TESTIMONY OF SHARI BETH LIBICKI, Ph.D.

1. My name is Shari Beth Libicki, Ph.D., and I am a Principal at ENVIRON International Corporation, a global consulting firm that addresses environmental issues. I have prepared this testimony in conjunction with Ralph Morris who is also a Principal at ENVIRON. Mr. Morris is also prepared to present this testimony in the event that I cannot attend the hearing of the State Water Resources Control Board. We are both based in Northern California, although we have both done extensive air quality work in Imperial County.

2. I have my doctorate, master's and bachelor degrees in chemical engineering from Stanford University and the University of Michigan, respectively. I have conducted and directed air quality studies for over twelve years at ENVIRON Corporation. Mr. Morris has a bachelor's and master's degree in mathematics from the University of California at Berkeley and the University of California at Davis, respectively. Mr. Morris has over twenty years experience in air quality issues, with particular emphasis in the development and application of advanced air quality models, including photochemical, particulate matter, acid deposition, and visibility grid and plume models. Mr. Morris is one of the original developers of most

the particulate matter (PM_{10}) State Implementation Plan (SIP) for Imperial County for submittal to the USEPA. The SIP is required to contain information on the Imperial County emissions inventory, PM_{10} monitoring network, and PM_{10} control measures with a demonstration that the control measures are sufficient to attain the Federal PM_{10} standard. It is with that perspective that we provide comments to the State Water Resources Control Board (SWRCB) and its staff on the air quality impacts that may result from the implementation of the project described in the draft environmental impact statement (DEIS) for the Imperial Irrigation District (IID) long-term transfer of water to the San Diego County Water Authority (SDCWA).

4. ENVIRON is concerned that the potential air quality impacts that might result from the long-term water transfer described in the DEIS would interfere with the attainment of the National Ambient Air Quality Standards (NAAQS) for PM_{10}. Recently, USEPA has issued a determination that Imperial County would be in attainment of the national ambient air quality standards ("NAAQS") for PM_{10} "but for" transported emissions emanating from Mexico. (66 Fed. Reg. 53106 - October 19, 2001). Thus, the current levels of particulate matter in the air in Imperial County exceed the NAAQS because of particulate matter transported from Mexico. Additional particulate matter generated from within Imperial County as a result of the water transfer could further increase the concentration of particulate matter in the air in Imperial County and jeopardize the "attainment designation" under the Clean Air Act.

5. There are at least two potential additional sources of PM_{10} as a result of the proposed water transfer: areas of newly-exposed exposed shoreline at the Salton Sea and fallowed farmland that may result from the proposed project. Although the DEIS evaluated both potential

sources of emissions, we do not believe that the evaluation in the DEIS was correct or complete. In addition, we are concerned that the listed conservation measures did not sufficiently evaluate conservation methods that would reduce evaporation, rather than simply reduce water use as a whole. The reduction of evaporation is key, as the conservation of water through water use reduction or through reduced drainage exacerbates the recession of the Salton Sea and has the potential to lead to additional dust emissions. Each of these comments is described more fully below.

6. The proposed project will transfer up to 300 thousand acre feet per year (KAFY) of water from the IID to the SDCWA and other water agencies. To accommodate the loss of water to Imperial County, water will be conserved in Imperial County from irrigated fields. One of the conservation measures would be the fallowing of up to 84,800 acres of agricultural land in Imperial County. This measure will reduce irrigation in Imperial County and also reduce subsequent run off into the Salton Sea. This will result in potential increases in respirable particulate matter (PM_{10}) emissions in Imperial County from two new potential sources: 1) wind-blown dust from the fallowed agricultural land; and 2) wind blown dust from the newly-exposed shoreline of the Salton Sea due to the water recession similar to that observed at other exposed saline lakebeds (e.g., Owens Lake and Mono Lake).

7. The DEIS on page 3.7-31 states that mitigation measures will reduce the air quality impacts from fallowing to a level of insignificance. However, the DEIS does not address: 1) the monetary cost for mitigation of air quality impacts; 2) the amount of water that mitigation of air quality impacts from fallowed lands will require; 3) how to determine whether mitigation of air quality impacts is effective; or 4) who will ensure that mitigation measures are properly carried

out. The DEIS does not provide assurance that the emissions that result from fallowed lands can be mitigated to a level of insignificance.

8. The DEIS did not even attempt to quantify emissions that may result from the increased fallowing of lands. Instead, it states on page 3.7-23 that, "it is not possible to quantify emissions and associated impacts from potential increases in fallowing of agricultural lands, at a variety of locations over time, for water conservation. On one hand, emissions would decrease because the fallowed land would not be subject to plowing or the other agricultural activities that disturb soil. On the other hand, fallowed lands that are not properly retired or mitigated may be subject to wind erosion, resulting in fugitive dust impacts."

9. The CARB has developed methods to estimate the emissions from a variety of farming operations, including emissions from fallowed lands. Although the ICAPCD has concerns about the applicability of some of the CARB-developed factors in the hot, arid environment of Imperial County, CARB's methods could have been used to at least estimate the potential impacts of fallowing. In addition, these methods could have been used to fix the applicable mitigation measures for the fallowed lands.

10. Mitigation Measure AQ-3 is described on page 3.7-30 of the DEIS as appropriate for fallowed lands. It states that, "at least one of the following BMPs to minimize PM_{10} emissions must be implemented. BMPs could include, but are not limited to the following…," followed by a list of vague measures. These measures offer no means of determining when mitigation has been achieved. In addition, although many of these measures require water use, no quantification of additional water use is provided. The listed mitigation measures to assure that fallowed lands

are not emissive must be stronger and have an enforcement mechanism to ensure that new emissive areas are not created from the water transfer.

11. The mitigation measures describe using either "light irrigation" or return water to ensure that sufficient growth is available to stabilize soils. However, the fallowing mitigation must have a monitoring system in place to ensure that the effectiveness of the mitigation measure does not erode over time. In addition, the DEIS does not quantify the water usage that will be required to stabilize fallowed fields. The use of return water will reduce the amount of water available to the Salton Sea. The use of light irrigation will reduce the water otherwise available to Imperial County. This water use must be quantified in either case as it will either reduce the water available for transfer, or will require additional fallowing of fields if the ultimate impact at the Salton Sea is to be mitigated.

