUST BE DENIED.

Attachment 1[10] provides the results of the modeling by the ED for different conditions, the range of 95th and 5th percentiles for summer and winter conditions. The different runs at a 95.6 mgd discharge rate were done with different historic temperatures and salinities to determine which conditions lead to the "critical conditions.[11]

The line in red – line 8 – on Attachment 1 is one of the winter conditions with a "95/5 percentile of probability" for a 40% recovery rate for usable water. The ED determined that this winter scenario is the "critical conditions"—what the ED says are the reasonable worst-case conditions for discharge of chemicals not already in the ambient channel waters. This can be seen by comparing the first three columns of the chart. Line 8 has the poorest mixing at all three mixing zones. Line 8 **at column S** shows that the ED's

[9] Ex. PAC-8, pp. 119-120; Ex. ED-SG-1 R, p. 23.

[10] Attachment 1 from Ex. Kings-Steves 21 R, the Excel version. Ms. Cunningham verified that the numbers are correct. Tr. Vol. 9, 2270:22 – 2271:7.

[11] The conditions include the low temperature with high salinity conditions in the and high temperature with low salinity conditions for different seasons. The conditions are for both the ambient waters and the effluent. All of these conditions are actual conditions, used so the real worst case condition, the lowest temperature and highest salinity for example, are not used.

modeling with its assumptions show the increase in salinity at the ALMZ will be 1.13 ppt under those winter conditions, *i.e.,* less than the 2.0 ppt permit limit.

However, with some of the other 95/5 summer and winter conditions, the increase in salinity is significantly worse. This is because the "critical conditions" for discharge of chemicals not already in the receiving waters **are not** the worst-case conditions for salinity and other chemicals already in the channel water.

Attachment 1 shows this. The ED's modeling predicts that there are worst cases for changes in salinity in both the winter and summer. Column S for lines 19, 20, 21, 23 and 25 show the salinity increase for other 95/5 percentile probability conditions. These scenarios result in increases in salinity at the ALMZ of 2.0 or greater. Those are when the recovery rate is 50%, but that rate is the more efficient production rate the Port has proposed. It is one of the two rates at which the application claims it can and will operate.

The Port's suggestion that the Commission can ignore the salinity levels at the 50% rate[12] because that it is maximum rate is incorrect. The Port has made it clear it will, if it can, operate at that more efficient rate.

The limit on salinity increases is not only needed, it is clearly reasonable. The GLO?TPWD recommendation is not strict. The limit would have been met if the Port had a diffuser at its new location that could meet the targets the Port set in its initial application. As the ALJs note, the initial-application target was for good mixing, 1.5% of the effluent to remain at the ALMZ. The ED's modeling for the 2019 and 2020 draft permit predicted 1.34% there. The 2.0 ppt increase would have been met. But the ED's modeling for the new location and diffuser shows the percentage of effluent remaining at the boundary of the ALMZ of 8.9%, a six-fold increase, with multiple scenarios resulting in the salinity increase over 2.0 ppt.

The Port simply picked a location and designed a diffuser that cannot meet the permit limits for salinity. And the Port has not shown that any diffuser can do so at that location.

[12] *See* PFD on Remand, p. 33.

And, according to the ED's modeling, shown at line 19, the change in salinity resulting from the discharge raises the absolute salinity levels in the channel at times at the ALMZ by 2.5 ppt, increasing the ambient salinity level of 40.57 (column M) to 43.07 ppt (column P).

Thus, the marine species, such as redfish larvae, will be exposed to a 2.5 ppt increase in salinity when they are already stressed by high salinity levels in channel. As was explained in both PFDs, for this migratory area of the bay system, abrupt changes in the salinity level can create significant impacts, including death, on redfish larvae and create even more problems when the ambient salinity concentrations are already putting the larvae under stress. These larvae have no time to acclimate for such salinity increases as they are incorporated into the plume with the ambient water mixed with the effluent.

And it needs to be stressed this conclusion is using the ED's modeling. And that modeling is subject to the 50% error range, meaning the salinity increases could be over 3 ppt before reaching 100 meters. The PFD's rejection of the need to consider such a margin of error would have been correct for the initial application. It is not for the amended one.

Moreover, PAC's experts have shown that the ED's results are clearly not conservative. PAC's experts have demonstrated that the boundary interactions with the bank, the side of the hole, and the sides of the cove reduce the mixing and increase salinity levels before the effluent plume gets to the ALMZ or the 100 meter distance.

The current case is unique with its problem discharge location and the importance of the area as a migration route for sensitive marine life. Whether a 2.0 ppt limit should be the standard for all coastal waters is not clear, and that is not proposed here. It would not have been a problem for the original diffuser and location. Here, however, the GLO/TPWD recommended limit requires denial of the permit.

III. THE AMENDED APPLICATION IS A MAJOR AMENDMENT

The Commission should also deny the permit because the ALJs improperly allowed the Port to move forward with a major amendment of its application without the required notice and comment period, or a full ED application considering public comments or those from TPWD. The Port's June 24, 2021 amended application should have been sent back to

TCEQ, or PAC's July 9, 2021 motion to certify the question on the scope of the remand should have been granted. Now, the only path is permit denial due the failure of the Port to follow the clear directions and limits in the remand order.

A. THE RELEVANT HISTORY OF THE CASE

During the original contested case hearing, Dr. Tischler, the Port's modeling witness, testified that his modeling showed that the diffuser design in the original application could not meet the permit limits for mixing at the ZID in the ED's 2020 draft permit.[13] The Port knew that long before Dr. Tischler testified. Yet, The Port did not take advantage of the provision in TCEQ rules for withdrawal of its application without prejudice[14] and filing a new one with a diffuser design, a different location, or other changes. The Port took the risk; hoping the ALJs would recommend issuance. The Port also, no doubt, wanted to avoid rearming protesting parties by reimbursing them for their expert witness costs for the original hearing.

TCEQ rules make it clear that the opportunity to withdraw and to make such major changes to a permit ends when a PFD is issued. Still, the Port, joined by the ED, argued for a remand. The Port has used the remand to try to do what it had decided not to do before the issuance of the original PFD. The Port filed what is essentially a new application, an application that changes all of the basic inputs for the modeling due to the new location. That end-run around TCEQ's application withdrawal rules is surely not what the Commission intended to allow in its remand order.

B. WHAT IS A MAJOR AMENDMENT?

TCEQ's rules provide some of the answer to when an amendment is a major or minor amendment. For example, for a permit that has been issued:

> A major amendment is an amendment that changes a substantive term, provision, requirement, 30 TAC § 305.62 (c)(1).

[13] Dr. Tischler testified in response to questions from OPIC that the POCCA:

> "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." Tr. Vol. 3, 264:20-265:3.

[14] 30 TAC § 80.25.

The new diffuser and location resulted in changes in the draft permit that would allow over a 2.0 ppt salinity increase rather than 0.2 ppt increase in the ED's 2019 and 2020 draft permits for the original application.

> A minor amendment is an amendment to improve or maintain the permitted quality or method of disposal of waste, or injection of fluid if there is neither a significant increase of the quantity of waste or fluid to be discharged … A minor amendment includes any other change to a permit issued under this chapter that **will not cause or relax a standard or criterion which may result in a potential deterioration of quality of water in the state**. 30 TAC § 305.62 (c)(2).

For amendments to applications, the rules state

> No amendments to an application which would constitute a major amendment under the terms of §305.62 of this title (relating to Amendment) can be made by the applicant after the chief clerk has issued notice of the application and draft permit, unless new notice is issued which includes a description of the proposed amendments to the application. 30 TAC § 281.23(a).

And while Texas courts have provided additional guidance, ruling for example that major amendments can be addressed as minor amendments under certain circumstances, [15] no court opinion has created any legal basis or precedent for treating the amendment here as a minor amendment. In fact, in the original hearing, the permit manager for the Port's application, Shannon Gibson, was asked how TCEQ would treat an amendment to the application that moved the location of the outfall and whether that would that require new public notice. She replied,

> 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.[16]

C. THE PORT'S AMENDMENT IS CLEARLY A MAJOR AMENDMENT.

There are at least three major changes to the Port's original application in the amended application:

1) the change in location of the outfall from open waters to a confined cove,

[15] *TCEQ v. City of Waco*, 413 S.W.3d 409 (2013).
[16] Tr. Vol. 5, p. 70.

2) the change in the location of the discharge ports from 27 feet above the bottom of an alleged 90-foot-deep channel to on the bank of the channel, if not buried in it, at the depth of 65 feet, and

3) the change in diffuser design.

These three changes alone result in a major amendment. They require a number of changes to substantive terms, provisions, or requirements that were specified in the original draft permit or incorporated in the permit as representations in the application. The changes in the requirements for mixing (the percentages of effluent) for the ALMZ and HHMZ are significantly more lenient than the model predicted for the original application.

1. The new draft permit allows more pollution and higher changes in salinity.

Table 1 below shows the results of the ED's modeling for the original and amended application. These are the best-case modeling results. The ED's modeling ignores all of the uncertainties and accepts the assumptions and modeling approach used by the Port over those of Dr. Socolofsky.

Table 1: Comparison of "critical (worst case) conditions" (i.e., the percentages of the concentrated brine effluent remaining in the channel waters at the mixing zones) and increases in salinity in these receiving waters for the Original and Amended Application.

Boundary	The 2019 Original Draft Permit (for Notice)	The 2020 Revised Draft Permit	The 2022 Final Draft Permit
ZID:	1.95%/0.3ppt	18.4%/3.1ppt	14.6%/1.85ppt
ALMZ	1.34%/0.2ppt	1.34% /0.2ppt	8.9%/1.13ppt
HHMZ	1.20%/0.2 ppt	1.20% /0.2ppt	5.4%/1.68ppt

It is obvious that the final draft permit is far less protective of water quality and the marine environment than was the one that was presented for public comment for the original application, at least beyond the ZID. The changes in salinity levels can be much higher at all mixing zone boundaries under the final draft permit versus the original 2019 draft permit, the one provided for public comment. And, as discussed above, even the ED's modeling shows that the increase in salinity levels can reach or exceed the 2 ppt level that

the PFD on remand recommends as a limit at 100 meters, just beyond the ALMZ. The revised amendment clearly was not prepared to enhance environmental protection.

2. Significance of the GLO/TPWD recommendation. These agencies did their work to develop the 2 ppt limit under the Legislature's directive in 2016.[17] TPWD also filed two sets of comments on the original application, one in 2018 and one in 2019, with the 2018 comments recommending the 2 ppt limit at 100 meters. Yet, it would take a decision that the Port's amended application is a major amendment to assure that TPWD is notified of the amended application and given an opportunity to comment on the Port's new approach and the ED's final draft permit. And the record here is clear here; TPWD was not notified by the ED. It was not provided an opportunity to comment or provide input to the ED's evaluation of the amended application.[18] It was not, for example, allowed to evaluate the new location or the impacts of the much higher effluent velocities in the new diffuser design, velocities of 8.2 meters per second (m/s) – about 18 miles per hour, while the CORMIX model warns modelers that velocities over 2.5 m/s could cause harm to aquatic species.[19] The original discharge rate was 1.4 m/s, about 3 miles per hour.

3. Public notice three years ago. The notice opportunity for comment was issued in November 2018. There was no notice of the June 2021 amended application, and the 2021 final draft permit was not made available until on September 1, 2021, almost three years after the original notice. Clearly, with a state growing as fast as Texas, there can be no assumption that there has been no change in property ownership within the area for which mailed notice is required over a 3-year period or that there might not be new information in public comments that the ED needs to consider Only with new notice for a major amendment would the proper public participation requirements have been met.

And there is precedent for doing so. For example, in a contested case hearing on a TCEQ permit for a proposed landfill, the ALJ allowed the applicant to abate a hearing and file an amended application. The Judge then ruled the amendment was a major one and

[17] Ex. PAC-17.
[18] Tr. Vol. 9, p. 2214:13-21.
[19] "The CORMIX model notes that a discharge velocity less than 2.5 m/s may be recommended to avoid possible adverse conditions for sensitive fish populations." Ex. AR-R5 (Admin Record – Remand Tab J) p. 135.

required new notice. New notice was issued, and the U.S. Air Force then filed for and was granted party status for the continuation of the contested case hearing to protect their pilots undergoing their initial training in vulnerable light aircrafts.[20]

4. More extensive hearing. The hearing here on the amended application took almost ten days, while the original took only five. And while the later hearing had fewer referred issues, some such as the modeling due to the new location, the issues in the later hearing were much more complex, leading to the uncertainty in modeling predictions that the ALJs noted.

5. More Port Witnesses. The Port presented nine expert witnesses in the 2021 hearing, but only three at the initial hearing.

6. Precedent Setting Decision. As the ALJs have pointed out, this is the first discharge permit application for a large-scale desalination facility in Texas coastal waters.

If the Port's amendments to its application do not constitute a major amendment for which TPWD and others should be given an opportunity provide their input, it is hard to think of amendments to applications that are major. The Port took the risk not only by not withdrawing and refiling after the first hearing, but also by attempting to use the remand for that purpose. Its permit should be denied.

IV. OTHER PROCEDURAL ERRORS

A. ADMISSION OF THE AMENDED APPLICATION INTO THE RECORD WITH NO SPONSOR.

The ALJs ruled correctly that Protestants had rebutted the original application,[21] and they shifted the burden of going forward and presenting their evidence first, as well as the burden of proof to the Port for the second hearing. Yet, they accepted the Port's position that its amended application deserved the same treatment as its original application under SB 709. The Port argued that the entire amended application must be admitted for all purposes, including the truth of the matters stated therein. The ALJs agreed.

[20] Application for Permit No. MSW 2253, Adobe Ecosystem Ltd., SOAH Docket No. 582-97-1547, TNRCC Docket No. 1997-0807-MSW.
[21] PFD, p. 5.

While Protestants objected to such an approach for the initial application as contrary to the rules of evidence and Protestants' due process rights, and still do, the issue on remand is different. There was at least a possible justification for the SB 709 approach in the initial hearing. Protestants have the burden of proceeding, going first, in such hearings. It can be helpful to have the application in the record from the start.

But here, we have already had that hearing, and Protestants went first and rebutted the *prima facie case*. Texas law then allows an applicant and the ED to present their evidence.[22] They still were doing that in the hearing on remand. The Port had to go first and it clearly could have provided sponsoring witnesses – those who prepared the application or other experts as it did so.

If the Port had withdrawn and refiled, the new application would have received the special treatment in SB 709, and Protestants would have had the opportunity for payment by the Port of Protestants' costs. The Port chose not to withdraw. Instead, it was allowed by the remand order to supplement its original application with new information. That is what it did, filing a redline strikeout of the original application and new supporting documents.

And this process of amending an application on remand is no different than when an applicant submits revisions, corrections, or additional information for its application in any initial hearing process. Those changes are allowed in the evidentiary record, but only if sponsored by a witness for the applicant if there is an objection to admission. Here, there was such an objection. If challenged, a sponsoring witness has to testify to the accuracy of the information, how it was developed, whether it is simply hearsay or speculation, and other aspects of whether the information is credible and reliable.

For example, here, the application provides the depth, latitude and longitude of the new outfall, a location which PAC's experts proved to be in dirt, not water. No witness

[22] If in accordance with Subsection (i-2) a party rebuts a presumption established under Subsection (i-1), **the applicant and the executive director may present additional evidence to support the draft permit**. Subsection (i-1) of Texas Government Code § 2003.047 (Emphasis added).

was required to verify the Port's figures for the location, or explain how that location was chosen.

