

# AGENDA

2015 May 14

Regular Meeting: 6 pm

Lincoln City, Council Chambers

801 SW Hwy 101, 3<sup>rd</sup> Floor



## Devils Lake Water Improvement District

Post Office Box 974, Lincoln City, Oregon 97367

Phone: (541) 994-5330 Fax: (541) 994-6040

[www.DLWID.org](http://www.DLWID.org)

### Quick Look:

- **HABS: - Dr. Alex Horne**
- **Devils Lake Revival**
- **East Devils Lake Road**

### **I. Roll Call**

### **II. Consent Agenda**

- a. Minutes of the Previous Meetings
- b. Financial Report

### **III. Comments from Citizens Present on Agenda/Non-Agenda Items:** *This is an opportunity for members of the audience to bring to the District's attention any item not listed on the agenda for public hearing. Comments are limited to five (5) minutes per citizen and the Board of Directors may use the light system. Speakers may not yield their times to others, and as a general rule this is not a time for exchange of questions. At the conclusion of this agenda item, a board member may discuss or raise questions regarding an item presented by a citizen. The Chair has the authority to reduce the time allowed for comment in accordance with the number of persons present and signed up to speak.*

### **IV. Unfinished Business**

(Agenda Support Item A)

- a. The Devils Lake Plan
  - i. Septic / Sewer
  - ii. Save our Shoreline
  - iii. Vegetation Management
- b. Communications Report
- c. Safety Report
- d. MidCoast TMDL
- e. East Devils Lake Road
- f. Harmful Algal Blooms
- g. Replacement of the Water Impoundment Device (The dam)

### **V. New Business**

(Agenda Support Item B)

- a. Devils Lake Grant Opportunity: TigerSharks Surf Club

### **VI. Non-agenda Items**

### **VII. Additional Comments from Citizens Present on Non-Agenda Items:** *This is an opportunity for members of the audience to bring to the District's attention any item not listed on the agenda for board discussion. Comments are limited to five (5) minutes per citizen, and the Board of Directors may use the light system. Speakers may not yield their times to others, and as a general rule this is not a time for exchange of questions. At the conclusion of this agenda item, a board member may discuss or raise questions regarding an item presented by a citizen. The Chair has the authority to reduce the time allowed for comment in accordance with the number of persons present and signed up to speak.*

### **VIII. Board Comments & Announcement**

### **IX. Adjournment**

Meetings of DLWID are handicapped accessible under the ADA.

If special accommodations are needed, please contact the District Office at (541) 994-5330 48 hours prior to the meeting.

Devils Lake Water Improvement District  
Staff Reports: 2015-05-14

# Staff Reports 2015-05-14

## Robertson

### Consent Agenda:

- Minutes of the Previous Meeting
- Financial Report

Note: The bulk of staff time since our last meeting has been dedicated to the budget which was released Friday, May 8, 2015. Updates to other projects are provided as feasible.

### Unfinished Business

### Agenda Support Item A

- a. **The Devils Lake Plan:** A watershed based plan adopted by the Board in 2011 that seeks to address the root causes of nuisance aquatic vegetation and/or Harmful Algal blooms which are excessive nutrients.

*Executive Summary excerpt\*:* “Devils Lake is a shallow, 680 acre coastal lake that has long suffered from the effects of inputs of excess nutrients. Most prominent of these effects was the domination of the lake by nuisance aquatic plants in the 1980’s. Aquatic weed infestations largely choked the lake covering over 60% of the surface. Recreation was greatly impacted, and property values were in decline. In 1984, a local government entity, Devils Lake Water Improvement District (DLWID), was formed with the purpose of improving water quality, improving the environment for fish and wildlife, and generally reestablishing beneficial uses, including safe navigation and public access.

“Current concerns in the watershed are ongoing inputs of nitrogen and phosphorus, increasing sedimentation, erosion, stormwater, annual cyanobacteria blooms, and the threat of the return of nuisance aquatic plants to the lake.”