12. If fields in the area are not fallowed on a fairly short rotational basis, farmland may be permanently removed from use. Due to the high perched groundwater in Imperial County, fields fallowed in Imperial County will degrade as a result of salt seepage from the perched groundwater via capillary effects. This phenomenon, known as "souring," will result in effective destruction of farmlands that have been fallowed for more than about five years. Although soured lands can be put back into service, this practice generally requires the use of soil amendments and water to remove the salts from the land. The DEIS does not assess this impact of long-term fallowing.

13. Salt that seeps to the surface along with the groundwater may have the effect of increasing the instability of the lands, and making the surface less stable and more emissive over time.

It may also make the restabilization of the fallowed farmland more difficult in successive years, as grasses will be less amenable to growing in soured land. The potential of long-term stabilization of fallowed lands has not been assessed in the DEIS.

14. The DEIS relies on both conservation methods and fallowing to provide for the water transfer. However, the conservation methods listed reduce seepage rather than evaporation. Methods that simply reduce seepage ultimately impact the Salton Sea, and a fraction of the water conserved through this method must be returned to the Salton Sea if further recession is to be prevented. However, conservation methods that simply reduce evaporation allow the entire saved water to be used in water transfer. The DEIR should evaluate whether there are available conservation measures that would act mostly to reduce evaporation and not seepage. This approach would both protect the Salton Sea, and may prevent additional fallowing of farmland. Even though such measures may be more expensive, they may be worthwhile in reducing the further need to fallow land to allow for the full water transfer.

15. The discussion of why the Salton Sea would not become emissive due to the water recession increasing the exposed area of the lakebed is based on unverified assumptions and some erroneous data. Exposed shoreline at the Salton Sea has the potential to result in an emissive area as seen at Owens Lake and Mono Lake. As stated in the discussion on page 3.7-34 of the DEIS, the proposed project would expose 50,000 acres (78 mi^2) of currently submerged lakebed bottom. This compares to an Owens Lake total area of 110 mi^2 with an emissive area of 35 mi^2. Thus, the area being exposed by the proposed project is only slightly less than the area of Owens Lake.

16. Three reasons are given in the DEIS on page 3.7-35 as to why the exposed areas of the Salton Sea would not create an emissive source like Owens Lake or Mono Lake: 1) the soil chemistry is different than that at Mono or Owens Lake, 2) wind speeds at the Salton Sea are less than Mono or Owens Lake, and 3) the recession rate is slower than that of Owens or Mono Lake. As discussed below, some errors in the provided data, and some generalizations do not provide sufficient assurance that the exposed shoreline will not generate dust storms in the area. This section fails to substantiate the premise that the Owens and Mono Lake experiences will not be repeated at the Salton Sea.

17. Although the salts and soils at the Salton Sea may not contain as much carbonate as the salts and soils at Mono and Owens Lake, the salts and soils do contain substantial amounts of sulfate and some carbonate salts as well. The conditions exist at the Salton Sea to allow an unstable salt crust to form from sulfate salts. When some sulfate salts form crust at temperatures below 60°F, an unstable form of the salt is produced. Although the surface temperature is more moderated than the air temperature, the air temperature at the southern end of the Salton Sea is below 60°F roughly 25% of the time, based on data from the Salton Sea East (#128) California Irrigation Management Information System (CIMIS) meteorological station. Any precipitation when the surface temperatures fall below 60°F during the year would produce conditions conducive to forming unstable sulfate salts.

18. The meteorological data that was presented in the DEIS to assert that wind speeds near the Salton Sea can not result in wind storms was incorrect and incomplete. The wind roses that ENVIRON produced from the CIMIS data are found in Attachment C. For comparison, those from the DEIS are in Attachment D. The wind data that was used and included the in

the DEIS were the CIMIS Salton Sea West (#127) and Salton Sea North (#154) sites. These sites are not representative of where the greatest shoreline exposure will occur. Moreover, the wind data presented in the DEIS for the Salton Sea North (#154) site are clearly incorrect.

19. Over three-quarters of the potentially exposed shoreline around the Salton Sea lies within Imperial County, and the bulk is at the southern end of the Salton Sea. As a result, wind data from the Salton Sea East (#128) site near Niland would be the most representative for understanding whether there would be high winds that could create dust storms. Niland is also the closest Imperial County PM_{10} monitor to the Salton Sea, and is aligned with the predominant winds that would advect dust from the Salton Sea to the PM_{10} monitor. Furthermore, the discussion on the wind speed threshold velocities needed for dust suspension on page 3.7-35 is flawed because it only considers hourly winds and does not account for wind gusts that can suspend dust.

20. We analyzed the CIMIS wind data for the two stations reported on in the DEIS (stations #127 and #154) and evaluated several of the facts stated in the DEIS discussion on the meteorology in the area (page 3.7-14). The amount and timing of data reported available for the two sites appear to be incorrect according to our database. In addition, we found many more hours with wind speeds greater than 7 m/s than was reported in the DEIS. The wind monitor anemometer height stated in the DEIS (366 cm) is different than the one stated on the CIMIS website (2 m = 200 cm). Finally, the wind rose for the #154 Salton Sea North site given in Figure 3.7-5 is incorrect. The correct wind rose for the Salton Sea North is provided in Attachment C. The errors in the wind speeds reported, the error in anemometer height,

failure to use the Salton Sea East (#129) winds combined with an overstatement of the threshold wind velocity needed for dust suspension all bias the results toward understating a potential new PM_{10} emission sources.

21. The DEIS's third argument for why Salton Sea would not become another Owens Lake involves the argument that the recession rate of the Salton Sea will be much slower (only 20% as fast) than for Owens Lake that went "dry" over several years. However, when Mono Lake recessed over a longer time its exposed shoreline was emissive and caused violations of the PM_{10} standard. Thus, based on recession rate, the Mono Lake situation is comparable to what the proposed project will do to the Salton Sea.

22. In short, the discussion in the DEIS as to why the Salton Sea will not be emissive is based on incorrect data and speculation. Given the critical nature of this issue to the air quality in Imperial County, this issue must be addressed in a final EIS for this process.

23. As noted above, contrary to what is stated in the DEIS, no information is available to demonstrate that the air quality impacts can be mitigated to a level of insignificance, based on the assumptions in the DEIS. If the air quality impacts can not be mitigated to a level of insignificance, then the air quality in Imperial County may be degraded and public health will be impacted.