And the conflict on the depth of the outfall is not the only conflicting information in the amended application. Figure 1 in the application, part of Dr. Tischler's June 24, 2021 memo to the Port,[23] conflicts with Figure 4 in the Parsons Technical June 24, 2021 "Measured Bathymetry" memo that was also part of the application.[24] The two show the contours for the area in different locations. That is seen in PAC exhibit which compare these figures[25] and which is provided as Attachment 2. Yet, no one had to sponsor either exhibit or explain which one is correct. Both were admitted over Protestants' objection. And the PFD on remand does not resolve the issue. TCEQ staff or inspectors or those with TPWD will not now where the outfall really is in relation to the contours.

This is, in fact, one more example of why any major amendment needs to be subject to a public comment period before a hearing process is started on the amended application. Moreover, public or TPWD comments can alert the ED to such conflicts so they can be resolved before discovery in the hearing process begins. That is part of the role of the ED's preparation of the response to comments.

There is no legal basis for overruling the rules of evidence to allow amendments to applications to be automatically entered into the evidentiary record with no sponsoring witness when there is an objection. There is no reason the applicant cannot provide the needed sponsoring witnesses as it proceeds with its case. That is how hearings have proceeded for over 50 years before SB 709. This return to the normal procedure makes SB 709 compatible with the rules of evidence, at least for remanded hearing. This case should set that precedent.

B. ERRORS IN RULING ON TESTIMONY OF PAC'S WITNESSES

The ALJs also erred in excluding critical testimony of Dr. Scott Socolofsky and Tim Osting.[26] The excluded and related testimony is provided as shown in Attachments 3 and

[23] Ex. AR-R4 (Admin Record – Remand Tab I) p. 254.
[24] Ex. AR-R4 (Admin Record – Remand Tab I) p. 185; Ex. PAC-53R at 10:9-19.
[25] Ex. PAC-53R BW-3.
[26] ALJs' Order No. 22.

4. Both PAC witnesses presented testimony that they had communicated with Dr. Robert Doneker, the owner of the CORMIX model. They were asked in their direct prefiled testimony what they did and with whom they have discussed their opinions. **They both identified Dr. Doneker and testified that he had confirmed to them that their approach to using the CORMIX model for this discharge was correct.** Dr. Socolofsky also stated a few other opinions that Dr. Doneker had expressed. The testimony provides significant verification of the approaches used by and the opinions of PAC's two modeling experts. They confirm that those experts did the proper modeling. The ALJs incorrectly rejected this testimony and PAC's experts' modeling results.

All parties rent their CORMIX model from Dr. Doneker's company MIXZON. All have access to him for discussions on proper use of the model under the rental agreements. Dr. Socolofsky and Mr. Osting took advantage of that, in the same way an expert might contact a representative of a company that manufactures pollution control equipment. Getting advice on the use of a model is no different from getting advice on the use of equipment. Both sets of advice can be helpful in developing permit applications or developing opinions regarding permitting issues.

It is often valuable, if not necessary, to engage in such consultation to ensure that the tools used in analysis are used correctly. In this very case, the modelers for the ED **and the Port** both misinterpreted their modeling results. They assumed the worst mixing was shown on the Y axis, the ZID boundary toward the center of the channel. Mr. Trungale, for PAC, pointed out their error. Because of the flow in the channel, the worst mixing was at the X axis, the ZID boundaries in the direction of flow in the channel. That led to the ED's 2020 revision of the permit. Both the Port and ED modelers were relatively new at modeling and apparently did not consult any expert to determine if they were implementing the model correctly.

The results of such expert-to-expert conversations are not excludible hearsay. Experts can provide and rely upon hearsay, as they did here. Moreover, neither the ED nor the Port argued that they were somehow prejudiced. They were not precluded from verifying the information or having their own discussions with Dr. Doneker, who was not

a consulting expert for PAC. There was no barrier to the ED or Port simply calling him. The Port and ED did not even claim prejudice. The Port and ED objected because the testimony was significant. The Port and ED simply did not want the Commission to consider it.

Either the Port or the ED could have done what Dr. Socolofsky and Mr. Osting did; pick up the phone and call the top expert on the use of the CORMIX model. They probably did not want to risk hearing what Dr. Doneker would tell them.

But that was a risk that Dr. Socolofsky and Mr. Osting were willing to take, knowing that they might get an answer different from what they expected. They would then have to admit that in testimony. But the result was greater assurance for them that their approaches to schematization, plume-boundary interaction, and other modeling issues were correct. That is very significant.

It is also important to point out that Dr. Socolofsky has historically worked with both Professor Gerhard Jirka, the creator of the CORMIX model, and Dr. Doneker, who took the model, expanded its use, and teaches classes on its use. The details on the history of Dr. Socolofsky's work with Professor Jirka and Dr. Doneker are also explained in the Attachment 3.

The ALJs should have considered all of the testimony in Attachments 3 and 4, and the Commissioners should also. It was a significant error to exclude the evidence. It makes the decision by Mr. Schaefer and the ALJs to not rely upon Dr. Socolofsky's modeling even more unreasonable.

V. REFERRED ISSUES

Protestants rely on the sections of PAC's exceptions on Issues A and C, issues dealing with impacts on marine species and the environment. The other four issues are discussed below.

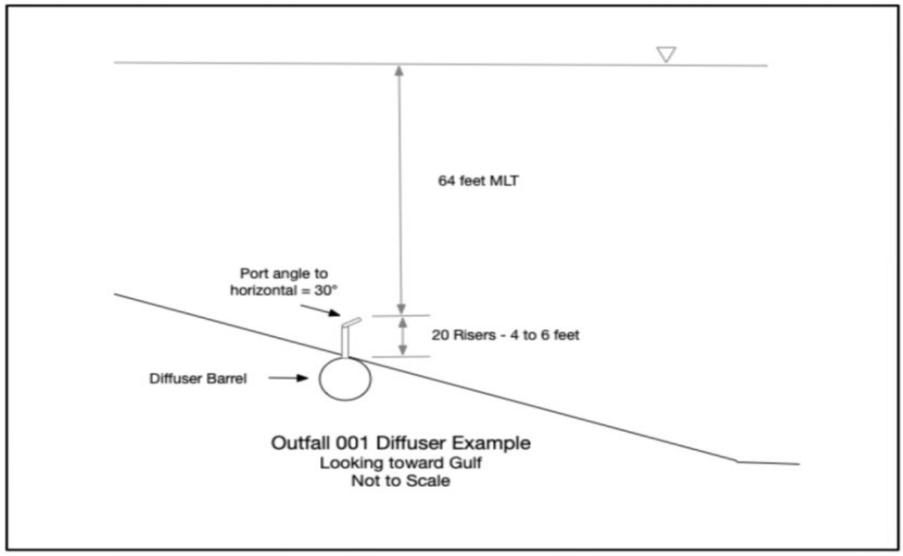
A. ISSUE D. WHETHER THE APPLICATION, AND REPRESENTATIONS CONTAINED THEREIN, ARE COMPLETE AND ACCURATE

The ALJs found the application to be complete and accurate. It clearly is not. However, before turning to the problems, it is important to understand key terms.

1. Key definitions.

- Outfall: This is where the discharge occurs. Here, it is where the effluent come out of the 20 ports in the 98-foot pipe that is part of the diffuser.
- Diffuser: This is the equipment that includes 1) a diffuser barrel into which the effluent is piped from on shore, and 2) risers which are pipes on top of the barrel that connect to the pipe with the discharge ports.
- Bank: Here, this is the downward extension of the bank at the shoreline of Harbor Island. It has been referred to as the bottom of the channel, and the sloping side of the hole.

Figure 1 is the Port's depiction of the diffuser as it would sit on the bank.[27]



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2. Depth of the outfall: When the application was filed, the ED asked the Port[28] to explain why the Port's application stated,

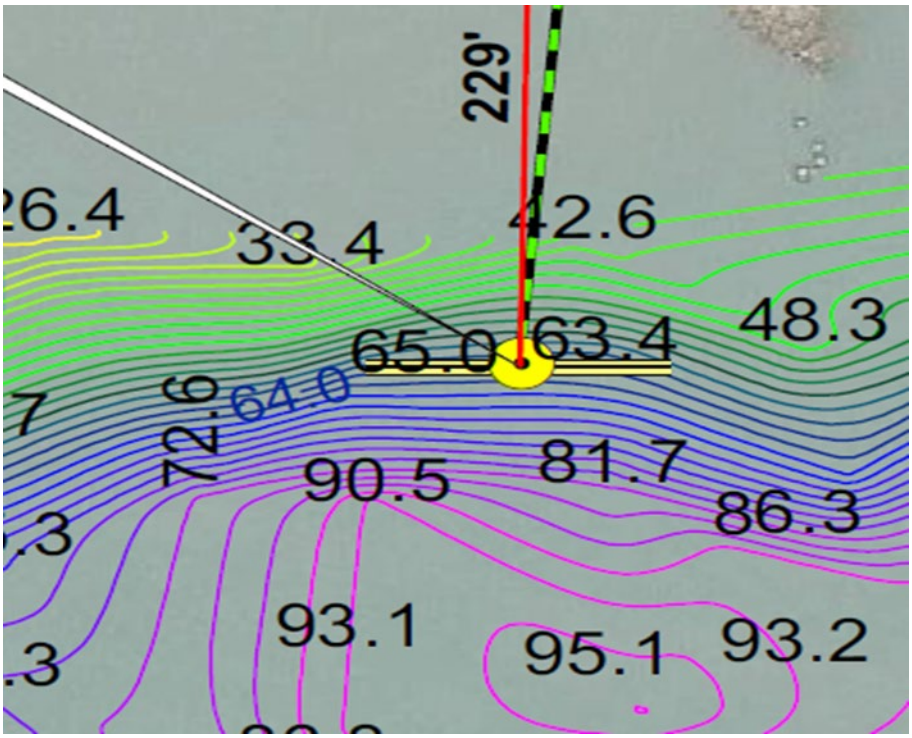
> The channel depth at the point of discharge of 27.4 m (90 ft) is based on the bathymetry of the site as confirmed by the June 2021 study.[29]

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. . .. This results in the depth of the channel at which the effluent discharges into at approximately 90 feet.[30]

[27] Ex. APP-LT-16-R.
[28] Executive Director's First Request for Clarification.
[29] Ex. AR-R4 (Admin Record – Remand Tab I) p. 248.
[30] Ex. ED-7 Remand.

The depth is not 90 feet. The outfall with the 20 ports is actually in or partially in the bank or side of the hole at the 65-foot depth. The 90-foot hole is about 70 feet further out into the channel. This can be seen in Figure 2 below, which is an excerpt from Figure 1 in the Port's application.[31]



And what is also very obvious from this figure is that the plume for most of the tidal cycle never gets over the 90-foot hole. The majority of the time, the plume turns in or out with the channel current, only going a few feet from ports before turning. The Port argues that the effluent is then carried with the current, which would not be into the 90-foot hole.

When going in, *i.e.,* to the left in Figure 2 above, the plume never goes below 75 feet or so, which can be seen even better in the first figure in Attachment 2. The idea that the plume always or even often falls to a flat 90-foot bottom and then moves along that flat bottom is clearly a serious mischaracterization of the facts. It allows the Port to model the plume with the minimum chance of the plume interacting with any bank or side of the hole, in any direction.

[31] Ex. AR-R4 (Admin Record – Remand Tab I) p. 254.

The ALJs' analysis appears to come down mainly to the observation that because "the diffuser ports would be oriented so that the discharge would point across the 90-foot depression toward the channel and that, during **slack tide**, the discharge would descend into the depression"[32] it is reasonable to use the 90-foot depth for modeling the plume as it moves in all directions, including for the critical conditions when the current at 0.8 meters per second is moving the effluent quickly in or out of the channel.[33]

And the ALJs also state they rely on their position that PAC's experts also used 90 feet for the depth.[34] That is misleading. PAC's experts did run the model with a 90-foot bottom, but that was to replicate the Port and ED's modeling before doing their own modeling with their own assumptions. They also explain that they run a number of conditions to understand the model results for different conditions. However, their evaluations of the mixing are based on the model using 70 or 72-foot depths. They did so following the guidance in the CORMIX User Manual. They did not use 65 feet for the depth, since they had to assumed that the 20 ports will be somewhat above the bank.

They had to assume that there could be plume contact with the bank, given the plume was placed on, if not in, the bank and even if it were not so deep, the concentrated brine effluent would still hit the bank as it expands and falls through the ambient waters. Putting the depth at 64 feet, as Figure 1 suggests, gets the ports at most only a foot above the bank at the location identified in the application.

3. Location of the outfall. Figure 1 above shows the risers 4 to 6 feet high, which would require burial of the diffuser barrel and risers into the bank in order to have the ports at the 64 or 65-foot depth. But ultimately, as discussed below, the Port decided to argue that the location of the outfall in latitude and longitude to 6 decimals[35] does not matter, as the Port is permitted to move the outfall to another location after the permit is issued. Thus, on rebuttal, Dr. Tischler testified:

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[32] PFD, p. 36.
[33] *Id.*
[34] *Id.*
[35] Ex. SG-7, p. 39. Such a precise location description, latitude and longitude to 6 decimal figures, means TCEQ rule require a location that has to be given within 4 inches of the proposed location.

> the diffuser design memorandum does not specify an exact latitude or longitude for the diffuser barrel and ports as these will be determined for the final design.
> * * * precise latitude and longitude of the diffuser ports will not be determined until the final design of the diffuser is completed.[36]

Yet the application does locate the outfall with latitude and longitude figures to 6 decimal points or with only a few inches as a range of error. But to get the 4 or 6-foot risers, plus the diffuser barrel, on the bank under the ports at 65 feet, the bottom of the diffuser barrel would have to be located somewhere else. The Port **might** move the outfall farther out on the sloping side of the hole, the bank. Figure 1 shows that slope to be about 5 to 1 at the diffuser location, which would mean the outfall would have to be at least 30 feet farther out into the channel than the location provided in the latitude and longitude figures in the application. That would be about half-way back out toward the original outfall location. **But it has to be assumed the Port did not like the original location and moved it 70 feet closer to the island for a reason, possibly to avoid ship traffic.**

So, the Port could, and more likely will, move it to some other area of the channel, closer to the Gulf or to the Bay, locations for which there is no site-specific information and no modeling. Neither the Port or ED would put limits on where the outfall can be moved next, after the permit is issued.

PAC's modelers understood that the outfall had to be moved, but with no information on where at the time they ran their models or thereafter, but they had to assume nearby. Therefore, they performed a number of CORMIX model runs that assume different distances from the bank to the outfall with the outfall close to the location in the application. The different distances allow them to see how moving the outfall at different distances above the bank affects mixing. For all distances in the range of 30 feet, and allowing for an elevation above the bank in the range of 6 feet, the modeling showed worse mixing due to contact between the plume and the bank.

The Port has not provided accurate or complete information on the site of its outfall in the application or otherwise.

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

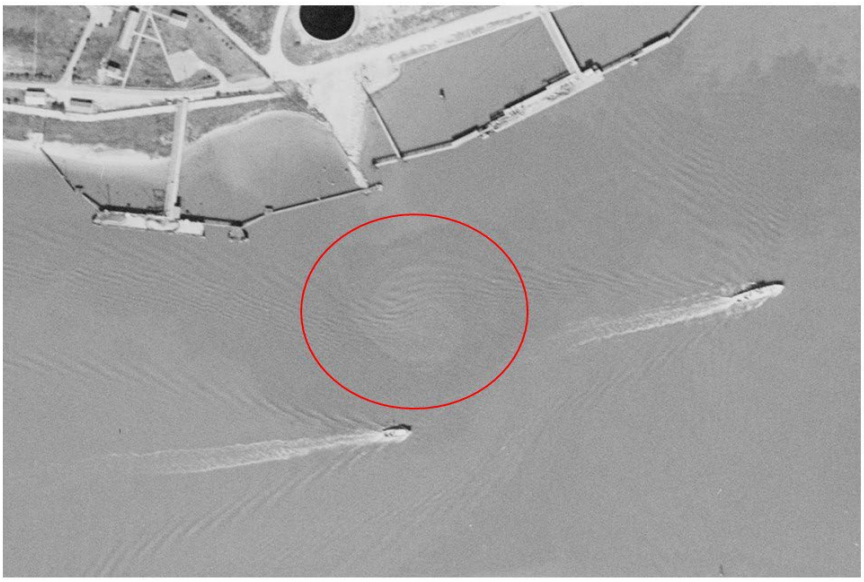
4. Existence of eddies and non-uniform flow. With its sparce information (four days of data collection), the Port decided to abandon its theory that an eddy created the 90-foot hole (now 95-feet deep) and would help with mixing. It now says there are no eddies that affect the modeling or mixing.