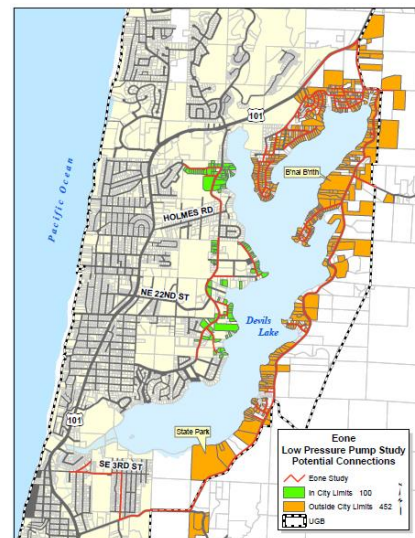
\*View the full document online: [http://www.dlwid.org/Projects/Devils\\_Lake\\_Plan/Devils\\_Lake\\_Plan\\_v2.1.pdf](http://www.dlwid.org/Projects/Devils_Lake_Plan/Devils_Lake_Plan_v2.1.pdf)

Projects within the scope of the plan are being worked on simultaneously and are listed on the Agenda and in this staff report as subheadings. Updates to the work on the projects are presented month to month as change happens and are left on the agenda until the project is complete. For a full background and all updates, please refer to previous staff reports and the Projects Page of the District’s Website under these headings: <http://www.dlwid.org/Projects.html>

#### i. Septic / Sewer

- <http://www.dlwid.org/Projects.html#Septics>
- <http://www.dlwid.org/Projects.html#Sewer>

Declaration of Potential Conflict of Interest: I, Paul Robertson, as have previously declared, but am restating have immediate family members in the business of servicing septic systems. While I am not a decision maker on these issues, I feel for complete transparency that this be again acknowledged and would ask that it be entered into the Minutes.



At the request of Commissioner Bill Hall, I provided a tour of Devils Lake for him recently. We spoke about LID processes among other things such as Shoreline restoration (SOS), septic and

the role of the county, noting that the County like the city has a LID process. Notably the City's budget speaks to the need to partner with the county on sewer LIDs and reimbursement districts. This is a good step forward as the Voyage lake LID gets going and momentum gains. This might be a good time for DLWID Directors to speak to Councilors about sewerage the lake.

From City Budget:

**Sewering the Lake**

Need a partnership with the County

Could be a large LID/Reimbursement District

To Do and Pending Items:

- Mandatory Septic System Inspection Ordinance: Lincoln City
- Full buildable lands inventory: Lincoln County - Spoke with Commission Hall about this request.
- Urban Growth Management Agreement: Lincoln City and Lincoln County, with FY 2014-2015, DLWID to provide comments to City
- Sewer Master Plan Update: Lincoln City – expected by April 2015, draft was completed, city reviewing it.
- Environmental Review of low pressure sewer backbone: City & DLWID expected by April 2015, draft was completed, city reviewing it.

Voyage LID: (Chair Green): Local Improvement District given the go forth from City Council along with reimbursement district. City budget states the following:

**LID's –**

Leverage the Unbonded Assessment as possible

Borrow construction funds to build the project

Sell Assessment Bonds (Bancroft Bonds)

Repay the construction loans with the proceeds of the assessment bonds

Begin the construction process for next LID

Repay the Assessment bonds with assessment receipts from the property owners

City Budget Link:

[http://www.lincolncity.org/vertical/sites/%7BDDC39B4D-9F7A-4251-AEA0-F594E7F89DDB%7D/uploads/City\\_Proposed\\_Budget.pdf](http://www.lincolncity.org/vertical/sites/%7BDDC39B4D-9F7A-4251-AEA0-F594E7F89DDB%7D/uploads/City_Proposed_Budget.pdf)

**ii. Save our Shoreline (SOS)**

- <http://www.dlwid.org/Projects.html#SOS>

**iii. Vegetation Management**

- <http://www.dlwid.org/Projects.html#Vegetation>

No Update

**b. Communications Report**

- Internet Streaming: Meetings the DLWID are now available for live streaming and/or recorded streaming on the internet. The internet feed can be accessed via the City's website: <http://www.lincolncity.org/> by clicking on Agenda, Packets & Video or from the following link: <http://lincolncityor.iqm2.com/citizens/default.aspx>
- Government Access Channel 4: The District's monthly meetings continue to be broadcast live and throughout the month repeatedly airs. This channel is available for Charter subscribers.