24. The PM_{10} levels are already above the National Ambient Air Quality Standards (NAAQS) in Imperial County. As noted above, the USEPA has determined that Imperial County would be in attainment "but for" emissions being transported from Mexico. If emissions from

fallowed lands and newly-exposed shoreline at the Salton Sea result in exceedances of the NAAQS, Imperial County will no longer meet the previously demonstrated criteria for this determination, and will be required to reduce further emissions within Imperial County. This could easily result in new restrictions in the use of off-road areas of the desert, and may also result in other mandated limitations on recreation in Imperial County, and would impose additional restrictions and limitations on agricultural activities.

25. If the newly-exposed shoreline at the Salton Sea causes dust storms only a fraction as powerful as those at Owens Lake, public health in Imperial County will be impacted. There are several populated areas less than five miles from the Salton Sea shoreline.

26. In addition, if the newly exposed shoreline of the Salton Sea results in dust storms only a fraction as powerful as those that take place in the Owens Valley, the resultant airborne dust would adversely impact recreation in the Salton Sea region. The scenic quality will be degraded, and other forms of recreation, such as fishing will be impacted as a result of visibility impacts, and the potential for personal discomfort.

I declare under penalty of perjury that the foregoing is true and correct. Executed at Emeryville, California, on April 10, 2002.

SHARI BETH LIBICKI, Ph.D.

ATTACHMENT A

SHARI B. LIBICKI, Ph.D.

EDUCATION

1985 Ph.D., Chemical Engineering, Stanford University

1981 M.S., Chemical Engineering, Stanford University

1979 B.S.E., Chemical Engineering, University of Michigan

EXPERIENCE

Dr. Libicki is a Principal at ENVIRON Corporation. She has technical expertise in chemical fate and transport, including estimation and measurement of air emissions from chemical processes and hazardous waste sites and air dispersion and deposition modeling to support risk assessments, emergency release evaluations and other evaluations involving airborne contaminants. She uses this information to negotiate complex technical agreements and permits with agencies, assist facilities with compliance programs, and provide technical expertise to litigation teams. Her work here has included the following:

- Provide nationwide compliance assistance to six iron and steel mini-mills. Work conducted includes: preparation of Title V permit applications and supporting emissions estimates; preparation of Prevention of Significant Deterioration (PSD) permits and associated emissions and dispersion modeling; evaluation of RACT controls for mini-mills.

- Prepared comprehensive air quality analysis for two large municipal solid waste landfills in Southern California. Evaluation included impact of exhaust from non-road heavy equipment, dust from waste operations, and emissions from landfill gas escaping the collection system. Projects included public testimony on results of analysis.

- Managed the preparation of an application for an Authority to Construct for a state-of-the-art hazardous waste treatment storage and disposal facility, which included a risk assessment for the project, and successfully negotiated permit conditions with state and local agencies. Currently working with facility and regulators to implement permit conditions.

- Worked as a technical advisor to the Imperial County Air Pollution Control District for the permitting of a rail-haul landfill. This landfill will be the largest landfill in the United States, and had monitoring, modeling, and enforceability issues associated with the permit.

- Provided technical support to attorneys on a litigation case where an accidental release of a particulate and liquid material from an industrial facility was alleged to have caused harm to thousands of plaintiffs. This included an engineering evaluation of the release quantity, meteorological data analysis, and an evaluation of dispersion and deposition of aerosols in complex and intervening terrain.

- Provided expert assistance on a litigation case where subsurface methane gas from a rogue landfill was alleged to damage property values in a housing development. Developed methods to evaluate trace chemicals and extent of gas migration.

- Evaluated the potential contribution of airborne dioxin releases from a refinery to deposit within a defined boundary and contribute to measured dioxin concentrations in wastewater. Analysis included estimation of dioxin releases from a variety of units; selection of units most likely to contribute to dioxin deposition; selection of deposition modeling technique; and analysis of results.

- Provided independent technical assistance to the court's mediator on landfill gas migration and control issues for a landfill toxic tort litigation involving a very large landfill (several square miles) in the Eastern United States.

- Gave an invited lecture series to senior environmental professionals in Mexico on the technical basis of the estimation of the impacts of sudden releases of toxic and flammable materials, in the wake of the Guadalajara explosions.

- Served as a technical expert in a case to evaluate the potential off-site migration of subsurface landfill gas from a hazardous waste site. Also evaluated impacts from landfill gas that escaped the surface of the landfill.

- Provided expert assistance to attorneys on a litigation case where ammonia was released from a refrigeration system. This included an analysis of the opposing expert's work, creation of a model to describe the release from the system, and evaluating alternative scenarios.

- Managed the consequence analysis for several Risk Management and Prevention Programs (RMPP). Projects included scenarios with acids, toxic gases, and chemical reactions. Analysis involved using standard analytical tools as well as some state of the art tools.

- Designed a complex fourteen-station ambient air monitoring network to measure the concentrations of 19 toxic chemicals in both gaseous and particulate phase for risk assessment purposes and negotiated approval with local, state and federal regulators.

- Provided technical support to attorneys for a litigation case evaluating the potential for cross-contamination via process exhausts, within an industrial facility. The potential for the airborne particulate contaminant to contribute to trace concentrations in the product was analytically evaluated. Provided expert report and deposition.

- Designed and conducted the compliance ambient air monitoring program for a large hazardous waste facility. The ongoing program collects whole air and total suspended particulate samples at five stationary sites. Prepared risk assessment based on the program, and quarterly reports for review by the local air district and the California EPA's Department of Toxic Substances and Control.

- Provided technical support to attorneys in a litigation involving the impacts from a chlorine tank spill. The spill was modeled and the impact of meteorological conditions and varying spill scenarios was evaluated.

- Evaluated the potential of deposited arsenic-based pesticide to contaminate adjacent property. Transport pathways examined included wind-blown dust, surface water transport, and vehicle trackout.

- Conducted preliminary evaluation of whether patterns of measured lead in soil supported contention that lead resulted from airborne emissions from a lead emitting stack located at the site. Concluded that insufficient data was available for analysis.

- Provided litigation support for an evaluation of pesticide contamination to determine whether pesticide at site was a result of spills and leaks or airborne deposition as a result of pesticide milling at the site.