Yet, it clearly told the Commission it would get the needed data to support its position on the eddy. But it could not or simply did not try hard enough to find or characterize such an eddy.

And the Port's Corporate Representative and environmental office had early testified that it was **common knowledge** that there was an eddy that created the hole.[37] It was also that eddy that, in the first hearing, the Port argued would help with mixing between its assumed 65-foot bottom depth and the real 90-foot, now 95-foot, depth.

Even the Port's June 2021 amended application stated, "The diffuser will be located on the north slope of the eddy-generated "hole" in the channel."[38] Later, when the Port did not find what it interpreted as evidence of any eddies in its data, it simply abandoned its eddy theories. Yet, eddies clearly exist today and did in the past. Both past and current eddies are shown on aerial and satellite photographs in the record. They are shown at or very near the new outfall location. Dr. Socolofsky also testified he saw the surface evidence of eddies on his site visit. He marked eddies structures – the surface expression of eddies – on a satellite photograph.[39] It is clearly shown in an older aerial photograph in Figure 3 below.[40]

[37] Ex. PAC-17, p. 12: 13-15.
[38] Ex. AR-R4 (Admin Record – Remand Tab I) p. 248.
[39] Ex. PAC-51R SS-4.
[40] Ex. PAC-53R BW-17. This is a blown up section and the eddy can be seen best if this photo is further blown up in size.



Still, the Port now claims there never was an eddy that created the hole and no eddies of significance in the area of the outfall. And despite owning the land on Harbor Island and the adjacent channel bottom, and despite working for years on deepening the ship channel and supporting port facilities, the Port could not provide any data on when the hole was created or whether the new bathymetry shows the hole is still growing. The Port's experts have theories, but no site-specific information needed on the life cycle of the hole has been presented—information it should have if its outfall is going to sit on the side of the hole that is deepening and widening. The eddy and hole and their origins, size and impacts on mixing have simply not been determined or evaluated. The Port failed to properly characterize the site.

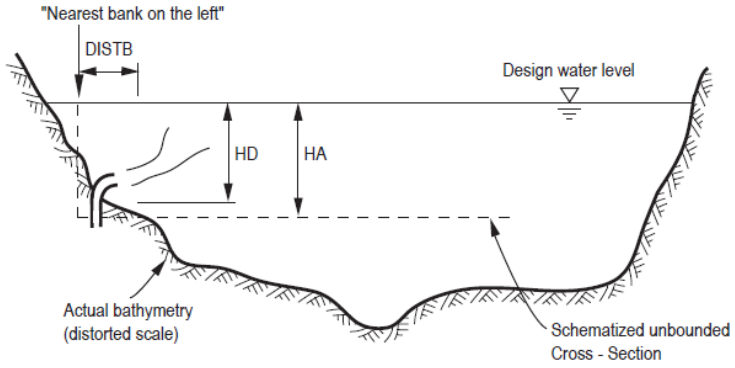
As was discussed in detail in the first hearing, the CORMIX model cannot take into account the impacts of an eddy or any non-uniform flow that alters the direction of the channel current. If the eddy or such non-uniform flows are small, this limitation in the model can be ignored. If they are what the Port claimed initially or even what PAC's experts have seen and found in the Port's data, they cannot be. They have to be considered, at least, in determining if the predictions from the model are conservative or even usable. But first, the Port needs to accurately characterize these flow conditions, not ignore them.

5, Mapping of contours of the ship channel. The discussion of this issue is provided in the Section (IV A.) above.

B. ISSUE G. WHETHER THE MODELING COMPLIES WITH APPLICABLE REGULATIONS TO ENSURE THE DRAFT PERMIT IS PROTECTIVE OF WATER QUALITY, INCLUDING UTILIZING ACCURATE INPUTS.

Neither the near field modeling nor the far field modeling by the Port and ED utilized accurate inputs or assures the draft permit is protective.

1. The near field modeling with CORMIX. The CORMIX modeling was not done properly. The failure of the Port to provide the location of the outfall was discussed above. It is enough to require denial of the permit. That is so because the CORMIX model that the ED insists it must rely upon requires accurate location data for the outfall, so the model user can create the simplified schematic of complex bathymetry, *i.e.,* schematization.[41] The modeling for this application requires a horizontal plane to represent the bottom of the channel and a vertical one to represent the bank. The distance to the bank is called the DISTB. The determination of the location for these planes is discussed in the CORMIX User Manual, which provides Figure 4 below.[42]



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

In this figure, the plume is lighter than the water in the channel so it goes up. The Port's plume will sink and hit the bank after moving just a few feet away from the 20 ports.

[41] The CORMIX User Manual defines "Schematization" as "the process of describing a receiving water body's actual geometry with a rectangular cross section." Ex. ED-5 Remand, p. 0071.
[42] Ex. ED-5 Remand, p. 0072.

It is important to note that, in this figure and almost all other locations in the CORMIX User Manual, the DISTB is shown as the distance to the "nearest bank" not the **shoreline** where the water at the surface is at the bank.

It is obvious from this figure that the vertical and horizontal planes – the dotted lines - were picked not to provide the maximum amount of water for mixing to the left and bottom of the outfall, but to provide some water. Using the approach by the Port and ED, the vertical dashed line for the bank would be at the "shoreline" to the left of where it is, and the horizontal dashed line for the bottom would have been much lower. But what that would do is make a large part of the island act as water in the model. The more water to the left and down means more water for mixing, and less likelihood that the plume contacts either plane.

The CORMIX User Manual uses the term DISTB as the distance between the vertical wall and the outfall. This can be seen in Figure 3 above. It is specifically defined in the Manual as:

> **the average** distance between the outfall location (or diffuser mid-point) and the shoreline. It is also specified as a cumulative ambient discharge divided by the product UA times HA.[43]

There is no second definition, despite what the PFD states. The DISTB is clearly not the full distance to the shoreline. The ALJs' position that "the 229-foot distance used by it and the ED is a reasonable interpretation for DISTB"[44] under this definition is wrong and is never explained. The use of the term "average" does not mean maximum.

Clearly the Port and ED have not used correct inputs. There can be no issue with that. It is not protesting parties responsible to do an applicant's work for it. Here they have shown the inputs were not correct. There is simply no modeling by the Port or ED with correct inputs. They did not even run sensitivity runs to look at other distances.

[43] Ex. ED-5 Remand, pp. 0021 and 0022. The "HA" is the "Average Depth" of the receiving water body determined from the equivalent cross sectional area during schematization." "UA" is "the Mean Ambient Velocity," or "the average velocity of the receiving water body's flow."
[44] *Id.*

But it is not only not the full distance to the shoreline that defines the DISTB. It is defined to reflect the average depth and the mean average channel velocity. And neither the Port nor the ED used those figures.

And they, like PAC's experts, could not. Those figures are based on the specific location of the outfall, which, according to the Port has not been provided. The location that was is on the bank or in it and it is clear that that cannot be the final location. Thus the average distance and the ambient velocity are dependent upon the specific location

And as PAC's experts have noted even the ambient velocity for the middle of the channel is not correct near the outfall. This can be seen in Figure 1 above, as the sides of the cove are obvious. Part of the land coming out from the island is seen as the small circles are visible in the upper right corner of the figure. Those spots are land. The last one is the one with the sign warning boaters to stay away shown in Attachment 5. Another one has a cone on it It is obvious from that picture that the land coming out from Harbor Island just before the location of the outfall change flow conditions, especially velocity.

The DISTB depends on the specific outfall location and specific site data there. The Port says the location does not matter, as it can decide on the location after the permit is issued.

Back to Figure 4, it is clear that the CORMIX User Manual is not suggesting in any way what the Port and ED did for an outfall on or near a bank. The schematization is not simply maximizing the water and minimizing the possibility of plume interaction.

The CORMIX User Manual defines "Boundary Interaction"

> as occurring "when the plume encounters a **vertical** (i.e. water surface, bottom, pycnocline, or terminal stratified level) or **lateral (bank)** boundary.[45]

In fact, The Author's Note at the beginning of the CORMIX User Manual emphasizes that the model has been specifically designed to address these plume interactions with channel bottoms or banks. It states

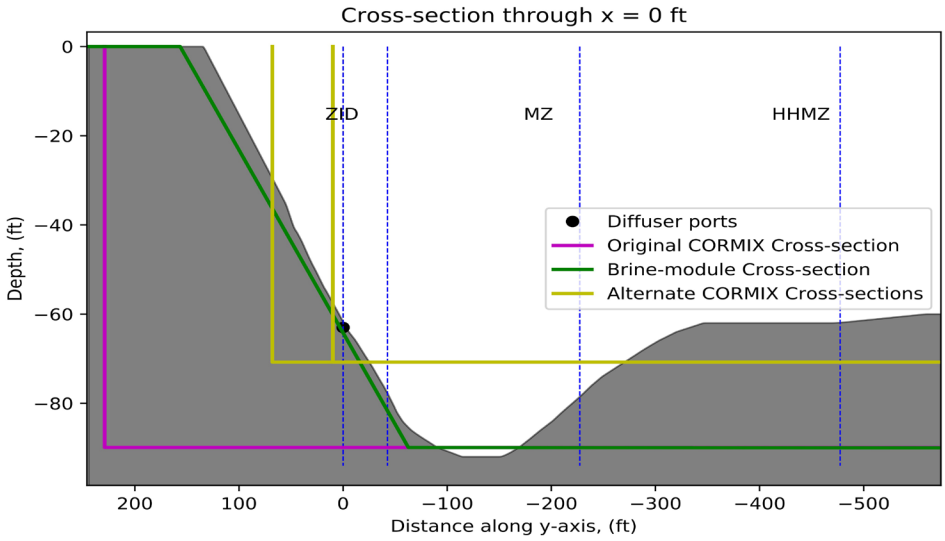
> CORMIX is broadly accepted as an easy-to-use yet powerful tool for accurate and reliable point source mixing analysis. . . **Because of its ability to simulate details**

[45] Ex. ED-5 Remand, p. 0021 (Emphasis added).

of plume boundary interaction, important for ecological and human health risk assessment, CORMIX is recognized by regulatory authorities in all continents for environmental impact assessment.[46]

It is only reasonable for the PAC's experts to have looked at plume interaction with the bank given the location. How can there not be such interaction, unless the outfall is going to be well above the bank, well above the 65 or 64-foot depth. And the Port claims it will be at such a location. So, PAC's experts have run the model for reasonable different DISTBs. And PAC's experts have proven that if the outfall is even close to the bank there will be plume interaction that will results in this worse mixing. At a minimum, their modeling showed that the ED's modeling is not conservative. The ALJs have accepted the ED's position that it can simply ignore the plume-bank interaction.

Figure 5 below makes that even clearer, showing how the Port, the ED and PAC schematized the channel. This is one of the figures from Dr. Socolofsky's testimony in which he has a number of figures, depending upon the DISTB: [47]



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The vertical line at 0 along the bottom of the figure is the location of the outfall with relationship to the bank at the latitude and longitude. It is shown at 65 feet by the dot on the green dotted line. The vertical and horizontal purple lines show the ED and Port's

[46] Ex. ED-5 Remand, p. 0007 (Emphasis added).
[47] The figures are from page 10 of Exhibit PAC-51R SS-6.

schematizations – with a 90-foot depth and 229 feet to the bank. Their approach assumes all of the gray area to the left of the 0 line is water, not land. They maximize the ability of the effluent plume to expand and mix.

The yellow vertical and horizontal lines are Dr. Socolofsky's schematization with a depth of 70 feet and one vertical line at 0, the latitude and longitude of the outfall in the application. There is also a yellow vertical line at about 60 feet to the left. Dr. Socolofsky modeled a number of possible vertical lines as banks between these two vertical yellow lines to get an idea of what happens if the model is run with different conditions/locations.

At the 0 distance, which allows the plume to hit the bank immediately, the CORMIX model predicts the percentage of effluent to be 55% at the ZID, 40% at the ALMZ and 24% at the HHMZ. Those figures are also the CORMIX predictions of mixing as far out as 10 meters. At about 15, 20 and 45 feet separation of the bank and the outfall, the model predicts about 30%, 20% and 17% of the effluent still remaining in the plume at the boundary of the mixing zone. The separation needs to be about 60 feet for the model to produce figures similar to those of the Port and ED.

And then there is the cove with sides wrapping around the outfall location creating more boundary interactions. Dr. Socolofsky has also proven that the path the CORMIX model predicts for the plumes under the majority of tidal conditions means the plume would have to go underground and through the sides of the cove to get to the boundaries of the mixing zones where the CORMIX model predicts. If they move in a different path, as they have to do, the model cannot predict the mixing at any of the boundaries.

2. <u>The far field modeling with SUNTANS.</u> It is also clear in the record that there will be far field impacts of the discharge; significant salinity layers on the bottom of the channel bottom a kilometer or two away from the outfall. The CORMIX model predicts them, and even the Port's desalination expert Dr. Jones agrees.

The ED requested evaluations of the impacts of the discharges over distance. The water quality standards require maintenance of salinity gradients and a careful consideration of potential impacts on such gradients.

The salinity gradients are not maintained in the far field until the effluent gets well away from the discharge. Moreover, the salinity layers of the bottom of the ship channel were never evaluated as part of the antidegradation evaluation or otherwise for their impacts on the salinity gradient. There was clearly no careful consideration.

The Port relies on its modeling with the SUNTANS model, a model developed for oil spills, with oil lighter than water. Its results are the same as if one took the effluent and mixed it instantaneously with all of the water in the whole Corpus Christi Bay system, showing there will be no or very little impact on changes in salinity. But that approach is not realistic here where the CORMIX model shows that the salinity gradients are changed significantly in the far field with bottom layers of higher salinity than the ambient water for at least a kilometer from the outfall, possibly a mile.

And in the ship channel, where about of half of the channel is dredged, there are significant benthic fauna, bottom-living creatures, from the microscopic to oyster and other fish and shellfish that cannot move easily when covered by a brine layer. It is in this area, away from the near field but not all the way to the large bays in this system, that CORMIX predicts layers of higher salinity on the bottom of the channel. That is the result of the modeling with CORMIX by the ED!

Not surprisingly, the Port and ED disagree with their own CORMIX results for the far field, while defending their CORMIX results close to the outfall and unassailable. The ED's modeling even shows that these bottom layers of higher salinity begin within the HHMZ and for some conditions within the ALMZ. That is, the plumes of effluent collapse, fall onto a bank or bottom of the channel, create layers that can be several feet thick and have salinity levels above the 2 ppt levels. And the model predicts, as it should, that once plumes are bottom layers, they do not easily mix. Here the can flow out for a kilometer.

And this is what even the Port's expert Dr. Jones testified would happen. Under cross examination, he agreed that the CORMIX model correctly predicted these brine layers on the bottom out to a kilometer or more. Dr. Socolofsky's modeling showed them out farther and he testified the layers could be out a mile from the outfall. Both Dr. Socolofsky and Dr. Jones testified that the CORMIX modeling for such distances better

predicts mixing and layer creation than the SUNTANS model, which predicts no such bottom layers.