- Social Media: The District uses these social media components to reach the general public periodically.
  - YouTube: <http://www.youtube.com/user/DLWID>
  - Facebook: <https://www.facebook.com/DevilsLake.Oregon>
  - Twitter: [https://twitter.com/Devils\\_Lake](https://twitter.com/Devils_Lake)



- KBCH am 1400: The District has had a standing interview spot on the THIRD Tuesday of the Month from 7:30 – 8:00 am.

- 100 History of Devils Lake: [http://www.dlwid.org/Communications/Know\\_Your\\_Lake/100\\_Year\\_History.pdf](http://www.dlwid.org/Communications/Know_Your_Lake/100_Year_History.pdf)

- Know Your Lake: The District, led by Chair Brian Green, has been publishing informational articles in the News Guard. The articles are meant to inform the public on the activities of the District. You can download copies of the articles from our website's Project Page: <http://www.dlwid.org/Projects.html>

- Devils Lake Radio 1610 am: Short recorded messages broadcasted on 10 KW AM frequency from Regatta Grounds.

- Clearwater E-Newsletter: Spring issue released in conjunction with equinox. <http://myemail.constantcontact.com/Clearwater-e-Newsletter--Spring-2015-edition.html?soid=1102761961457&aid=at52BELKxWA>



- Community Days & Lake Steward: Presented award at banquet to Skye Anderson and Keith Galbraith. Participated in Radio Days, cohosting with Miss Oregon. Devils Lake Paddle held on the 18<sup>th</sup>.

- Devils Lake Revival: Saturday, July 18<sup>th</sup> secured for the event at Regatta Grounds.

I was asked to bring back some options for staffing the event. Here is some information from the 2013-05-09 staff report on cost estimate for staffing:

“In order to put on the Revival based on the prices quoted for event planning we could assume between 114 hours – 83 hours - 47 hours at \$35, \$48, and \$85

respectively. Internally we would have likely logged approximately 240 hours for this event in each previous year over the course of at least 3 months. Based on the cost of a full time employee this would equate to about \$5,865 to the District. Should a consultant take this on we could expect a similar number of hours being needed and thus it could cost the District between \$11,900 - \$20,400 based on the 240 hours previously logged. Based on a salaried position of \$34,000 to \$40,000 for a Administrative Assistant Event planner and and Event Planner respectively this would cost between \$5,450 and \$6,400, exclusive of health insurance and payroll taxes.”

The previous Project Manager logged approximately 240 hours to put on the event over three months. Last year BAMA volunteers logged unknown number of hours and our intern logged approximately 160 hours. I logged approximately 20 hours.

For this year we have as I see it three viable options which I will ask for direction on from the Board as to how to best proceed\*.

- Professional Event Planner\*: Offer from Behemoth llc as provided to the Board. This offer is basically a one-stop shop approach for staffing. Everything would be handled externally.
  - **Note:** Should we seek to go with a Professional Planner, procurement laws will require us to solicit two additional proposals which will in itself require some staff time figure 2-3 hours. If direction is given to proceed with a profession event planner, I would seek your authority to select the best choice from existing and solicited offers given time constraints of holding an additional meeting.
- Direct Hire through Temporary Agency\*:  $\$13.50 - \$20.00 \text{ hr} * 240 \text{ hours} * 1.4$  (taxes and payroll handling fee) = \$4,536 - \$6,720 estimate. Hiring someone and training would require significant time, oversight, and thus added cost. Figure 20+ hours = \$1,000+ worth of staff time. Having our intern supplement some of the 240 hours would effectively reduce the funds paid to the direct hire, reducing the hard costs. Given the time the intern will be available, there may be as many as many as 160 hours available which includes post event time to cover follow up efforts (thank yous, etc.) This could reduce the cost associated with a direct hire significantly, but not likely a 1 to 1 as there would be similar training and oversight needs having two relatively new individuals to get up to speed. Plus the needs of organizing are well in advance of when our intern will start (2015-06-22). Likely we might be able to reduce the direct hire to half time (20 hours a week) for two months or approximately 172 hours. This would be \$3,250 to \$4,816 towards direct hire. Notable, we pay our intern (13.50/hr).
- Lake Manager/Intern\*: Based on \$45/hr including benefits, taxes, etc. for 240 hours = \$10,800 worth of staff time. If we can reduce that to 80 of Lake Manager time and 160 of intern time, we effectively drop the cost of staff time to  $\$3600 + \$3,024 = \$6,024$ .