- Gave lecture series on the harmonization of the State and Federal Risk Management Programs in California, and how to best implement the unified program.

- Provided expert assistance in cases where the impacts of facility emissions were compared to Proposition 65 thresholds. Several of the cases were in active litigation.

- Prepared and submitted several Federal Operating Permit Applications under Title V of the Clean Air Act for industrial facilities. Currently working on ongoing negotiation for permits.

- Analyzed the impacts of potential accident scenarios prior to the construction of several new industrial facilities. The results of the analyses were used to make recommendations as to how to improve the safety and minimize the risks to the surrounding community.

- Prepared and negotiated a settlement proposal with regulators for a large facility which included new methods for calculation of organic emissions, additional controls on processes, and monitoring requirements.

- Managed technical support team for large toxic tort litigation which involved estimating current and historical emissions from several large facilities, comparing and choosing appropriate meteorological data for the analysis dispersion modeling, mapping of impacts with respect to plaintiffs, and comparison with air quality guidelines and toxicological end points.

- Analyzed the particulate emissions from a basic chemicals processing plant containing over 90 separate sources, conducting a dispersion and culpability analysis, and evaluating the effectiveness of proposed and implemented source controls.

- Designed, negotiated and managed a novel cost-effective ambient air monitoring program that yielded real-time information on the health impacts of a site remediation. This study is the basis of a well-received paper.

- Analyzed the results of a complex multi-year total suspended particulate monitoring program to understand the sources of arsenic in the ambient air, and to evaluate the health risks of the arsenic levels that could be related to nearby facility emissions.

- Estimated emission from contaminated ground water under residential neighborhood and resulting indoor air concentration, using regulatory models and alternative models.

- Designed a protocol for estimating the quantities of specific hazardous chemicals disposed of in California by region and waste type, and worked with the Department of Health Services to verify protocol.

- Participated in the design of a hazardous waste treatment storage and disposal facility.

- Estimated emissions due to volatilization and erosion from hazardous waste sites to support health risk assessments, cleanup levels, and Proposition 65 warning radius.

- Managed AB 2588 emission inventory plans, emissions inventories, and health risk assessments; negotiated reduced emission inventory for a major manufacturer with SCAQMD; conducted AB 2588 screening assessments.

- Estimated emissions and impact of emissions on ambient air quality for a planned municipal solid waste landfills and co-disposal site.

- Modeled dispersion of air emissions from multi-source industrial facilities and estimated increases in ambient air concentration of specific emissions to determine scope of potentially impacted area.

Prior to joining ENVIRON, Dr. Libicki held the following positions:

- Physical Sciences Officer, Bureau of Oceans and Environmental and Scientific Affairs, U.S. Department of State. Developed and implemented a successful negotiation strategy for cooperative scientific projects with Japan and the Soviet Union. Worked with Japan's Science and Technology Agency to initiate a Japanese funding organization for innovative international biotechnological studies.

- Staff Scientist, Alza Corporation. Led teams that created, designed, tested, and patented controlled release transdermal and osmotic pump drug delivery systems. Studied the correlation between drug physical-chemical data and dermal transport and absorption. Designed and implemented systems to provide effective membrane thickness control in the manufacture of miniature osmotic pumps.

- Lecturer, Department of Chemical Engineering, Stanford University. Taught courses in Chemical Engineering Laboratory and Technical Speaking and Writing.

PATENTS

H.F. Sanders, Y.L. Cheng, D.J. Enscore, S.B. Libicki. *Transdermal Drug Composition with Dual Permeation Enhancers.* Patent Number: 4,820,720. April 11, 1989.

R.M. Gale, D.J. Enscore, D.E. Nedberge, M. Nelson, Y.L. Cheng, S.B. Libicki. *Transdermal Administration of Progesterone, Estradiol Esters, and Mixtures Thereof.* Patent Number: 4,788,062. November 29, 1988.

AWARDS AND HONORS

American Association for the Advancement of Sciences Diplomacy Fellow, 1987-1988

United States Department of State Meritorious Honor Award, March 1989

PROFESSIONAL MEMBERSHIPS

Member, American Association for the Advancement of Science.
Member, American Chemical Society.
Member, Air and Waste Management Association.

PUBLICATIONS AND PRESENTATIONS

Libicki, S.B. When Good Data Goes Bad: What the Numbers Really Mean. American Bar Association Section of Environment, Energy and Resources 7th Section Fall Meeting, San Diego, California. Oct. 1999.

Libicki, S.B. and R. Van de Griend. *RMPs, RMPPs and SB 1889*: *Consolidation of State and Federal Risk Management Programs*. Presented as a Minimum Continuing Legal Education course at various law firms. San Francisco, California. November-December, 1996.

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Libicki, S.B. The Use of Simplified Quantitative Risk Analysis in Risk Management Decisions at Small and Medium-Sized Process Plants. 88th Annual Air & Waste Management Association Annual Meeting, San Antonio. June 1995.

Jain, S. and Libicki, S.B. Estimating the Additional Airborne Release Due to Heat of Reaction and Aerosolization When Strong Acids React With Water During a Release. Air & Waste Management Association Annual Meeting, San Antonio. June 1995.

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Gates, L.J., S.B. Libicki, R. Scofield, and J. Wilhelmi. A flexible real-time ambient air monitoring program during Superfund Site redevelopment. *EPA/AWMA Field Screening Methods for Hazardous wastes and Toxic Chemicals.* February 24-26, 1993.

P.M. Salmon, S.B. Libicki, and C.R. Robertson. 1988. A theoretical investigation of convective transport in the hollow-fiber reactor. *Chemical Engineering Communications* 66:221-248.

Libicki, S.B., P.M. Salmon, and C.R. Robertson. 1986. Measurement of inert gas permeabilities in compact bacterial cell aggregates using an annular reactor. *Annals of the New York Academy of Sciences*, Vol. IV; and *Biochemical Engineering* 469:145-151.

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Campbell, J.H., P. Peters, S.B. Libicki, M.L. Gregg, and J.E. Clarkson. 1981. Analysis of the operation of Occidental's modified *in situ* retort 6. In *Fourteenth Oil Shale Symposium Proceedings,* Golden, Colo.: Colorado School of Mines Press.