And, of course, no one with the Port or ED addressed the issue of how such layers could be shown to have maintained the salinity gradient even if the concentration of salinity over ambient dropped below 2 ppt. There was certainly no "careful consideration." These layers were not discussed in the ED's modeling reports or available to Mr. Schaefer for his antidegradation evaluation. There is no mention of them by Mr. Schaefer, as he simply accepted the results of the SUNTANS modeling.

And it is not just the salinity levels that are of concern. As Dr. Esbaugh explained in the first hearing, the resulting low dissolved oxygen levels caused by higher salinity levels in such bottom layers can also adversely affect species on the bottom - mussels, clams, oysters, and many benthic species. Yet the Port and ED ignored the potential impacts, relying on the SUNTANS modeling to say there would be no such bottom layers anywhere, not even in the mixing zones, where Dr. Furnans agreed the SUNTANS model provides no predictions of such layers. The model is set up to assume complete mixing of the brine throughout the mixing zones and well beyond, as the initial cell covers an area bigger than all of the mixing zones.

C. ISSUE H. WHETHER THE EXECUTIVE DIRECTOR'S ANTIDEGRADATION REVIEW WAS ACCURATE.

There are three overriding criticisms of the antidegradation review conducted by Mr. Schaefer. The criticisms are: (1) while he claimed it was the result of a "weight of the evidence" analysis, he never described what was entailed in such an analysis and his selection of data to be weighed in the analysis was intentionally skewed to omit important data presented by permit opponents; (2) he was unable to define specific regulatory terms, such as "*de minimis*" and "salinity gradient," for which definitions would be necessary, if one were to undertake an antidegradation review for a saline discharge; (3) he relied in part on Dr. Furnans' "salt flux" calculation, for which the theoretical validity was never explained and which, because of a math error, underestimated by a factor of 10 the salt flux from the Port's discharge.

As an initial matter and prior to turning sequentially to the three criticisms just summarized, the limited value of the *Implementation Procedures*[48] (IPs) in guiding antidegradation analyses has to be recognized. The IPs provide very little guidance.

The PFD on remand recites, on page 42, without criticism, Mr. Schaefer's testimony that he is able, by following the guidance in the IPs, to ensure no more than *de minimis* degradation results from the Port's discharge. But, as a legal and practical matter, following a process does not, alone, ensure a lack of *de minimis* or greater degradation. There is a substantive, not a procedural, regulatory standard that must be met. We should be clear, also, however, that the IPs do not actually set forth a process for conducting an antidegradation analysis.

The IPs include a chapter on antidegradation.[49] At page 63, the IPs begin a section captioned "Evaluating the Potential for Degradation of Water Quality." Here, the IPs provide a baseline water quality date for degradation analysis (November 28, 1975), direct that a screening process be the initial step in an antidegradation analysis and refer the reader to three other sections of the IPs: "Determining Water Quality Uses and Criteria," on page 14, "Evaluating Impacts on Water Quality," on page 20, and "Toxic Pollutants," on page 130.

"Evaluating Impacts on Water Quality" is the most potentially-useful guidance for how to conduct an antidegradation analysis. But, when one reviews that section, one learns only that the staff will review all available information, will consider impacts on endangered species consistently with an EPA MOA, and will consider receiving water TMDLs and WLEs, if any. The guidance devotes some pages to endangered species, to bacteria, to nutrients, and, in two paragraphs, to "Other Applicable Rules." The IPs provide no guidance on how to conduct an antidegradation review in a marine environment, where the pollutant is, itself, a saline brine. (To be completely fair, the IPs provide a screening procedure for total dissolved solids and comment that: "Even though salinity criteria have not been established, the absence of numerical criteria does not preclude evaluations and

[48] Ex. ED-6 R.
[49] *Id.,* beginning on p. 55.

regulatory actions based on estuarine salinity. Careful consideration is given to all activities that may detrimentally affect estuarine salinity gradients."[50] That is not much of a process description.)

Weight of the evidence methodology:

The ALJs assert[51] that Mr. Schaefer was not required to follow EPA's weight-of-the-evidence methodology. That argument rebuts a position Protestants never took. Protestants have not argued Mr. Schaefer had to use EPA's methodology. They have argued he did need to have some articulatable set of steps for what he characterizes as a "weight of the evidence" methodology, and the EPA methodology is a thoughtful example of such set of steps.

The ALJs appear to agree[52] that Mr. Schaefer is required to follow TCEQ's weight-of-the -evidence methodology. When asked in hearing if there is agency guidance regarding its weight-of-the-evidence methodology, Mr. Schaefer replied that "there is little guidance in that regard."[53] The ALJs find that the fact the methodology is not clearly set out does not call into question Mr. Schaefer's analysis. That is a difficult argument to sustain: one should follow TCEQ's methodology, but there is very little guidance about what that methodology is. What are the steps one should follow?

The ALJs do not dispute that Mr. Schaefer never described the steps of his "weight of the evidence" methodology. Instead, they say he testified he did certain things, things that one might infer (though Mr. Schaefer never said so) were the outset of a methodology. Those things were: he determined from Ms. Cunningham's critical conditions memo the percentage of effluent at the edge of the aquatic life mixing zone; he calculated the salinity at that point based on Dr. Tischler's memo to Sarah Garza;[54] and he compared that salinity to something.[55] He did not testify what role these actions played in his execution of the weight-of-the-evidence methodology, what was the evidence those actions led to, what

[50] *Id.,* p. 174. *See, also*, p. 180.
[51] PFD, pp. 48-49.
[52] PFD, top of p. 49.
[53] Tr. Vol. 9, p. 2359:13-16.
[54] Ex. AR-R4 (Admin Record – Remand Tab I) p. 247 (likely, specifically, at p. 253).
[55] Tr. Vol. 9, p. 2359:24 through 2360:15.

were the other pieces of evidence he weighed, or how the various pieces of evidence were weighted or valued vis-à-vis one another.

The ALJs indicate he was "cut off" at the point where he was about to explain to what he compared the salinity at the mixing zone boundary. The record shows that is not an entirely accurate way to describe what occurred. A truly neutral way to characterize the Q and A at this point would be to note that he was asked, here, why he relied exclusively on Dr. Tischler's modeling results, disregarding the Dr. Socolofsky and Mr. Osting modeling results. In any event, the witness's counsel had the unrestricted opportunity to ask him on re-direct examination to complete his thought regarding to what the salinity at the boundary was compared and what other evidence was also weighed and how heavily he weighed the various pieces of evidence – but, the ED's counsel did not take this opportunity.

Mr. Schaefer's antidegradation analyses ignored the CORMIX modeling presented by the Protestants. (Q: "You did not consider the salinity concentrations projected by Dr. Socolofsky or Dr. Osting, correct?" A: "Correct.").[56] The ALJs argue[57] this is permissible, because he relied on information from sources he knew. This defense is based on the premise that the source of the data and not the data or its means of creation determines the value of the data. This premise is false. A regulator acts arbitrarily. if (in this instance) he disregards without explanation any seemingly relevant data.

he ALJs argue his use of the data depended on the value of the data, apparently implying that the data of Dr. Socolofsky and Mr. Osting were low-quality data. When asked how he could accept only data from one side of the argument, what Mr. Schaefer actually said was: "It depends on the -- it depends on the, I don't want to say integrity. That sounds wrong. But depends on the value of that data." Mr. Schaefer never explained why he thought data from PAC's experts were of low quality and, indeed, he only actually insinuated that those data were of low quality. All the record evidence shows is that he rejected the Protestants' modeling data because it did not come from sources, *i.e.,* the staff

[56] Tr. Vol. 9, p. 2361:2-5.
[57] PFD on Remand, p. 48.

and, apparently, Dr. Tischler, he knew well. The ALJs argue it was within Mr. Schaefer's discretion to heavily discount data from "outlier" CORMIX modeling runs. But, Mr. Schaefer did not characterize the Socolofsky and Osting CORMIX runs as "outliers,"[58] and he did not just heavily discount their runs, he discounted all of Dr. Socolofsky's and Mr. Osting's runs to "zero." ("You discounted it to zero, right?" "That's right.")[59]

1. Failure to understand regulatory standards

De minimis degradation:

Before the quality of waters such as those of the Corpus Christi ship channel may be lowered by a wastewater discharge, regulation requires a showing that the lowering is necessary for important economic or social development, unless the lowering is of a *de minimis* or less extent and is not to the extent that an existing use is impaired.[60] The Port was allowed to forego a showing of necessity for important economic or social development, because Mr. Schaefer found the lowering of water quality would be *de minimis* or less.

The ALJs acknowledge, as did Mr. Schaefer, that he used no *de minimis* definition in conducting his antidegradation review. ("And, do you have a definition of *de minimis* that you used in your review?" "No. I don't.")[61] The ALJs, however, argue[62] that a general understanding of the "*de minimis*" concept is all one must have to enforce this regulatory standard, and Mr. Schaefer allegedly had such an understanding.

It is heretical to argue that a general understanding of a regulatory concept is a sufficient basis on which to find compliance with a regulatory standard. It essentially concedes the regulator is not an expert but has only a minimal ability to adequately do the job. This is not what is expected for environmental permitting reviews. In any event, Mr.

[58] The entire concept of "outlier" modeling is difficult in this case. For example, the so-called not-outlier modeling assumes a vertical bank 229 feet north of the diffuser, which is plainly unrealistic. It ignores the interactions of the effluent plume with the sides of the elevated groins that partially enclose the diffuser. Indeed, it ignores entirely the non-uniformity of the channel floor and of the water flows in the channel. The non-outlier modeling badly outlies reality.
[59] Tr. Vol. 9, p. 2361:22-23.
[60] 30 TAC § 307.5(b)(2).
[61] Tr. Vol. 9, p. 2384:9-11.
[62] PFD, pp. 46-47.

Schaefer did not claim a general understanding of the *de minimis* concept. When asked, at hearing, how he made the *de minimis* finding, given the absence of a definition, he did not lay out even a concept of what *de minimis* degradation would be. Instead, he fell back on his undefined weight-of-evidence methodology, "It's difficult for narrative criteria when we don't have numeric numbers to push around, and, so, it's this weight of evidence approach that we've been talking about."[63]

At hearing, he followed the just-quoted response by saying he had an idea, apparently prompted by the "Texas Water Development Board" study[64] that turned on examining the tolerances of certain species (it appears he looked primarily at red drum) to salinity concentrations. He testified, initially, that he calculated the percentage effluent[65] to be expected at the edge of the aquatic life mixing zone. Shortly later,[66] he testified he took the effluent percentage at the edge of the aquatic life mixing zone from the critical conditions memo. In any event, he testified he looked at the SUNTANS far-field modeling, looked at some whole effluent toxicity testing results, and looked at some information from Dr. Nielsen. Then, he determined by an undescribed method that the salinities at the edge of the mixing zone would be within the tolerance range of the red drum. His testimony is very unclear as to the logic of his analysis, but, it is clear that he is not addressing the level at which the change in the salinity gradient exceeds *de minimis*. At the most, this explanation could be argued to support a Tier 1 antidegradation finding, *i.e.,* existing uses (by red drum) will not be impaired.

At hearing, Mr. Schaefer's re-direct testimony addressed antidegradation only in respect to the reason the agency never finds more than *de minimis* degradation. Mr. Schaefer's prefiled direct testimony includes three pages[67] of uninterrupted narrative about antidegradation analyses, but, in describing the step to evaluate the discharge's impacts on water quality, he offers no standard for determining the *de minimis* or otherwise

[63] Tr. Vol. 9, p. 2384:14-17.
[64] Ex. PAC-85R. This is actually a 1989 UT Marine Science Institute study submitted to the Texas Water Development Board, and it is Part II of that study that addresses Red Drum larvae salinity tolerances.
[65] Tr. Vol. 9, p. 2385:1-2.
[66] Tr. Vol. 9, p. 2385:23-24.
[67] Ex. ED-PS-1 Remand, pp. 25-27.

extent of changes in salinity concentrations or gradients. He recites the IP's rule of thumb regarding 10% of assimilative capacity, but he acknowledges that calculation requires numeric criteria, and there are no numeric criteria for salinity or salinity gradients. He references Dr. Furnans' flawed salt-flux calculation, but he does not explain how that calculation, even if done correctly, informs a decision as to whether or not salinity concentrations or salinity gradients are changed by more than a *de minimis* extent. He recites some calculations regarding zones of passage under various ambient flow conditions, but does not tie those to any type of *de minimis* standard. He briefly discusses the Port's WET testing results. He acknowledges what he characterizes as a worst-case salinity concentration of 45 parts per thousand in the ZID. And he concludes with the statement, "all this information informed the antidegradation review to conclude... that degradation would not occur..." He does not testify how the conclusion was reached, how the miscellaneous facts show a regulatory standard was reached. A couple of pages later,[68] he testifies he performed a Tier 2 antidegradation review, but he provides no further details about that review.

Salinity gradients:

The Texas Surface Water Quality Standards provide that salinity gradients in estuaries must be maintained to support attainable estuarine dependent aquatic life uses. Though there are no numerical salinity criteria, the 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.[69]

The ALJs, as they did for the *de minimis* degradation analysis, argue that Mr. Schaefer would have the necessary knowledge to find that the regulatory standard for salinity gradients will be maintained, so long as he has a general understanding of the concept of a salinity gradient. The issue arises, because, in deposition, Mr. Schaefer was asked, "Can you define for me what a salinity gradient is?" And, he responded, "I don't

[68] Ex. ED-PS-1 Remand, p. 29:18-24.
[69] 30 TAC § 307.4(g)(3).

know what, you know, the precise definition is." And, when asked in hearing about the deposition exchange, he confirmed that "I don't know the precise definition, no, sir."[70] He thought the time over which a change in salinity occurs "could" be part of the "gradient" definition, but he was not sure.[71] Slightly earlier, he had testified, "I could give you a definition from -- just from the head, so to speak."[72] However, he did not provide even a "from the head" definition, and he was not asked to do so by agency or Port counsel. His prefiled direct testimony, which was prepared after his deposition had been taken, provided no "gradient" definition.

It simply is not reasonable to argue that a witness can credibly find compliance with a regulatory standard, if the witness cannot articulate precisely what the standard is. This is particularly true in a regulatory context, where time is not of the essence and access to technical resources is virtually unlimited.

2. The Furnans salt flux evidence and Mr. Schaefer's antidegradation review.

The ALJs are tasked with being fact-finders, -- fact-recommenders, anyway. They found the incontrovertible fact that 95.6 million gallons per day is 361,781 cubic meters per day. They found that Dr. Furnans, in making his salt flux calculations, had mistakenly assumed 95.6 million gallon per day was 31,216.86 cubic meters per day. They found this mistake, roughly a factor of 10, led to a factor of 10 undercalculation of the mass of salt discharged at the diffuser in a day.[73] But, citing "lack of evidence," they were unable to find that Dr. Furnans' ratio of the mass of salt through the diffuser in a day to the mass of salt otherwise through the plane of the diffuser in a day was, also, under calculated by roughly a factor of 10.[74]

This inability is inexplicable. Dr. Furnans' exhibit (APP-JF-3-R) plainly, but incorrectly, shows a daily salt mass through the diffuser of 2,488,235.61 kilograms. It plainly shows a daily salt mass without the diffuser but through the diffuser plane (under

[70] Tr. Vol. 9, p. 2349:12-21.
[71] Tr. Vol. 9, p. 2349:22 through p. 2350:6.
[72] Tr. Vol. 9, p. 2349:10-11.
[73] PFD on Remand, p. 50, first full paragraph.
[74] PFD on Remand, p. 51, first full paragraph.

the low-flow and low-ambient-salinity conditions) of 398,260,800 kilograms. The ratio of these two numbers is 0.0062, or 0.62%. This is the Dr. Furnans salt-flux percentage relied upon by Mr. Schaefer in his antidegradation analysis. Inasmuch as Dr. Furnans' numerator was low by a factor of roughly 10, his ratio will be roughly 10x higher, when the numerator is corrected.