\*Additional cost average about \$3,000 for prizes, permits, rentals, special events, music, advertising, t-shirts, etc and are not included in these estimates or the offer from Behemoth llc.

Our budget in the current fiscal year (FY 2104-2105) has approximately \$10,000 available in unspent Public Relations funds which could be used towards the Revival, \$800 of which was left over from last year's budget. This though if spent in full would significantly reduce the expected Net Working Capital available for transfer to the Improvement Fund for 2015-2016. Next year's budget proposes \$6,000 in total for the Revival, inclusive of prizes, advertising, etc. which based on these more detailed calculations may be insufficient or require use of existing staff to supplement.

- Sitka Kids Ecology Art Project: At Hosteller Park. Opened on Earth Day Event –We participated in preliminary event at Lincoln City Cultural Center in accompaniment with Ian Keene, Open Space Coordinator, and SDCWC.
- Oregon Lake Association: Hosted the Board of Directors meeting at Oregon Coast Community College – May 2, 10-4pm

c. **Safety Report** (Robertson) No incidents or updates. Safety is no accident!

d. **MidCoast TMDL** (Robertson)

- <http://www.dlwid.org/Projects.html#TMDL>

Department of Environmental Quality (DEQ) has begun the planning process for developing an Implementation Ready - Total Maximum Daily Load (IR-TMDL) for 303(d) listed waterbodies in the Oregon Mid-Coast Basin. The initiation of this TMDL process has been a long-time in the works and the process itself will be lengthy stretching over the next 18 - 20 months. Devils Lake is listed for Weeds/Algae, Chlorophyll a and pH and Thompson Creek is listed for fecal coliforms, and thus as a local government we have been invited to participate. Notably, temperature listings are also proposed by EPA for the lake and one of its tributaries. Representatives from local, state and federal government, special districts, Tribal Nations, private industry, forestry, agriculture, conservation, NGOs, watershed councils, landowners, and others were also identified.

- Links to the DEQ's website are posted below.  
<http://www.deq.state.or.us/WQ/TMDLs/midcoast.htm>  
<http://www.deq.state.or.us/WQ/TMDLs/midcoastLSAC.htm>

Stakeholder Meeting: No meetings since our last DLWID meeting. View the website for more information.

Bacteria Technical Working Group: Met April 22. Reviewed funding opportunities through OWEB, Load Duration Curves, and Big Elk Creek watershed modeling. Beach Water Quality data processed and sent to DEQ ahead of May 1, 2015, deadline.

- **East Devils Lake Road:** We have been invited to a stakeholder meeting May 21 9 am-12 which is being organized by Oregon Solutions as part of Governor Brown's Regional Solutions Team. Tentatively scheduled for OCCC. I have passed the invite also on to Salmon Drift Creek Watershed Council's new Executive Director Josh Murphy who also will be attending. Others invited include DSL, Lincoln County, OPRD, Lincoln City, and others. See email excerpt below:

Oregon Solutions has been asked, by way of Jackie Mikalonis of Governor Brown's Regional Solutions Team, to help address the long standing flooding problem on East Devils Lake Road in Lincoln County involving local, state and federal agencies as well as an outlet mall and some 500 other private property owners. Finding a solution to reduce the flooding is uniformly agreed upon as is the growing sense of urgency. Finding a financially feasible means to accomplish this is the challenge. Oregon Solutions is conducting an expedited assessment in the form of a fact-finding meeting in lieu of the more extensive assessment.