Campbell, J.H., J.H. Raley, F.H. Ackerman, W.A. Sandholtz, and S.B. Libicki. 1980. Investigation of critical parameters in modified *in situ* retorting. In *Thirteenth Oil Shale Symposium Proceedings*, Golden, Colo.: Colorado School of Mines Press.

ATTACHMENT B

RALPH E. MORRIS

EDUCATION

1979 M.A., Mathematics, University of California, Davis

1976 B.A., Mathematics, University of California, Berkeley

EXPERIENCE

Mr. Morris is a Principal at ENVIRON Corporation where he directs air quality modeling and analysis, emission inventory development, control strategy evaluation, and regulatory policy analysis projects. He has over twenty years experience in air quality issues, with particular emphasis in the development and application of advanced air quality models. Mr. Morris has been using photochemical, particulate matter, acid deposition, and visibility grid and plume models since the 1970's. He has used over 50 different air quality and acid deposition models in over 500 air-quality-related projects. Mr. Morris has working knowledge of atmospheric chemistry, meteorology, physics, emissions, and computer science. He has also had extensive experience in the regulatory and policy analysis aspects of air quality issues. This hands-on experience in a variety of air quality disciplines gives Mr. Morris a broad-based interdisciplinary background that enables him to address a wide range of air quality issues.

At ENVIRON, Mr. Morris has been heavily involved in the eastern U.S. ozone nonattainment problem and directed (with others) the development of ENVIRON's Comprehensive Air-quality Model with extensions (CAMx). Mr. Morris has performed several studies for eastern U.S. Stakeholders (e.g., States, utilities, trade organizations, and other industries) using the CAMx advanced ozone apportionment capability to aid in the identification of ozone source-receptor relationships and the design of optimal control strategies for reducing ozone. Mr. Morris is currently directing the development of a new generation of 8-hour ozone modeling databases for several regions including St. Louis, Kansas City, and several locations in Texas.

Mr. Morris is one of the original developers of most photochemical air quality models being used for regulatory decision making in the U.S. today including CAMx, UAM, and UAM-V. At ENVIRON he directed the development of the Comprehensive Air-quality Model with extensions (CAMx) that combines state-of-art science with a modern and modular framework. CAMx has been used for many ozone regulatory applications. Currently it is being updated to include advanced mass balance and sensitivity analysis (Process Analysis and Decoupled Direct Method – DDM sensitivities), inclusion of the treatment of size resolved particulate matter (PM), and inclusion of the treatment of air toxics.

Mr. Morris is also heavily involved in PM_{10}, fine particulate, and visibility modeling. He has performed PM_{10} modeling as part of the development of State Implementation Plans (SIPs) for the Owens Valley California, Maricopa County (Phoenix) Arizona, Rogue Valley (Medford) Oregon, and Imperial County California. Mr. Morris also directed a study to assist the City of Los Angeles with the development of a PM_{10} emission control plan for the South Coast Air Basin (SoCAB) that was included with the 1997 California SIP. Mr. Morris was selected as a member of the EPA Fine Particulate Guidance Workgroup and the SoCAB PM_{10} Technical Enhancement Program (PTEP) Modeling Working Group.

RALPH E. MORRIS

Mr. Morris' expertise in regional visibility is best exemplified by the fact that for both of the visibility modeling activities that the Western Regional Air Partnership (WRAP), who are responsible for implementing the regional haze rule in the western U.S., are undertaking teams including ENVIRON led by Mr. Morris have been selected over the other experts in the country. WRAP requested assistance in setting up a Regional Modeling Center (RMC) to perform regional visibility modeling over the next two and possibly more years and selected a team consisting of the University of California (UCR) and ENVIRON. WRAP needed a Jump Start contractor to quickly develop the REMSAD and Models-3/CMAQ regional visibility modeling databases for the WRAP RMC and selected a team consisting of ENVIRON and MCNC. Thus, ENVIRON is at the forefront of the visibility issues in the western states for years to come.

During 1986, Mr. Morris also directed the application of the CALMET/CALPUFF PM/Visibility Model as part of the Mount Zirkel Visibility Study (MZVS). Over the past couple years Mr. Morris has applied the CALPUFF modeling system to estimate PSD pollutant concentrations, visibility degradation, and acid deposition impacts at sensitive Class I and II areas for several Environmental Impact Statements (EIS) and PSD permits, including:

- The Pinedale Antcline Oil and Gas Exploration Project in southwestern Wyoming;
- The Dakota, Minnesota, and Eastern (DM&E) railway expansion project across Minnesota, South Dakota, and into northeastern Wyoming;
- The North American Power Group (NAPG) electrical line and coal-fired power plant project in northwestern Wyoming;
- The Salt River Project (SRP) Santan energy generation facility expansion in Arizona;
- The Portland Cement Plant modification in Lebec, California;
- The Holnam Lee Island project to build the largest cement plant in the U.S. to be located south of St. Louis, Missouri; and.
- The Intergen Ocotillo Energy Project (OEP) to build a natural gas fired turbine near Palm Springs, California.

Because of his broad-based technical experience and ability to interpret the policy implications of air quality studies, Mr. Morris was selected by the Environmental Council of States (ECOS) Ozone Transport Assessment Group (OTAG) to review and determine the implications of existing ozone measurement and modeling studies of the eastern U.S.

C Prior to joining ENVIRON Mr. Morris worked for over 15 years at Systems Applications International (SAI) in San Rafael (now part of ICF Consulting), California, where he was Director of the Advanced Modeling Program, managed model development activities and air quality modeling and analysis studies. His work at SAI included the following:

  - Project Manager for a new EPA study to develop a Particulate Matter (PM) and toxic model to be used to: (1) evaluate alternative PM standards; (2) perform PM attainment demonstrations; and (3) estimate toxic deposition onto the Great Waters.