The ALJs seem galled that Protestants did not brief this error until their response arguments**. <u>Protestants did not discover the error until they were preparing their response brief</u>**. Protestants, like everyone else, just assumed a person of Dr. Furnans' education backed by the resources of the Port and a multi-state consulting firm would be unlikely to make and allow an uncorrected a conversion error of this magnitude. There is absolutely no evidence – and it is not, in fact, the case – that Protestants knew of this error at a time earlier than briefing their responsive arguments. Given Protestants' early forthcoming revelations of modeling errors in this case (beginning in May of 2020 with Ms. Cunningham's errors regarding mixing zone dimensions), it is not reasonable to raise the specter that Protestants sat until near the end on a known error in Dr. Furnans' salt-flux analysis and, further, to fault them for failing to cross-examine him regarding the at-that-time undiscovered error.[75] As a procedural matter, the fact of the error was raised while the record remained open.[76]

The ALJs lament that "as these issues [one of which as the salt-flux math error] were not raised until PAC's reply brief, no other party addressed them" and that the ALJs' "inability to determine the significance of the error is compounded by PAC's raising the issued for the first time in its reply brief."[77] Of course, the fact is that any party could have moved to file a reply (or, sur-response) brief, and the ALJs could have asked for additional briefing.

The ALJs conclude their support of the agency's antidegradation review by saying that "6.2% of the mass of salt flowing through an area smaller than the HHMZ does not

[75] *See,* PFD on Remand, pp. 49 (twice), 51, 52 ("first time in its reply brief") and 52 ("chose not to cross-examine him").
[76] ALJs' Order No. 16, p. 4.
[77] PFD on Remand, pp. 49 and 51.

seem to result in degradation…."[78] Mostly, this argument is unpersuasive, because it is a fact-finding by the ALJs, who, however bright, lack the technical expertise to make such a finding. This is not a situation in which one qualified expert opined that a 6.2% salt-flux change makes a non-*de minimis* difference and another qualified expert opined that it did not make such a difference. This is just the ALJs starting from a blank slate and wondering what 6.2% might mean.

Mr. Schaefer's view[79] in prefiled direct testimony was that a 1% increase in the mass of salt at the diffuser location supported his weight of the evidence antidegradation conclusion. His later August 19, 2021 permit review worksheet[80] was to the same effect: "The [Furnans] results indicate that at the most extreme conditions, the mass of total salt would increase by less than 1% at the diffuser location. Thus, indicating that the discharge of brine as proposed would not constitute degradation of the receiving waters with respect to salts." Mr. Schaefer was clearly looking at the worst-case scenario, not some less-conservative scenario, and he did not offer any opinion as to the relevance of mass increases above 1% or that would exist under other flow conditions.

(The ALJs' reference to the human health mixing zone is not helpful. As further explained in the note below,[81] the relevant area, *i.e.,* the vertical area, of the HHMZ is roughly 2/3s the relevant cross-section of the ship channel, so an area could be smaller than the HHMZ area and still be a large area.)

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[78] PFD on Remand, p. 51.

[79] Ex. ED-PS-1-Remand, p. 26:28-32.

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

[81] Conceptually, the ambient salt flux would move through the roughly N-S cross-sectional area of the channel that includes the diffuser. This is, per Dr. Furnans' exhibit (APP-JF-3-R), 6,146 square meters. The HHMZ has, per Ms. Cunningham's "reviewed" diffuser report (Ex. AR-R5 (Admin Record – Remand Tab J) p. 137 at 138), a roughly N-S width of 145.5 meters; its height would be the depth of the channel at the location of the diffuser, which Ms. Cunningham fixes at approximately 90 feet or 27.44 meters. So, at the location of the diffuser, the HHMZ vertical cross-sectional area is roughly 145.4m x 27.44m = 3,992.5 square meters. This is roughly 2/3s of the full channel cross-section. As one moves down gradient, the sizes of these cross-sections change, because the width and depth of the channel change. In the vertical N-S plane that includes the diffuser, the area of the discharge is tiny, but the effluent plume expands outward downgradient from the discharge point.

D. ISSUE I. WHETHER THE DRAFT PERMIT INCLUDES ALL APPROPRIATE AND NECESSARY REQUIREMENTS.

The ALJs correctly recommended the additional limit and monitoring for salinity increases, noting that without these additions the permit would not be protective. It would not include all appropriate and necessary requirements.[82]

The legal basis for this is in the water quality standards which require that any permit:

> maintain the salinity gradient to support attainable estuarine dependent aquatic life uses. … [C]areful consideration must be given to all activities that may detrimentally affect salinity gradients."[83]

The strongest support factually for the recommendation are the recommendations in the comments by TPWD and those in the joint report on seawater desalination by TPWD and GLO.[84]

VI. FINDINGS OF FACT AND CONCLUSIONS OF LAW

Attachment 6 provides the recommendations of the Protestants Kings and Steves for changes to the proposed findings of fact and conclusions of law filed with the PFD on remand. The changes are provided in a redline strikeout format with most of the findings and conclusions that do not need revision not included in the document.

VII. CONCLUSION

The Port has not met its burden of proof. The permit must be denied.

Respectfully submitted,

/s/ Richard Lowerre
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[82] Finding of Fact No. 122 and Conclusion of Law No. 22 (Findings of Fact and Conclusions of Law, pp. 13 and 16).
[83] 30 TAC § 307.4(g)(3).
[84] Ex. PAC-7.

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ATTORNEYS FOR PROTESTANTS

CERTIFICATE OF SERVICE

I hereby certify that, on July 11, 2022, a true and correct copy of the foregoing document has been served on all parties to this case, in accordance with the applicable service procedures.

/s/ Richard Lowerre

ATTACHMENT 1

Case	ZID %	MZ %	HH %	Eff Flowrate (MGD)	Ambient Velocity (m/s)	Sal Ambient	Sal Effluent	Sal ZID	Sal MZ	Sal HH	Sal Dif ZID	Sal Dif MZ	Sal Dif HH	Sal % above ZID	Sal % above MZ	Sal % above HH
S_40_a	14.6	8.9	5.2	95.6	0.8	29.93	46.8	32.39	31.43	30.81	2.46	1.50	0.88	8%	5%	3%
S_40_b	14.6	8.9	5.2	95.6	0.8	40.57	59.7	43.36	42.27	41.56	2.79	1.70	0.99	7%	4%	2%
S_40_c	14.6	8.9	5.3	95.6	0.8	29.93	46.8	32.39	31.43	30.82	2.46	1.50	0.89	8%	5%	3%
S_40_d	14.6	8.9	5.2	95.6	0.8	40.57	59.7	43.36	42.27	41.56	2.79	1.70	0.99	7%	4%	2%
W_40_a	14.6	8.9	5.4	95.6	0.8	23.24	35.9	25.09	24.37	23.92	1.85	1.13	0.68	8%	5%	3%
W_40_b	14.6	8.9	5.2	95.6	0.8	33.20	51.6	35.89	34.84	34.16	2.69	1.64	0.96	8%	5%	3%
W_40_c	**14.6**	**8.9**	**5.4**	**95.6**	**0.8**	**23.24**	**35.9**	**25.09**	**24.37**	**23.92**	**1.85**	**1.13**	**0.68**	**8%**	**5%**	**3%**
W_40_d	14.6	8.9	5.2	95.6	0.8	33.20	51.6	35.89	34.84	34.16	2.69	1.64	0.96	8%	5%	3%
S_50_a	14.6	8.9	5	83.1	0.8	29.93	53.9	33.43	32.06	31.13	3.50	2.13	1.20	12%	7%	4%
S_50_b	14.6	8.9	5	83.1	0.8	40.57	68.7	44.68	43.07	41.98	4.11	2.50	1.41	10%	6%	3%
S_50_c	14.6	8.9	5	83.1	0.8	29.93	53.9	33.43	32.06	31.13	3.50	2.13	1.20	12%	7%	4%
S_50_d	14.6	8.9	5	83.1	0.8	40.57	68.7	44.68	43.07	41.98	4.11	2.50	1.41	10%	6%	3%
W_50_a	14.6	8.9	5.1	83.1	0.8	23.24	41.2	25.86	24.84	24.16	2.62	1.60	0.92	11%	7%	4%
W_50_b	14.6	8.9	5	83.1	0.8	33.20	59.4	37.03	35.53	34.51	3.83	2.33	1.31	12%	7%	4%
W_50_c	14.6	8.9	5.1	83.1	0.8	23.24	41.2	25.86	24.84	24.16	2.62	1.60	0.92	11%	7%	4%
W_50_d	14.6	8.9	5	83.1	0.8	33.20	59.4	37.03	35.53	34.51	3.83	2.33	1.31	12%	7%	4%
S_50_a_95	14.6	8.9	5.1	95.6	0.8	29.93	53.9	33.43	32.06	31.15	3.50	2.13	1.22	12%	7%	4%
S_50_b_95	**14.6**	**8.9**	**5.1**	**95.6**	**0.8**	**40.57**	**68.7**	**44.68**	**43.07**	**42.00**	**4.11**	**2.50**	**1.43**	**10%**	**6%**	**4%**
S_50_c_95	**14.6**	**8.9**	**5.1**	**95.6**	**0.8**	**29.93**	**53.9**	**33.43**	**32.06**	**31.15**	**3.50**	**2.13**	**1.22**	**12%**	**7%**	**4%**
S_50_d_95	14.6	8.9	5.1	95.6	0.8	40.57	68.7	44.68	43.07	42.00	4.11	2.50	1.43	10%	6%	4%
W_50_a_95	14.6	8.9	5.1	95.6	0.8	23.24	41.2	25.86	24.84	24.16	2.62	1.60	0.92	11%	7%	4%
W_50_b_95	**14.6**	**8.9**	**5.1**	**95.6**	**0.8**	**33.20**	**59.4**	**37.03**	**35.53**	**34.54**	**3.83**	**2.33**	**1.34**	**12%**	**7%**	**4%**
W_50_c_95	14.6	8.9	5.2	95.6	0.8	23.24	41.2	25.86	24.84	24.17	2.62	1.60	0.93	11%	7%	4%
W_50_d_95	**14.6**	**8.9**	**5.1**	**95.6**	**0.8**	**33.20**	**59.4**	**37.03**	**35.53**	**34.54**	**3.83**	**2.33**	**1.34**	**12%**	**7%**	**4%**
W_40_c_strat	14.6	8.9	5.4	95.6	0.8	23.24	35.9	25.09	24.37	23.92	1.85	1.13	0.68	8%	5%	3%
S_40_c_strat	14.6	8.9	5.2	95.6	0.8	29.93	46.8	32.39	31.43	30.81	2.46	1.50	0.88	8%	5%	3%
S_40_c_strat_2	14.6	8.9	5.3	95.6	0.8	29.93	46.8	32.39	31.43	30.82	2.46	1.50	0.89	8%	5%	3%
W_40_c_05	4.6	3.3	2.6	95.6	0.05	23.24	35.9	23.82	23.66	23.57	0.58	0.42	0.33	3%	2%	1%
W_40_c_06	4.8	3.5	2.8	95.6	0.06	23.24	35.9	23.85	23.68	23.59	0.61	0.44	0.35	3%	2%	2%
W_40_c_08	12.8	6.6	4.2	95.6	0.08	23.24	35.9	24.86	24.08	23.77	1.62	0.84	0.53	7%	4%	2%
W_40_c_09	12	7	4.4	95.6	0.09	23.24	35.9	24.76	24.13	23.80	1.52	0.89	0.56	7%	4%	2%
W_40_c_1	12.3	7.4	4.6	95.6	0.1	23.24	35.9	24.80	24.18	23.82	1.56	0.94	0.58	7%	4%	3%
W_40_c_2	14.6	8.9	5.4	95.6	0.2	23.24	35.9	25.09	24.37	23.92	1.85	1.13	0.68	8%	5%	3%
W_40_c_3	14.6	8.9	5.4	95.6	0.3	23.24	35.9	25.09	24.37	23.92	1.85	1.13	0.68	8%	5%	3%
W_40_c_4	14.6	8.9	5.4	95.6	0.4	23.24	35.9	25.09	24.37	23.92	1.85	1.13	0.68	8%	5%	3%
W_40_c_5	14.6	8.9	5.4	95.6	0.5	23.24	35.9	25.09	24.37	23.92	1.85	1.13	0.68	8%	5%	3%
W_40_c_6	14.6	8.9	5.4	95.6	0.6	23.24	35.9	25.09	24.37	23.92	1.85	1.13	0.68	8%	5%	3%
W_40_c_7	14.6	8.9	5.4	95.6	0.7	23.24	35.9	25.09	24.37	23.92	1.85	1.13	0.68	8%	5%	3%
W_40_c_8	14.6	8.9	5.3	95.6	1	23.24	35.9	25.09	24.37	23.91	1.85	1.13	0.67	8%	5%	3%
W_40_c_9	14.6	8.9	5.3	95.6	1.2	23.24	35.9	25.09	24.37	23.91	1.85	1.13	0.67	8%	5%	3%
W_40_c_10	14.6	8.9	5.3	95.6	1.5	23.24	35.9	25.09	24.37	23.91	1.85	1.13	0.67	8%	5%	3%
W_40_c_11	14.6	8.9	5.3	95.6	1.7	23.24	35.9	25.09	24.37	23.91	1.85	1.13	0.67	8%	5%	3%
W_40_c_12	14.6	8.9	5.3	95.6	2.0	23.24	35.9	25.09	24.37	23.91	1.85	1.13	0.67	8%	5%	3%