This initial meeting will serve to identify the issues to be addressed, outline alternative steps, and desired outcomes. We will also review the Oregon Solutions process and the level of interest in proceeding with Oregon Solutions or developing a different methodology. If Oregon Solutions is a desired process, and a request for our assistance is made, the next step would be for us to submit the proposal to Governor Brown for project designation. An Oregon Solutions collaborative process would include additional representatives beyond this initial assessment meeting to insure that we include all of the stakeholders who might contribute to a solution or solutions.

Michael P Mills  
Project Manager, Oregon Solutions  
National Policy Consensus Center  
Hatfield School of Government  
Portland State University

**e. Harmful Algal Blooms:** <http://www.dlwid.org/Projects.html#Aeration>

Aeration/Oxidation Project: The District has confirmed the commitment from Dr. Alex Horne, world-renown Limnologist and Professor Emeritus of Ecological Engineering from UC Berkeley, for the design of an aeration-oxidation system. Dr. Horne has a Ph.D. in Limnology & Oceanography from the University of Dundee, Scotland and a B.Sc. in Biochemistry from University of Bristol, England. Dr. Horne through Alex Horne Associates, El Cerrito, California has further secured the additional technical assistance of Dr. Ken O'Hara of Wales, UK and is developing partnership with an Oregon licensed engineering firm. I am not sure we could have a more qualified lead for this project than Dr. Horne as evident from his resume below, which notably I have truncated and was itself his "short" resume.

Through Dr. Horne's visit to Devils Lake in April and his research into our system, he has determined that a technique that he has developed and currently has in operation at Cherry Creek Reservoir dubbed Vigorous Epilimnetic Mixing of VEM is the most suitable approach to reducing scum forming Harmful Algal Blooms on Devils Lake. The District has developed a Scope of Work and once a suitable engineering firm is established we will solidify contracting with Alex Horne Associates for the development of the Engineering Plan and General Report which will serve for permitting, financing determination, and a subsequent bid packet for actual construction.

**ALEXANDER J. HORNE**, December 2011



**Professor Emeritus and creator of the Ecological Engineering Group, Department of Civil & Environmental Engineering. University of California, Berkeley.**

**Education:** Ph.D. Limnology & Oceanography 1969 University of Dundee, Scotland. Dissertation title: *Nitrogen & Carbon Fixation in Aquatic Ecosystems* (Europe, Antarctica & Africa). B.Sc. 1964 University of Bristol, England: Biological Chemistry

**Areas of Special Competence:** Pure & Applied Limnology and Oceanography

**Applied areas:** Water quality and quantity. Design of constructed wetlands for drinking water supply, wastewater treatment, wildlife habitat provision, and aesthetic enjoyment. Use of oxygenation for eutrophication reversal, taste and odor and algal nuisance control in freshwater, lakes, rivers, estuaries. and costal oceans Design and management of drinking water and recreational reservoirs, taste & odor. Algal toxicity problems. Design of lakes & wetlands for heavy metal, nitrate, & phosphate removal. for enhanced land value & wildlife mitigation. Effects of urban runoff. Toxicity & biostimulation of domestic, industrial, & agricultural wastewaters on animals & plants in lakes, reservoirs, wetlands, rivers, estuaries, coastal waters, deep oceans. Sewage, oil, heavy metal, selenium pollution. In situ pollution monitoring with bivalves & attached algae in marine and freshwater ecosystems.

**Pure research:** Wetlands: Factors controlling denitrification, metal, pesticides, explosives and pathogens; Nitrogen fixation; blue-green algae (cyanobacteria) in temperate, polar, tropical & Mediterranean waters; Saline lake ecology; use of micro-, meso- and macro-cosms in environmental research, carbon fixation & extra-cellular products of photosynthesis; spatial heterogeneity in aquatic ecosystems; effects of freshwater inflows to estuaries; nutrition & growth of larval striped bass and juvenile Dungeness crabs; Ecological economics of damaged ecosystems. Scientific ethics.