- Principal designer and developer of the new nested-grid version of the Urban Airshed Model (UAM-V), which incorporates the latest state-of-the-art chemistry, deposition, advection/diffusion, computing, grid nesting, and sub-grid-scale plume treatment techniques.
- Project manager and principal investigator in the development of an ozone attainment strategy for the South Coast Air Basin for the city of Los Angeles which was used in the 1994 California State Implementation Plan (SIP).
- Principal investigator and director of the UAM-V photochemical modeling portion of the Lake Michigan Ozone Study (LMOS).
- Project manager and principal investigator in a study for the American Automobile Manufacturers Association (AAMA) to asses the air quality impacts of the adoption of a California-style Low Emissions Vehicle (LEV) program in the Northeast.
- Project manager and principal investigator in a project for EPA OPPE to estimate the air-quality-related benefits (including reduction in ozone, PM_{10}, $PM_{2.5}$, acid deposition, nitrification, visibility impairment, and human mortality and morbidity) of the 1990 CAAA Title IV NO_x controls by applying regional acid deposition and oxidant models to the eastern United States.
- Project manager and principal investigator in the EPA Five Cities UAM Study, a landmark study that demonstrated the use of the UAM in five cities for SIP-type applications.
- Principal investigator in coordinating and performing the air quality modeling component of the $40+ million joint Phase I Auto/Oil Air Quality Improvement Program.
- Project manager and principal investigator in designing the UAM modeling system and documentation and delivery of the EPA regulatory version of the UAM to the EPA.
- Project manager and principal investigator for the EPA Rocky Mountain Acid Deposition Model Assessment project to develop a new model for simulating air quality and acid deposition in complex terrain.

PROFESSIONAL MEMBERSHIPS

Air and Waste Management Association

EPA's Urban Airshed Model (UAM) Guidance Workgroup

PM_{10} Technical Enhancement Program Modeling Working Group

EPA’s Fine Particulate Modeling Guidance Workgroup

RALPH E. MORRIS

PUBLICATIONS AND PRESENTATIONS

Mr. Morris is principal author of hundreds of technical reports, scientific papers, and conference presentations. Selected papers and reports prepared over the last decade 1990s are listed as follows:

Morris, R.E., G. Yarwood, C. Emery, and G. Wilson. 2001. "Recent Advances in CAMx Air Quality Modeling" presented at the AWMA Annual Meeting & Exhibition, Orlando, FL. June 2001.

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Morris, R.E. and E. Tai, C. Hersey, C. Fitzner, M. Rodenberg and M. Lebeis, L.Pocalujka, and G. Wolff. 2001. "A Methodology for Quantifying Ozone Transport and Assessing the Benefits of Alternative Control Strategies" presented at the AWMA Annual Meeting & Exhibition, Orlando, FL. June 2001.

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Morris, R.E., E. Tai, G. Wilson, and D. Weiss. 1998. "Use of Advanced Ozone Source Apportionment Techniques to Estimate Area of Influence (AOI) of Emissions Contributions to Elevated Ozone Concentrations" presented at the 91st Annual Meeting of the Air and Waste Management Association, San Diego, CA. June 14-18, 1998.

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RALPH E. MORRIS

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Morris, R.E.. 1999. "Review and Interpretation of the EPA NOX SIP Call Photochemical Modeling Results" "Volume II: Review and Assessment of EPA's Definition of "Significant Contribution" to "Nonattainment" Prepared for Midwest Ozone Group. February.

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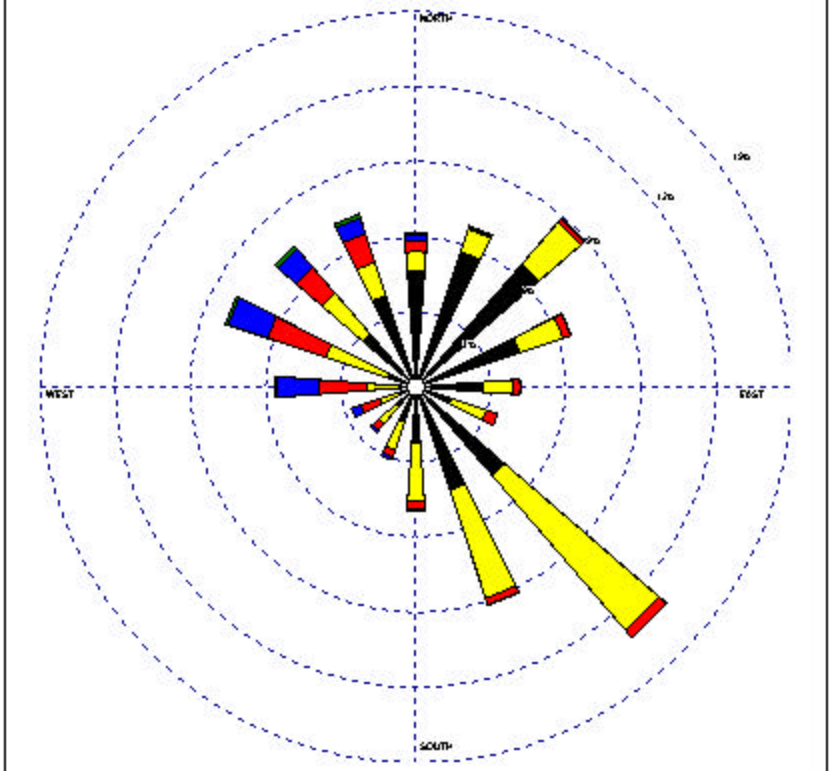
ATTACHMENT C

WIND ROSE PLOT

Station # 54000 - .



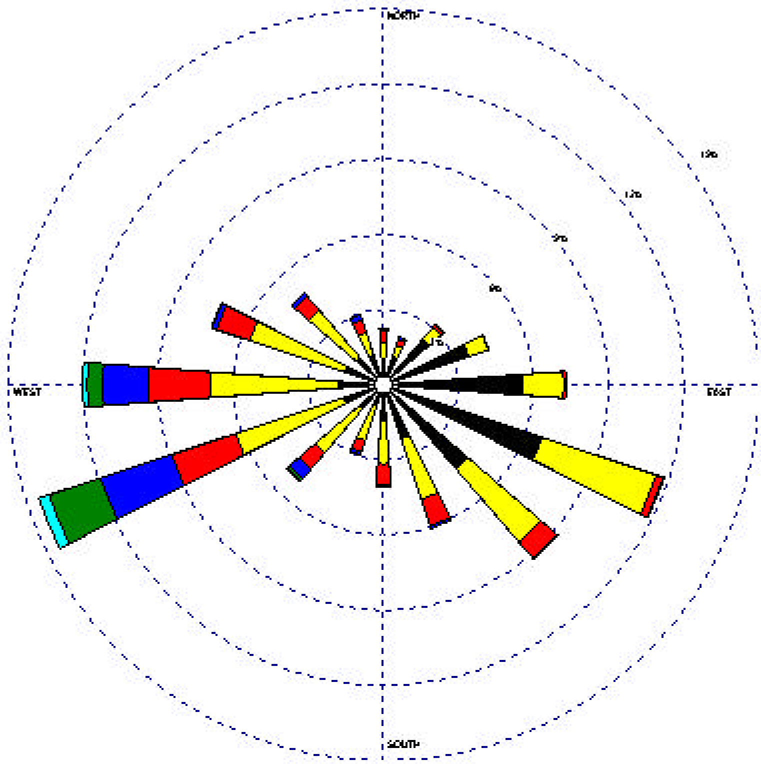
Wind Speed (mph)