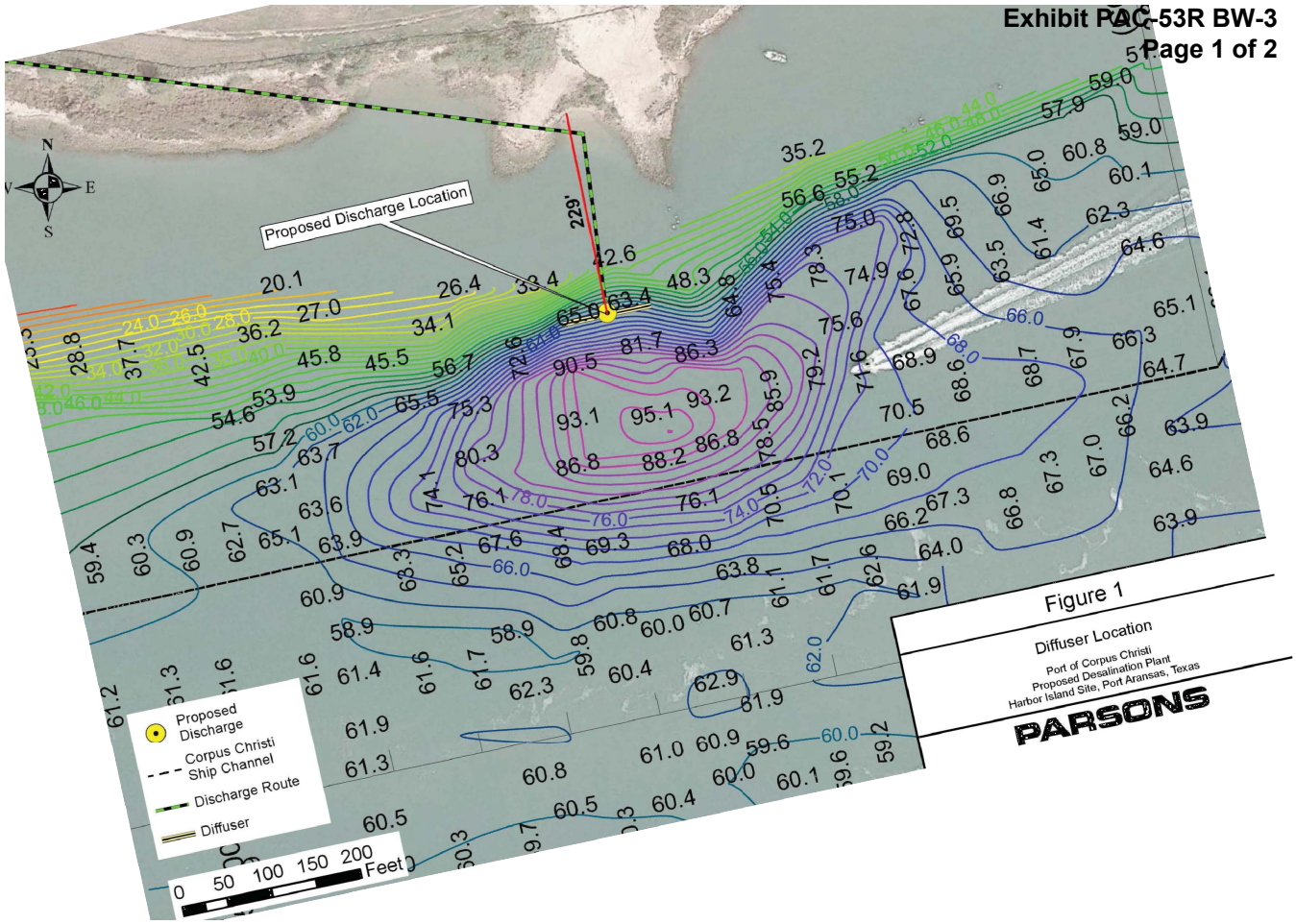
ATTACHMENT 2

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

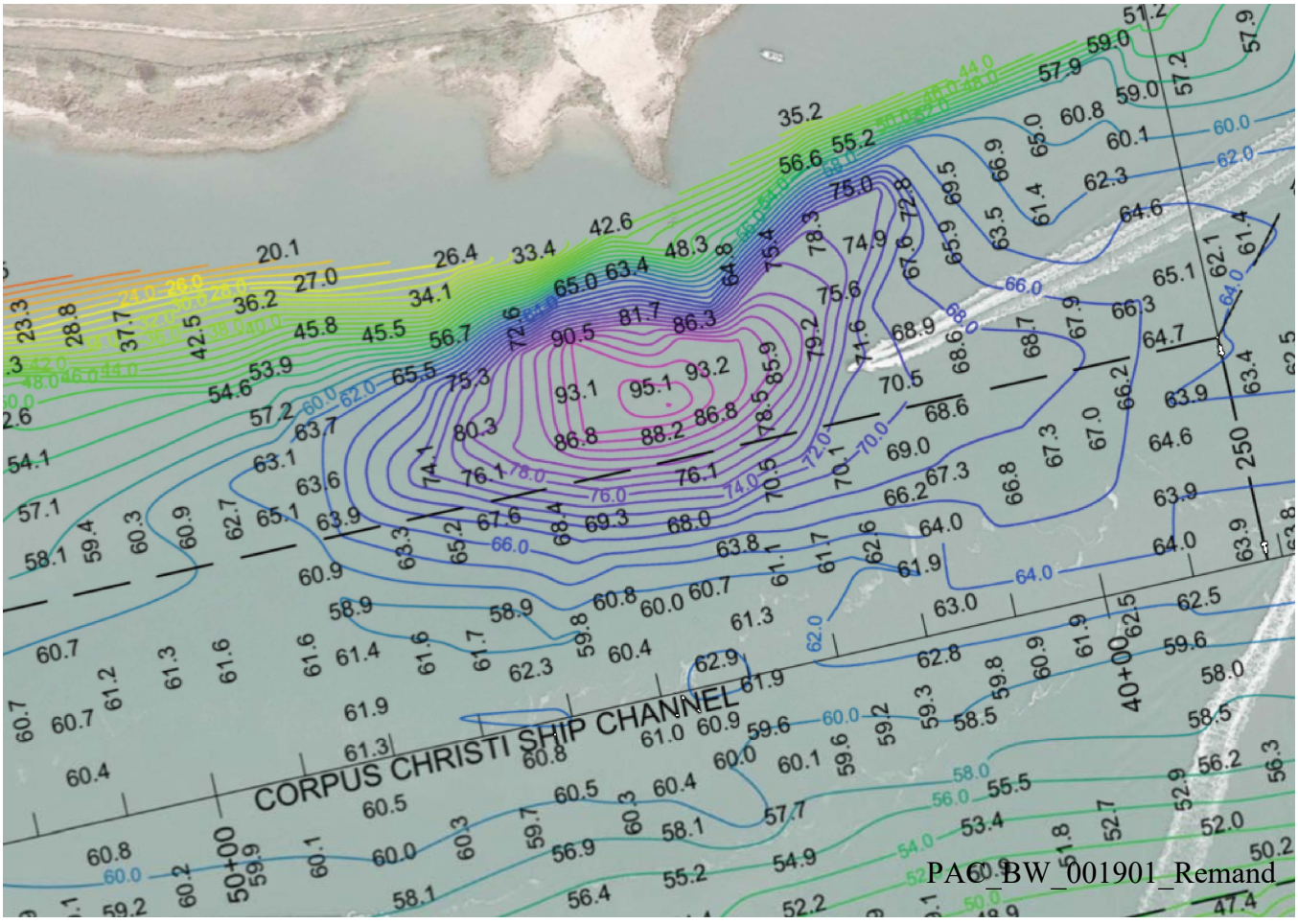
IN THE MATTER OF THE	**§**	**BEFORE THE STATE OFFICE**
APPLICATION OF PORT OF	**§**	
CORPUS CHRISTI AUTHORITY OF	**§**	**OF**
NUECES COUNTY FOR TPDES	**§**	
PERMIT NO. WQ0005253000	**§**	**ADMINISTRATIVE HEARINGS**

EXHIBIT PAC-53R BW-3

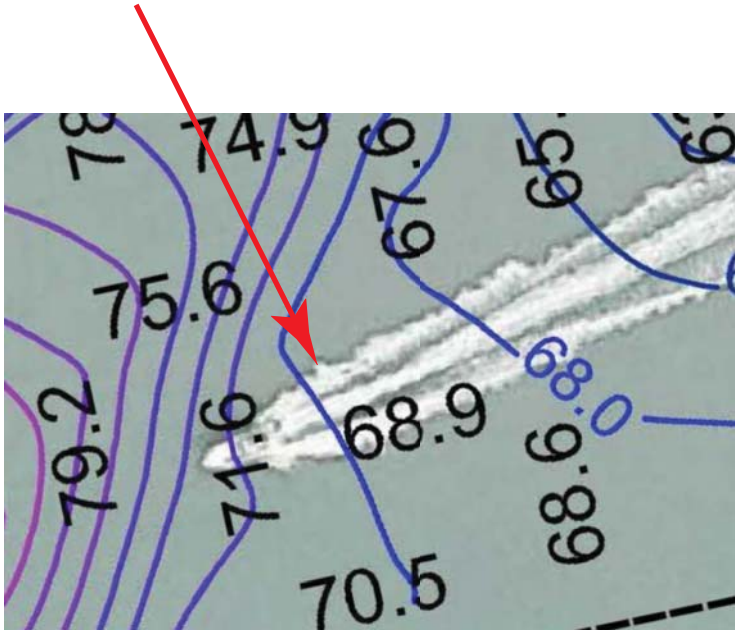
(a) Map Contours from Figure 1 of 24 Jun 2021 Tischler Tech Memo



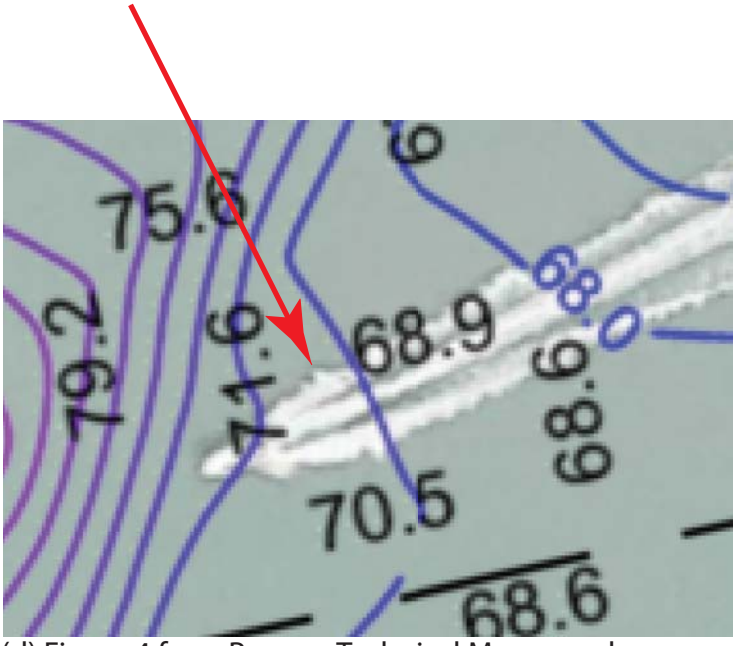
(b) Map Contours from Figure 4 of 24 Jun 2021 Parsons Tech Memorandum



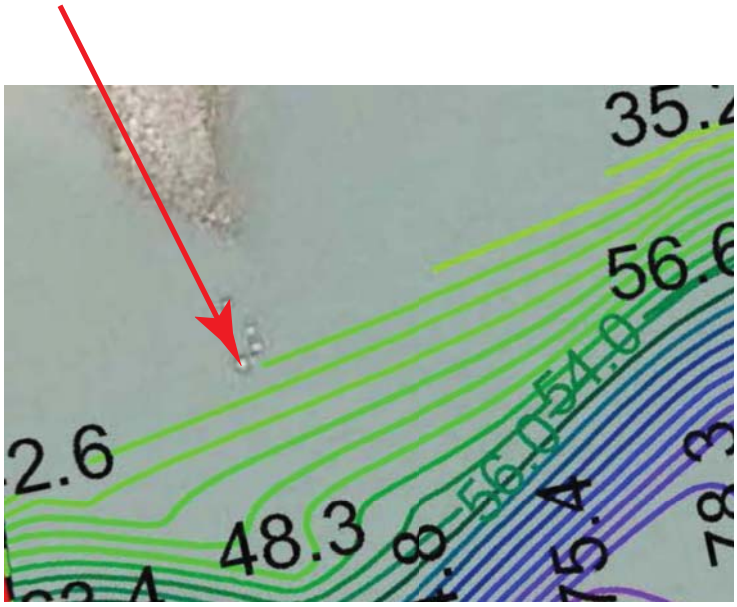
COMPARISON OF CONTOUR LOCATIONS IN MAPS FROM TISCHLER TECHNICAL MEMO AND PARSONS TECHNICAL MEMO



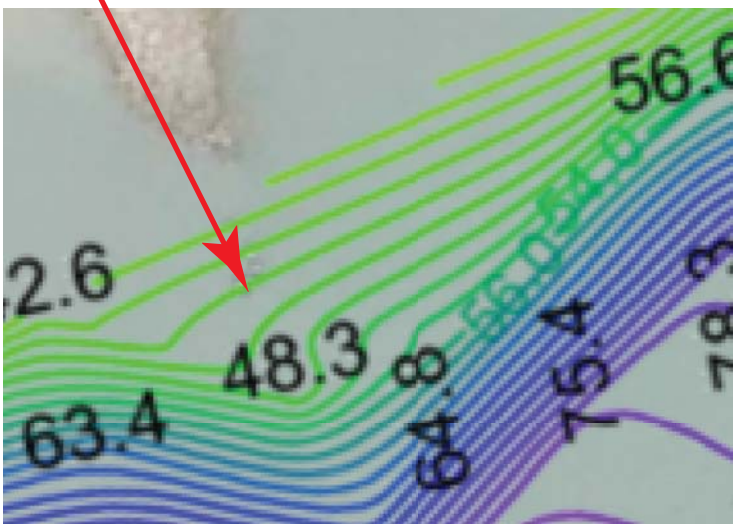
(c) Figure 1 from Tischler Technical Memo



(d) Figure 4 from Parsons Technical Memorandum



(e) Figure 1 from Tischler Technical Memo



(f) Figure 4 from Parsons Technical Memorandum

The red arrows point to the same location on the aerial images in the side-by-side comparisons. Note the diffence in contours at those points.

ATTACHMENT 3

I. SUMMARY OF EDUCATION AND EXPERIENCE.

Q. PLEASE STATE YOUR NAME, EMPLOYER, TITLE AND BUSINESS ADDRESS.

A. Scott A. Socolofsky, Professor, Zachry Department of Civil and Environmental Engineering, Texas A&M University, College Station, Texas.

Q. DO YOU RECOGNIZE THE DOCUMENT MARKED AS EXHIBIT PAC-51R SS-1?

A. Yes. This is a copy of my curriculum vitae.

Q. DOES YOUR CURRICULUM VITAE ACCURATELY DESCRIBE YOUR EDUCATION AND EXPERIENCE?

A. Yes, but it is a summary and does not show all of my work experience.

PAC offers Exhibit PAC-51R SS-1.

Q. PLEASE OUTLINE YOUR EDUCATIONAL BACKGROUND.

A. I received a bachelor's degree in Civil and Environmental Engineering from the University of Colorado, Boulder, in 1994. I received a Master's degree in 1997 and a Ph.D. in 2001, both in Civil and Environmental Engineering from Massachusetts Institute of Technology. From January 2000 to December 2001, I was a post-doctoral scholar under Professor Gerhard Jirka at the Institute for Hydromechanics, University of Karlsruhe, Germany.

Q. PLEASE DESCRIBE BRIEFLY YOUR CURRENT ROLE WITH THE TEXAS A&M UNIVERSITY'S DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING AND THE TYPE OF WORK IN WHICH YOU ARE CURRENTLY ENGAGED THAT IS RELATED TO OR A BASIS FOR YOUR OPINIONS HERE.

A. I am the J. Walter "Deak" Porter '22 and James W. "Bud" Porter '51 Chair professor in the Zachary Department of Civil and Environmental Engineering at Texas A&M University. I teach courses in the Environmental, Water Resources, and Coastal Engineering Division, which is within the department. I teach courses in environmental fluid mechanics at the

Q. WHAT ARE THE RESOURCES THAT YOU HAVE RELIED UPON IN PERFORMING YOUR WORK AND ANALYSIS?

A. I have relied largely on my own education and experience with modeling and my ability to interpret modeling results and validation. I have also relied upon the CORMIX User's Manual. I reviewed a number of journal articles on the use of the CORMIX model, behavior of desalinization brine plumes, and channel flow over stratified depressions.

I have conducted modeling with CORMIX to evaluate the modeling done by the Port and ED and to determine if there are conditions at the new location for the proposed discharge that would affect the modeling or the mixing of the effluent.

I have also relied on my education and experience developing a model similar to CORMIX and working with the SUNTANS model results for the Corpus Christi and Galveston Bays systems. I have also relied on studies of coastal waters, including evaluations of the hydrodynamics of passes, channels and related bays and estuaries. I have relied on work done by other experts who are working or have worked for PAC in this matter.

Q. WHAT DOCUMENTS DID YOU REVIEW IN PERFORMING YOUR ANALYSIS?

A. I reviewed the modeling in the Port's amended application, and that of the ED of the TCEQ, and several journal articles. I have reviewed the results of runs using the CORMIX model for the new location performed by the ED, the Port, and some of the runs by Mr. Osting. I also reviewed sections of the Port's original and amended applications, and prefiled testimony from the prior hearing and this present hearing. I reviewed the SUNTANS report by Dr. Furnans dated October 21, 2019. I reviewed work by other experts engaged by PAC on modeling and conditions near the discharge location.