- 1.1-2.6
- 2.6-4.9
- 4.9-6.6
- 6.6-11.6
- 11.6-16.6
- 16.6-21.6

MODELER	DATE 5/12/2012	COMPANY/HOME
DISPLAY Wind Speed	UNIT mph	COMMENTS
AVG. WIND SPEED 2.39 mph	CALM WINDS 0.00%	
ORIENTATION Direction (blowing from)	PLOT YEAR-DATE-TIME 2008 2008 Jan 1 - Dec 31 Midnight - 11 PM	PROJECT/PLOT NO.

WIND ROSE PLOT

Station # 2000 - .

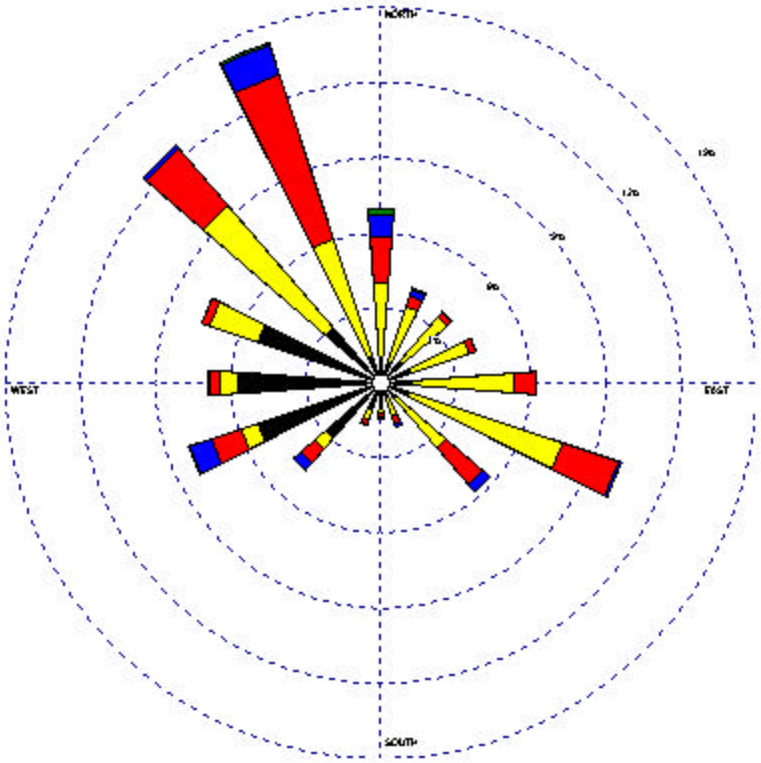


Wind Speed (m/s)			
>= 11.06 / 8.49 - 11.06 / 5.40 - 8.49 / 3.34 - 5.40 / 1.80 - 3.34 / 0.51 - 1.80	MODELER	DATE 3/12/2002	COMPANY NAME
	DISPLAY Wind Speed	UNIT m/s	COMMENTS
	AVG. WIND SPEED 2.80 m/s	CALM WINDS 0.00%	
	ORIENTATION Direction (blowing from)	PLOT YEAR-DATE-TIME 1995 1996 1997 1998 1999 Jan 1 - Dec 31 Midnight - 11 PM	PROJECT/PLOT NO.

[illegible]

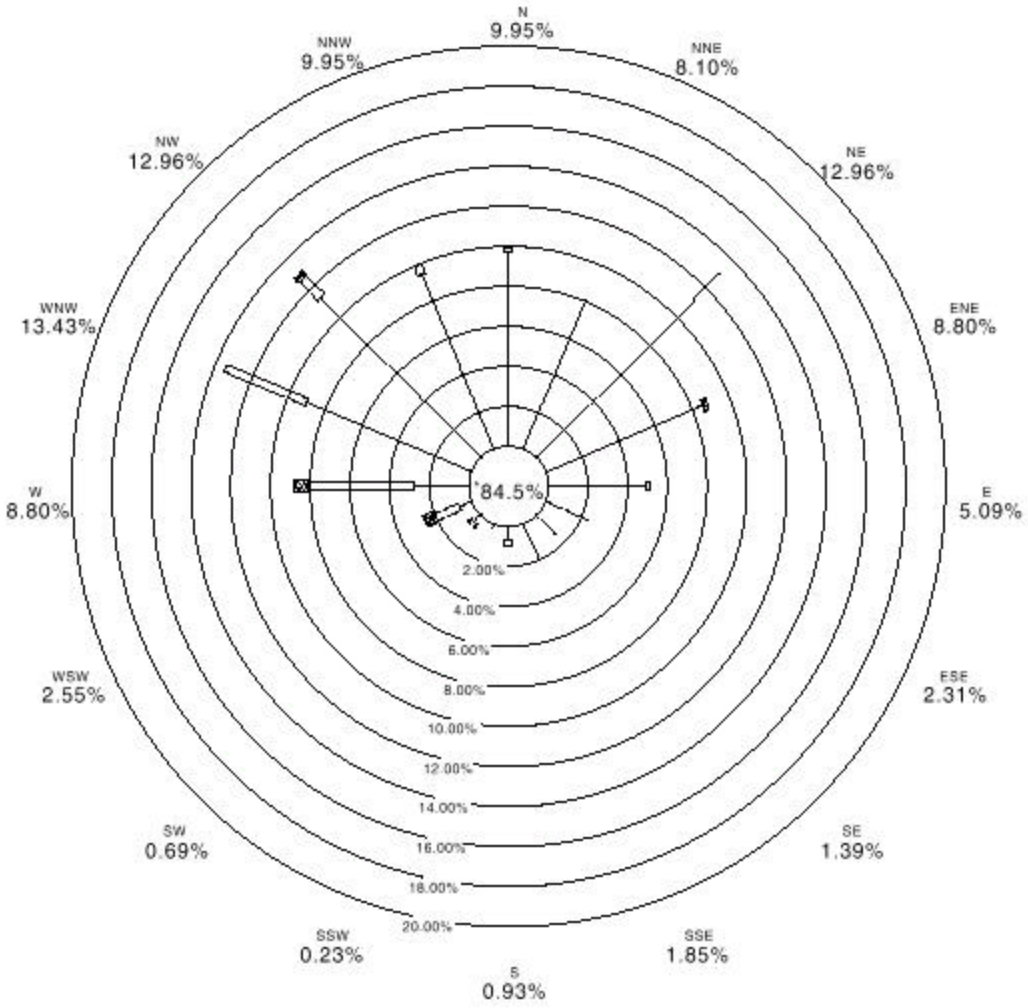
WIND ROSE PLOT

Station #: 27100 - .



Wind Speed (m/s) >= 11.26 8.49 - 11.26 5.46 - 8.49 3.34 - 5.46 1.86 - 3.34 0.51 - 1.86	HOOSIER	DATE 3/12/2002	COMPANY NAME
	DISPLAY Wind Speed	UNIT m/s	COMMENTS
	AVG. WIND SPEED 2.68 m/s	CALM WINDS 0.00%	
	ORIENTATION Direction (blowing from)	PLOT YEAR-DATE-TIME 2002 / 3/12 / 2002 / 3/12 / 2002 Jan 1 - Dec 31 Midnight - 23:59	PROJECT/PLOT NO.

ATTACHMENT D



HOURLY AVERAGE SURFACE WINDS
PERCENTAGE FREQUENCY OF OCCURRENCE

STABILITY CLASS: ALL

STATION LOCATION: #154 SALTON SEA NORTH

INCLUSIVE DATES: 1998-1999

* CALMS PLUS LOWEST VELOCITY CLASS

Figure 3.7-5
Windrose Diagram of Conditions at Station 154
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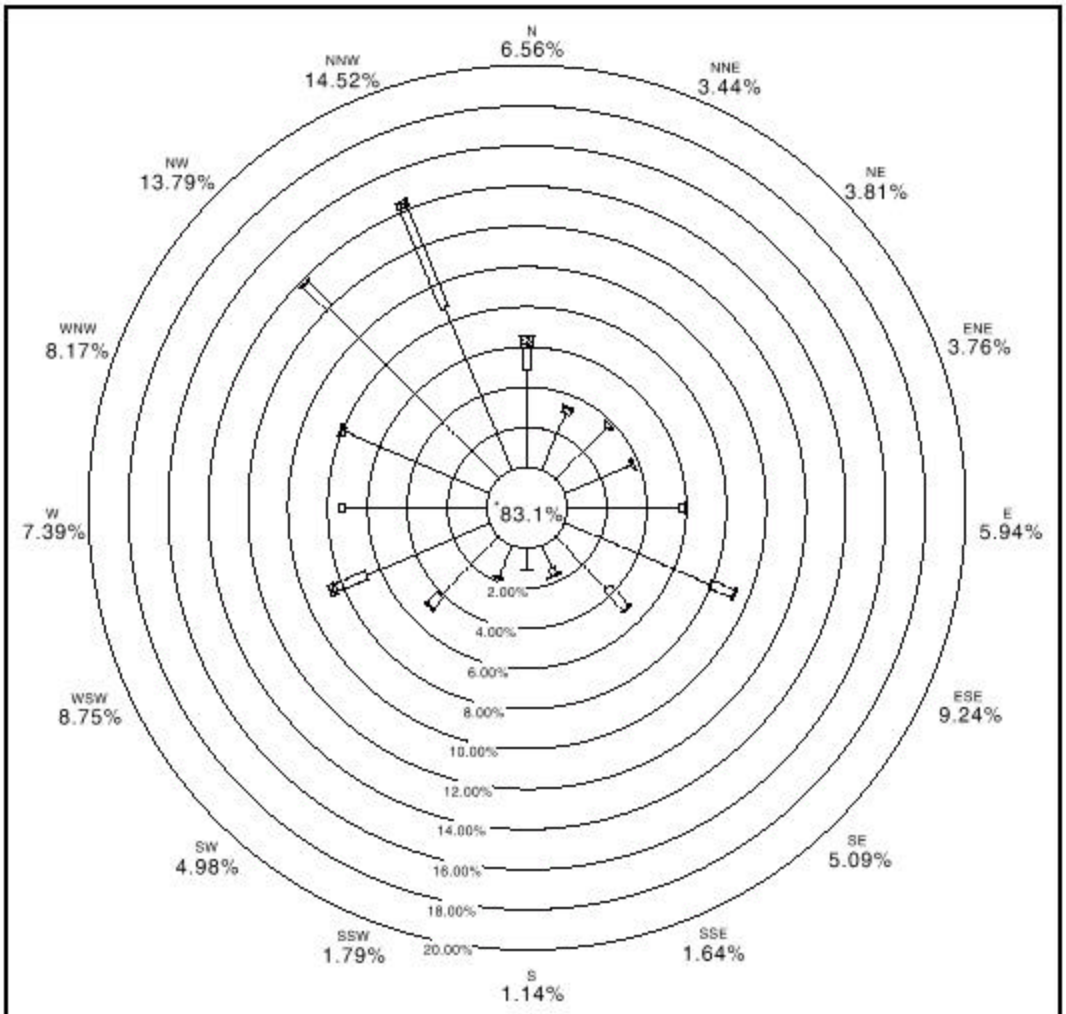

HOURLY AVERAGE SURFACE WINDS
PERCENTAGE FREQUENCY OF OCCURRENCE

STABILITY CLASS: ALL

STATION LOCATION: #127 SALTON SEA WEST

INCLUSIVE DATES: 1995-1999

* CALMS PLUS LOWEST VELOCITY CLASS

0.0< 4.0< 7.0< 11.0< 17.0< >22
M/S

Figure 3.7-6
Windrose Diagram of Conditions at Station 127
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