Q. HAVE YOU DISCUSSED YOUR OPINIONS OR BASIS FOR THEM WITH OTHER MODELERS?

A. Yes. Joe Trungale, Bruce Wiland, Tim Osting, and Dr. Robert Doneker.

Q. HAVE YOU RELIED ON ANY OF THEIR WORK OR OPINIONS IN DEVELOPING YOUR OPINIONS?

A. Although I developed my opinions independently, I used the discussions to provide confirmation of my opinions. My discussion with Dr. Doneker is a good example of that since he is the owner of the model.

I have relied on evaluations of the discharge location identified in the application and the bathymetric and flow conditions near that location that were prepared or presented to me orally or in writing by Mr. Wiland, Mr. Osting, and Mr. Austin.

Q. HAVE YOU DONE ANY OTHER WORK TO EVALUATE THE FLOW CONDITIONS IN THE AREA OF THE DISCHARGE?

A. Yes. I obtained several satellite photographs from Google Earth of the area which are in Exhibit PAC-51R SS-4. I have identified some of the conditions that I saw on those photographs, such as locations of eddies or eddy structures and the mixing layer boundaries. I will explain the significance of eddy structures and mixing layer boundaries later in this testimony.

Q. ARE THE SATELLITE PHOTOGRAPHS THE TYPE OF INFORMATION YOU AND OTHERS IN YOUR FIELD COMMONLY RELY UPON FOR OBTAINING INFORMATION ON THE CONDITIONS IN CHANNELS AND BAYS SUCH AS FOR EDDY STRUCTURES AND MIXING LAYERS?

A. Yes. I and others with similar expertise often rely upon such photographs to help understand conditions in areas such as the location of the proposed discharge.

PAC offers Exhibit PAC-51R SS-4.

IV. SUMMARY OF OPINIONS

A. OPINIONS REGARDING THE USE OF THE CORMIX MODEL

Q. EXPLAIN YOUR OPINIONS REGARDING THE USE OF THE CORMIX MODEL IN THE PRESENT CASE?

The CORMIX model includes a far-field simulation module. It is my opinion that it correctly predictions the existence of a density current, which under most conditions forms in the HHMZ as the concentrated plume falls to the bottom of the channel. CORMIX also predicts that this bottom density current will remain separated from the overlying channel flow throughout the domain of the simulations, which normally extends out at least 1.5 kilometers (nearly 1 mile). This distance is great enough that it is reasonable to expect that a density current may cross the channel between Harbor Island and Mustang Island and move in and out some distance in the Corpus Christi Ship Channel.

V. BASIS FOR OPINIONS ON CORMIX

A. EXPERIENCE WITH CORMIX

Q. PLEASE DESCRIBE YOUR PROFESSIONAL TRAINING AND EXPERIENCE RELATED TO THE USE OF THE CORMIX MODEL.

A. I first used the CORMIX model in the 1990s in my work for my Ph.D. to predict the trajectories of jets and plumes in cross flow conditions, conditions like we have here. When I completed my Ph.D., I took a post-doctoral position with Professor Gerhard Jirka at the University of Karlsruhe and worked for him for two years. Professor Jirka led the development of the CORMIX model for EPA when he was a Professor at Cornell University. I gained significant experience with the inner workings of the CORMIX model and the theories of jets and plumes during this period, as I worked on and attended various projects, seminars, and workshops related to the submodels and modules within CORMIX. I have also attended CORMIX training conducted by Dr. Doneker in the early 2000s.

Q. DO YOU KNOW DR. ROBERT DONEKER?

A. Yes. He is the person who has taken the EPA CORMIX model and made it available to universities, government agencies, industries and the public through his company MixZon, Inc.

Q. HAVE YOU WORKED WITH HIM OR CONSULTED HIM BEFORE YOUR WORK IN THIS CASE?

A. Yes, I have had numerous discussions with Dr. Doneker before this case, but I have not worked with him on any specific project. When I was a postdoctoral scholar at the University of Karlsruhe, Dr. Doneker was working with some of Professor Jirka's students, who were developing both the internal hydraulics and brine modules of CORMIX at the time. I had numerous discussions with those students and also discussed the model with Dr. Doneker at the time. Since 2002, my main consultation with him was through a CORMIX training workshop he held in Austin, Texas, that I attended in 2007. I have also kept in touch personally whenever I met him at professional conferences.

Through my discussions with Dr. Doneker and reading the literature related to CORMIX over the last several decades, I stayed up-to-date with the CORMIX model and its development. I have not studied all of the uses of the model and not read every detail of the current CORMIX manual, but I understand what is inside CORMIX, how it works, and the data validation process for the model. I understand the limitations and approach it takes.

Q. HAVE YOU WORKED WITH OTHER SIMILAR MODELS?

A. Yes, I have also developed my own integral models to study plumes in the marine environment. My modeling suite (the Texas A&M Oil spill / outfall Calculator, or TAMOC) is based on one of the inner core modules of CORMIX, CorJet. CorJet models the buoyant jet dynamics of entrainment and dilution of a discharge in the marine environment.

A similar model is the JetLag model by Professor Lee at the Hong Kong University of Science and Technology (formerly, he was at the University of Hong Kong). My model uses the theoretical aspects of these two models to simulate the trajectory and dilution of

oil and gas plumes from sub-marine oil spills. I have validated my model to much of the data used to validate the CORMIX single-port discharge model, following the paper by Jirka in 2004 in Environmental Fluid Mechanics. In that paper, Professor Jirka included more than 20 data sets used to validate CORMIX under different conditions, including cases with a negatively-buoyant discharge, like the brine plume here. A good summary of my modeling system is in Dissanayake et al. (2018), which I also published in Environmental Fluid Mechanics. I also developed a line-diffuser version of the model for a reservoir bubble plume, published in Dissanayake et al. (2021). Through this work, I have a fundamental understanding of the validity and limitations of the CorJet model and its usage in CORMIX.

Q. HAVE YOU SPOKEN WITH DR. DONEKER REGARDING YOUR WORK ON THIS DISCHARGE APPLICATION?

A. Yes, I have. Twice.

Q. WHAT WERE THE DISCUSSIONS ABOUT IN THE FIRST CONVERSATION?

A. Last year, the lease PAC had for use of the CORMIX model had expired. The plan was to lease the model again. There are options with the CORMIX model, and I wanted to confirm with Dr. Doneker the contents of the different versions of the licenses.

Dr. Doneker joined the conversation late as I recall, and from an automobile, I believe. So the call was short. We did have some discussions regarding the proposed discharge. We mostly discussed the need to couple the CORMIX results with a high-resolution far-field model, if one hoped to credibly extend the end of the CORMIX simulation to determine the path and evolution of the dense bottom current resulting from the brine discharge such as the one here well into the far field, beyond what the CORMIX

model can predict. He agreed with my position that the model would have to have high resolution, capable of capturing a density current.

Q. WHAT ABOUT THE SECOND CONVERSATION?

A. The second conversation occurred in November 2021. Dr. Doneker had apparently declined to be engaged by PAC as an expert witness, but was willing to discuss the model's use and some related matters. It was clear in the way he answered the questions, and in many cases avoided answering, that he was trying to avoid being pulled into the hearing process. So, the conversation was quite limited.

Much of the discussion was led by Dr. Doneker and focused more on the suitability of the site for a discharge than the appropriate uses of the CORMIX model. He strongly indicated his support for moving to an offshore discharge location.

We again discussed the need to couple a separate far-field model to the CORMIX simulations and the time and cost that would be involved. He, like me, expressed the opinion that he expected a significant bottom density current moving across the channel and into the ship channel, which was the type of density current predicted by the CORMIX model. He confirmed my opinion that a significant far-field modeling study would be required to assess plume interactions along the ship channel beyond what the CORMIX model predicted.

B. CORMIX MODULES USED

Q. PLEASE EXPLAIN THE OPTIONS FOR USING THE CORMIX MODEL TO EVALUATE THE PROPOSED DISCHARGE.

A. CORMIX can consider a number of site-specific conditions: It allows consideration of boundary interactions that I have discussed above, tidal conditions, and stratification. It also has two ways to handle the negatively-buoyant brine: the conservative tracer module and the brine module.

ATTACHMENT 4

REMAND PREFILED TESTIMONY OF TIM OSTING, P.E.

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND OCCUPATION.

A. Tim Dennis Osting, P.E., D.WRE, Principal Engineer, Aqua Strategies Inc.

Q. ON WHOSE BEHALF ARE YOU PRESENTING TESTIMONY IN THIS PROCEEDING?

A. Port Aransas Conservancy.

Q. PLEASE IDENTIFY THE DOCUMENT MARKED AS EXHIBIT PAC-49R TO-1.

A. This is a copy of my resume showing selected recent work.

Q. DID YOU PREPARE THIS RESUME?

A. Yes.

Q. DOES EXHIBIT PAC 49-R TO-1 ACCURATELY REFLECT THE INFORMATION CONTAINED THEREIN?

A. Yes.

PAC offers Exhibit PAC-49R TO-1.

Q. WHAT IS YOUR EDUCATIONAL BACKGROUND?

A. I received a B.S. in Civil Engineering (1998) from the University of Texas at Austin and an M.S.E. (2007) from the University of Texas at Austin in the Environmental Water Resources Engineering program.

Q. HOW ARE YOU CURRENTLY EMPLOYED?

A. Since July 2014, I have been employed at Aqua Strategies Inc.

Q. WHAT IS THE NATURE OF YOUR EMPLOYMENT?

A. I am the Principal Engineer and Chief Operating Officer. I primarily work on water resources projects. These types of projects include surface water planning and modeling (hydraulics, hydrology, water quality, habitat), environmental flows (bays and estuaries inflows, and instream flows), and field data collection (topography, cross-sections, bathymetry, vegetation, habitat, organism abundance, sediments, etc.).

responsible for navigating boats and completing measurements using ADCP, GPS, and water quality instruments.

A. For the 1997 TWDB Lower Laguna Madre major estuary study, I installed and maintained automated instrumentation throughout the bay for roughly 6 weeks, and was also responsible for initial setup of ADCP instruments for participating staff with TWDB, TPWD, and USGS, and for computer programming for post-processing of the data.

Q. DO YOU CURRENTLY HAVE A COPY OF THE CORMIX MODEL?

A. Yes.

Q. WHICH VERSION DO YOU HAVE?

A. I have CORMIX 12.0GTH version v12.0.0.0.

Q. HAVE YOU HAD ANY SPECIAL TRAINING ON THE USE OF THE CORMIX MODEL?

A. Yes. In October 2021 I participated in a series of training sessions put on by MixZon, the company that leases the CORMIX model and taught by the owner of the company, Dr. Robert Doneker.

Q. WHY DID YOU TAKE THIS TRAINING?

A. The training had been arranged for Mr. Trungale. When he took another position out of state, I was offered to participate, since MixZon would allow the training to be transferred to me, but not cancelled with reimbursement of PAC for the costs.

Q. ARE YOU ABLE TO EVALUATE THE USE OF THE CORMIX MODEL HERE BASED ON YOUR EDUCATION AND EXPERIENCE WITH IT AND OTHER MODELS?

A. Yes.

Q. HAVE YOU RUN THE CORMIX MODEL FOR THE DISCHARGE PROPOSED HERE?

A. Yes.

Q. HAVE YOU RUN THE MODEL USING THE INPUTS AND ASSUMPTIONS USED BY THE PORT OR THE EXECUTIVE DIRECTOR (ED) OF TCEQ?

by Joe Trungale and Dr. Scott Socolofsky for PAC. I have also reviewed documents prepared by Bruce Wiland. I have reviewed all or parts of depositions and prefiled testimony of some of the experts of the Port, the ED, and PAC. I have reviewed Port documents and data collected in the area of the discharge.

Q. HAVE YOU DISCUSSED YOUR OPINIONS OR THE BASIS FOR THEM WITH OTHER EXPERTS?

A. Yes.

Q. WITH WHOM?

A. Joe Trungale, Bruce Wiland, Dr. Barney Austin. and Dr. Scott Socolofsky. I also participated in one call with Dr. Robert Doneker.

Q. HAVE YOU RELIED ON ANY OF THEIR WORK OR OPINIONS IN DEVELOPING YOUR OPINIONS?

A. I have relied on some processing of the bathymetry data and flow conditions near the location of the proposed discharge, Outfall 001, that I developed with assistance from a staff at Aqua Strategies. I reviewed bathymetry information produced by Mr. Bruce Wiland. However, I developed my opinions on the use of the CORMIX model independently based on my education and experience, the modeling I performed, and my evaluation of condition in the channel in the area of the discharge.

Q. WHY DID YOU TALK WITH DR. DONEKER?

A. I participated in one conversation with Dr. Doneker. PAC had leased the CORMIX model for my use from MixZon, Dr. Doneker's company. As I understand the lease, MixZon provides technical assistance to those who lease it. Dr. Socolofsky or Mr. Lowerre, for him, had set the call and I was asked to participate. Most of the discussions were between Dr. Socolofsky and Dr. Doneker.

Q. DID DR. DONEKER OFFER ANY INSIGHTS TO THE MODEL THAT HAVE INFLUENCED YOUR OPINIONS?

A. He confirmed some of the opinions I had already had initially formed.

Q. WHICH OPINIONS WOULD THOSE BE?

A. He validated my opinions that the saline effluent plume would result in concentrated salinity in features such as the 90-foot hole and that, once on the bottom, the plume or a density current could not drain out by gravity and would not be easily mixed by the ambient water. He confirmed my belief that significant non-uniform flows and the irregular bathymetry of the site associated with the proposed POCCA discharge can limit how the model results should.be interpreted or used. He verified my understanding about the level of field and office work, and type of modeling, that would be needed to evaluate the dilution of the plume in areas of the near and far fields.

II. SUMMARY OF OPINIONS

Q. PLEASE SUMMARIZE THE OPINIONS YOU HAVE DEVELOPED

A. It is my opinion that:

1) the predictions from my modeling of the discharge with CORMIX correctly shows that the mixing of the effluent will be severely limited due to the location of the discharge ports, which will result in significantly higher salinity concentrations at most of the boundaries of the mixing zones in comparison with the results of the modeling by the Port and ED.

2) The CORMIX model correctly predicts one or more concentrated plumes will develop in the far-field, which are results that the SUNTANS modeling here did not and cannot predict.

3) The ADCP data collected by the Port shows significant non-uniform flow in the area of the discharge which raises additional question about how much the ED

ATTACHMENT 5


SUBMERGED
DANGER
OBJECTS

ATTACHMENT 6

I. FINDINGS OF FACT

Background * * *

Notice and Jurisdiction * * *

Proceedings at SOAH * * *

13.5 On July 20, 2020, the ED filed a 2020 draft permit which changed the limit on the maximum percentage of effluent allowed at the ZID from 1.98 in the original 2019 draft permit that was based on the ED's technical review to 18.4 in the 2020 draft permit due to an error by the ED in interpreting the results of its modeling.

15. At the preliminary hearing, the ALJs determined that SOAH had jurisdiction, named parties, and admitted the administrative record into evidence for all purposes over the objection of PAC.

15.5 The Protestants rebutted the presumption established under Subsection (i-1) of Texas Government Code § 2003.047 and the Applicant and the Executive Director were allowed and did present additional evidence to support the draft permit.

* * *

21. On June 24, 2021, the Applicant submitted a revised application (Revised Application) to change the location of the discharge (outfall), to revise its proposed diffuser design, and to present additional modeling and data, among other things.

22. On September 1, 2021, the ED issued a revised draft permit (Revised Draft Permit).

* * *

Description of Proposed Facility and Discharge * * *

Texas Surface Water Quality Standards (TSWQS) * * *

36. The TCEQ has adopted standard procedures to implement the TSWQS, which are approved by the U.S. Environmental Protection Agency (EPA) and developed the agency's "Procedures to Implement the Texas Surface Water Quality Standards (RG 194)" (IPs).

Revised Draft Permit Requirements

43. The Revised Draft Permit specifies daily maximum and daily average flow limits of 110 million gallons per day (MGD) and 95.6 MGD, respectively, but has no minimum limit to assure mixing performance of the diffuser will meet permit limits for phased in production or operations of 83.1 MGD.

44. No analytical data regarding the effluent was provided in the Application because the Port and ED took the position that since the Facility has not yet been constructed or begun discharging, screening against the water-quality-based effluent limits in the TSWQS could

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not be accomplished.

44.5 Representative chemicals (such as chlorine) and types of chemicals (such as chemicals for coagulation and corrosion control in desalination facilities) are available due to the existence of many desalination facilities in Texas and a number of seawater desalinations facilities in other parts of the country, but no figures on projected use or analysis of the impacts of the discharge of such chemicals was presented by the Applicant.

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4.5 The Revised Draft Permit includes the following requirements:

a. The effluent must be monitored daily before it is discharged for total suspended solids, total dissolved solids, chloride, and sulfate.
b. The effluent's pH must be not less than 6.0 standard units (SU) and not more than 9.0 SU.
c. The maximum effluent percentage limit at the ZID boundary is 14.6% as determined by future modeling with the CORMIX model. * * *

Modeling Analysis * * *

46. The Cornell Mixing Zone (CORMIX) model is the most commonly used model to design diffusers and evaluate mixing near outfalls.

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46.5 The CORMIX User Manual provides guidance on how the model should be used.

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47. The TCEQ's IPs provide for the use of the CORMIX model when a diffuser will be used, and the TCEQ has developed a guidance manual for running the model titled "Mixing Analyses Using CORMIX" (CORMIX SOPs).

48. Use of the CORMIX model was appropriate in this case to determine the mixing of the effluent until the mixing contacts the bank or bottom for the channel but not the mixing at the boundaries of the mixing zones.

49. The ED uses the CORMIX model to predict the percentage of effluent present at the edge of each regulatory mixing zone, and then sets permit limits based on the highest predicted effluent percentages.

49.1 The percentage of effluent present at the edge of each regulatory mixing zone for the critical conditions do not provide the worst-case conditions for increases in salinity over ambient conditions.

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49.2 The ED did not use the predicted percentages from the model to determine the worst-case scenarios for the increase of salinities over ambient for its evaluation of the impacts of the discharge, including the antidegradation review.

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50. In running the model, the ED relied solely on information provided in the Application and the CORMIX SOPs for the inputs to the model, including the depth of the channel and distance to shore.

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51. For the Revised Application, the ED's CORMIX modeling predicts effluent percentages of 14.6% at the ZID boundary, 8.9% at the ALMZ boundary, and 5.4% at the HHMZ boundary.

52. Use of the CORMIX model requires "schematization," the process of describing a receiving water body's actual geometry with a rectangular cross section. CORMIX's conservative module simulates the geometry of the receiving water body as a rectangle with a flat bottom and vertical sides and does not account for variations in channel depth or a sloping bank.

53. Due to the need for schematization, some professional judgment will be necessary when selecting the inputs to the CORMIX model and a range of values may be reasonable.

53.1 Dr. Socolofsky, who studied under the creator of the CORMIX model, has worked with the current owner of the model and who has developed his own similar model based on the CORMIX model, provided the most credible evidence on schematization.

54. The depth of the water body at the discharge point is an important model input because it is a variable that influences near-field mixing.

55. The depth of the channel at the outfall location is close to 65 feet but is adjacent to a 90-foot depression.

56. Using a 90-foot depth was among the range of reasonable options a modeler could select but was not a reasonable input due to the bathymetry of the channel.

57. The distance from shore to the diffuser (DISTB) is an input to the model that impacts mixing predictions that is an average distance to the nearest bank at the depth of the outfall.

57.1 Due to schematization, the shore placement effectively creates a vertical wall behind which no mixing is determined to take place; thus, the further it is located from the diffuser, the more water the model predicts will be available for mixing and dilution of the effluent.

58. The distance directly between the proposed diffuser location and the shoreline is shown as in the application 229 feet, but because the channel floor slopes downward from the shoreline, using that value for DISTB will overpredict mixing.

58.1. Because the location of the outfall was shown as located on, if not in, the bank, that location cannot accommodate a diffuser barrel and risers and maintain the depth of the outfall at 65 feet, and all parties assume the location will have to be different than in the application.

58.2 There is no evidence in the record of any new location or for any limit on where the Applicant can move the location, and there is no modeling for any new location.

59. The modeling results by Dr. Socolofsky were materially different using the DISTBs he used to represent the depth of the outfall and distance to the shore, with the distance of 10 feet resulting in modeling predictions of 55% of the effluent remaining at the boundary of the

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ZID.

60. Using CORMIX's brine module was not required in this case, however, its use requires evaluation of the appropriateness of the proposed outfall location for use of the model and consideration of the bathymetric and flow conditions that the model cannot consider as well as the 50% margin of error the model states needs to be considered.

61. The ED's modeling did not used reasonable inputs for the proposed discharge site, and the ED did not consider the bathymetric and flow conditions that the model cannot consider as well as the 50% margin of error the model states needs to be considered..

62. The potential for an eddy to form occasionally near the proposed discharge site does not invalidate the CORMIX modeling results or indicate that inaccurate inputs were used but the failure of the Applicant to characterize such eddies reflects the failure of the Applicant to obtain the type of site-specific information the Applicant stated it would provide and that the interim order requires.

63. The presence of two outcropping extending from the shoreline and the 90-foot depression introduces additional uncertainty into the modeling results, that adds to the unreliability of predictions from the modeling by the ED for determining the mixing performance at the boundaries of the mixing zones for the new diffuser and the new proposed outfall location.

64. *(See Finding 49.1 above)*.

65.1 Including a limit on salinity in the permit were a permit to be issued is supported by the uncertainty introduced into the modeling results by the site-specific bathymetry, basing the ED's critical conditions on modeling results that do not represent the worst-case scenario for salinity, and CORMIX's margin of error.

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67. The ED's CORMIX modeling inputs are not within the range of reasonable values or are materially inaccurate.

68. The ED's CORMIX modeling is not sufficient to ensure the Revised Draft Permit is protective of water quality or the marine environment.

69. The Port Authority separately conducted modeling with the SUNTANS model to evaluate the proposed discharge's effects in the far field as the effluent moves further from the mixing zones.

70. The SUNTANS modeling predicts that the desalination brine discharge increases computed salinity by 0-1 parts per thousand (ppt) in the vicinity of the discharge and throughout the Corpus Christi Bay system, with daily tidal fluctuations continuously mixing the discharge so that stratification is never persistent.

70.1 The CORMIX model predicts the existence of higher salinity layers on the channel bottom for a kilometer from the outfall if not farther and is more credible for these distances than the predictions from the SUNTANS modeling.

70.2 Neither the Applicant nor the ED evaluated the impact of the bottom higher salinity levels or proved on the requirements that the salinity gradient be maintained.

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Antidegradation Review

1. An antidegradation review is designed to ensure that a proposed discharge does not impair the uses or degrade the water quality of the receiving waters.

2. Tier 1 and Tier 2 antidegradation reviews are required due to the exceptional aquatic life use designation at the outfall location.

3. The ED's antidegradation review for the Revised Application was performed by Peter Schaefer. and, later, the salinity toxicity testing by Dr. Kristin Nielsen; some of the CORMIX modeling results; the SUNTANS modeling results; and the permit requirement that the Port submit effluent data within 90 days beginning to discharge. He did not consider total salinity levels at the boundaries of the various mixing zones or in the far field.

4. For his Tier 2 antidegradation review, Mr. Schaefer did not use an "assimilative capacity" screening analysis but used, instead, a methodology he labeled "weight of the evidence" analysis.

5. Mr. Schaefer did not explain the steps of his "weight of the evidence" analysis; he explicitly relied in his analysis on Dr. Furnans' erroneous salt flux analysis; he explicitly excluded from his analysis the results of CORMIX modeling performed by Protestants' witnesses; and he was unable to define precisely what a salt gradient is and was not able to define his understanding of "*de minimis*" degradation.

6. Mr. Schaefer used a Texas Water Development Board paper to determine the optimal salinity level of red drum for his review, and also examined salinity toxicity testing by PAC witness Dr. Kristin Nielsen.

7. The ED's antidegradation review did not demonstrate that the proposed discharge will maintain existing uses and not lower water quality by more than a de minimis amount.

Impact on the Marine Environment, Aquatic Life, and Wildlife * * *

Accuracy and Completeness of the Application

116. The Revised Application did not provide complete or accurate information needed as inputs to the modeling, such as depth of the channel at the outfall location or for the evaluation of the appropriateness and reliability of the model predictions, such as the eddies, non-uniform flow conditions and DISTBs bathymetry that can affect the evaluation of the reliability of the model predictions.

117. The Revised Application did not provide information on the chemicals that it will use, or representative chemicals used in similar desalination facilities, for their evaluation of the potential impacts of such chemicals on water quality and the marine environment.

Permit Requirements

122. Any Draft Permit that is issued should include additional provisions requiring mixing limits for percentages of effluent at the boundaries of all three mixing zones; imposing a salinity limit of 2.0 ppt over ambient to be measured at 100 meters from the outfall; and requiring a monitoring plan.

15. An additional provision should be included in any permit to make the following major amendments to the permit with the most important being:

- the latitude, longitude, or depth for the location of the outfall; and
- the identification of chemical to be used in the desalination process or for treatment of the water to control corrosion, scaling and fouling.

Notice Requirements

125. Notice was properly mailed and published, and a copy of the Application was made available at appropriate public locations for the initial application. The location of the outfall determines the owners of properties who, at the time the application is filed, are required to be identified in the Application as affected landowners.

125.1 The Revised Application includes changes that, if accepted for determining permit amendments, weaken the pollution control limits from the initial draft permit and include the new location and the diffuser design.

125.2 No new notice or opportunity for comment was provided to the public or local, state or federal agencies on the Revised Application.

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126. Protestants have not challenged their own notice.

Texas Coastal Management Program * * *

Transcription Costs * * *

II. CONCLUSIONS OF LAW

1. The Commission has jurisdiction over water quality and the issuance of TPDES permits. Tex. Water Code §§ 5.013, 26.003, 26.011, 26.027, and 26.028.

2. The Application was referred to SOAH under Texas Water Code § 5.556.

3. SOAH has jurisdiction to conduct a hearing and prepare a proposal for decision in contested cases referred by the Commission under Texas Government Code § 2003.047 for the original application but did not have jurisdiction for the Revised Application due to the fact that the application constituted a major amendment.

4. Notice of the Application and the hearing for the original application were properly provided to the public and to all parties. Tex. Water Code §§ 5.115, 26.022, 26.028; Tex. Gov't Code §§ 2001.051-.052; 30 Tex. Admin. Code, ch. 39.

5. The Application is subject to Texas Government Code § 2003.047(i-1)-(i-3).

6. In the Initial Proceeding, the filing of the Application, the Draft Permit, the preliminary decisions issued by the ED, and other supporting documentation in the administrative record of the Application established a prima facie case that: (i) the Draft Permit meets all state and federal legal and technical requirements; and (ii) the permit, if issued consistent with the Draft Permit, would protect human health and safety, the environment, and physical property. Tex. Gov't Code § 2003.047(i-1).

7. Protestants rebutted the prima facie demonstration for six of the issues referred to SOAH for the initial application by presenting evidence that: (1) relates to an issue directly referred; and (2) demonstrates that one or more provisions in the Draft Permit violates a specifically applicable state or federal requirement. Tex. Gov't Code § 2003.047(i-2); 30 Tex. Admin. Code §§ 80.17(c)(2), .117(c)(3).

8. Applicant retains the burden of proof on the issues regarding the sufficiency of the Application and compliance with the necessary statutory and regulatory requirements. 30 Tex. Admin. Code § 80.17(a).

9. The Remand Hearing was to allow the Applicant to present additional evidence on specified issues. Therefore, the process of rebutting a prima facie case has previously occurred. The Applicant was not entitled to another presumption.

10. The administrative record, with the exception of parts of the Revised Application, was properly admitted into evidence for all purposes. 30 Tex. Admin. Code § 80.127(h).

11. There must be no significant lethality to aquatic organisms that move through a ZID. 30 Tex. Admin. Code § 307.6(e)(1).

12. Water in the state must be maintained to preclude adverse toxic effects on aquatic life. 30 Tex. Admin. Code § 307.6(b)(4).

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13. Surface waters must not be toxic to man from ingestion of water, consumption of aquatic organisms, or contact with the skin, or to terrestrial or aquatic life. 30 Tex. Admin. Code § 307.4(d).

14. Salinity gradients in estuaries must be maintained to support attainable estuarine-dependent aquatic life uses. 30 Tex. Admin. Code § 307.4(g)(3).

15. An attainable use is a use that can be reasonably achieved by a water body in accordance with its physical, biological, and chemical characteristics whether it is currently meeting that use or not. 30 Tex. Admin. Code § 307.3(a)(4).

16. Careful consideration must be given to all activities that may detrimentally affect salinity gradients. 30 Tex. Admin. Code § 307.4(g)(3).

17. The ED's antidegradation review did not ensure compliance with the Tier 2 antidegradation standards. 30 Tex. Admin. Code § 307.5(b).

18. The ED's antidegradation review did not ensure compliance with the Tier 1 and Tier 2 antidegradation standards. 30 Tex. Admin. Code § 307.5(b).

- the ED's antidegradation review was arbitrary in its discounting to "zero" data developed by and the implications of CORMIX modeling presented by parties other than the agency and the Applicant
- It is not possible to conduct a credible antidegradation review, if the reviewer is unable to define important terms, such as "*de minimis*" and "salinity gradient," on which the antidegradation review depends.
- The ED's reliance in its antidegradation review on a salt flux analysis the significance of which was not explained and which, in any event, included a factor-of-ten error in the calculation of the salt attributable to the wastewater discharge was unreasonable, arbitrary and capricious.

19. The Commission may accept environmental testing laboratory data and analysis for use in Commission decisions regarding any matter under the Commission's jurisdiction relating to permits or other authorizations only if the data and analysis is prepared by an accredited environmental testing laboratory. Tex. Water Code § 5.134(a).

20. The accreditation requirement applies to "environmental testing laboratory data," and an "environmental testing laboratory" is "a scientific laboratory that performs analyses to determine the chemical, molecular, or pathogenic components of environmental media for regulatory compliance purposes." Tex. Water Code § 5.801; 30 Tex. Admin. Code § 25.2(6).

21. The Revised Draft Permit contains sufficient provisions to protect the health of the requesters and their families.

22. The Revised Draft Permit is consistent with the Texas Coastal Management Program's

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goals and policies. 30 Tex. Admin. Code, ch. 281, subch. B.

23. The Port Authority did not substantially comply with all applicable notice requirements. 30 Tex. Admin. Code, ch. 39.

24. No transcript costs may be assessed against the ED or OPIC because the TCEQ's rules prohibit the assessment of any cost to a statutory party who is precluded by law from appealing any ruling, decision, or other act of the Commission. Tex. Water Code §§ 5.275, .356; 30 Tex. Admin. Code § 80.23(d)(2).

25. Factors to be considered in assessing transcript costs include: the party who requested the transcript; the financial ability of the party to pay the costs; the extent to which the party participated in the hearing; the relative benefits to the various parties of having a transcript; and any other factor which is relevant to a just and reasonable assessment of the costs. 30 Tex. Admin. Code § 80.23(d)(1).

26. Considering the factors in 30 Texas Administrative Code § 80.23(d)(1), a reasonable assessment of Original Hearing transcript costs against parties to the contested case proceeding is that the Port Authority should bear all costs of the transcript for the hearing on the original application.

27. Considering the factors in 30 Texas Administrative Code § 80.23(d)(1), a reasonable assessment of Remand Hearing transcript costs against parties to the contested case proceeding is that the Port Authority should bear all costs of the transcript for the hearing on the Revised Application.

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