**Experience:** Dr. Horne taught at Berkeley 1971-2003. Initial research on blue-green algae in lakes, oceans, & wetlands in 4 continents began in 1964 in the English Lake District, Antarctica & East Africa & included first studies on eutrophication in Clear Lake, California (1970-78). Expert in ecological & chemical aspects of water & aquatic management including pollution in all waters (fresh or salty). He has studied lakes, reservoirs, streams, wetlands & oceans in Africa, Antarctica, Alaska, Europe, the Middle East, Australia, Asia & N. & S. America. He has been a university Principal Investigator in over 100 funded research projects & a consultant in over 600 water-related projects in California, Nevada, Arizona, Oregon, Washington, Montana, Colorado, Florida, New York, as well as China, Kuwait, Spain, France, Canada, Taiwan, Central America, Australia, & UK. Involved in the design & operation of all California Water Project reservoirs & conveyance facilities since 1972 & has studied & testified on the Project including ecological effects in the Sacramento-San Joaquin River Delta & the San Francisco Bay Estuary. Areas of specialty include: toxicity & bio-stimulation of domestic, industrial, & agricultural waste waters on animals & plants in lakes, reservoirs, wetlands, rivers, estuaries, coastal waters & deep oceans. Environmental effects of large ocean power plants. Sewage, oil, heavy metal & selenium pollution. In situ pollution monitoring with bivalves & attached algae. Eutrophication & algal nuisance control in freshwater lakes, rivers, & estuaries. Effects of urban runoff. Design & management of drinking water & recreational reservoirs, taste & odor & blue-green algal toxicity problems. Projects include constructed wetlands for water re-use, contaminant removal (nitrate, copper, pharmaceuticals & pathogens) from urban storm water and wastewater streams for drinking water supplies and wildlife



protection in California, Arizona, & Colorado. Additions of pure oxygen or air for fish health & eutrophication reversal, TOC/DOC & taste & odor reduction in reservoirs. Farmers versus water quality solutions, restorations of San Francisco Bay-Delta, Mountain Lake (San Francisco), Lake Elsinore (S. Calif.), Newport Bay-estuary (S. Calif.), Upper Klamath Lake (Nevada) & saline Walker Lake, Nevada. Testimony in 2001 to a US Senate sub-committee on oxygenation as a cure for water and fish problems in western states. Co-lead 2002 team on review of \$3 billion Spanish National Water Project and recommended major environmental improvements. Designed a novel BMP, Natural Treatment Systems (NTS) - a sustainable method using unit process wetlands to achieve remove pollutants & achieve TMDL compliance in urban and semi-rural areas. Large-scale oceanographic studies 2003-4 of oil spill effects in the Gulf of Arabia & seaweeds in US estuaries. Recent work on lake/reservoir/river management (oxygenation/aeration, nuisance algae, taste & odor, Cyanobacterial toxicity, selenium & mercury toxicity). Recent wetland work with World Bank & consulting firms include several on constructed treatment & bird wildlife wetlands (up to 45 km<sup>2</sup>) in US, China, Bogotá & Ethiopia and the \$40 million-10 year NSF-funded project to “Reinvent urban water reuse.” Past President; American Ecological Engineering Society & California Lake Management Society, associate editor & former board member of NALMS, former editorial board member of ASLO. Reviewer to many journals & government agencies.

**Publications:** Approx. 270 publications in major scientific and engineering journals & reports including the then world’s best selling textbook on Limnology (the study of lakes, ponds, reservoirs, wetlands, rivers, streams & estuaries).

### **Previous employment**

2003-present. Emeritus Professor, minor teaching and research activities (see above), self employed consultant on water matters.

1995-2003. Professor & Leader of Ecological Engineering Group, Dept. Civil & Environmental Engineering, University of California at Berkeley

1993-1995. Professor, Dept. Civil & Environmental Engineering & Research Ecologist, Environmental Engineering & Health Sciences Laboratory (EEHSL) UC Berkeley

1991-93. Group Leader, Environmental Engineering, Dept. Civil Engineering, UC Berkeley.

1987. Visiting Fellow, Taupo Research Laboratory, New Zealand.

1979-1991. Professor, Dept. Civil Engineering (CE), and Research Biologist, Sanitary Engineering & Health Sciences Research Laboratory (SEERHL), UC Berkeley

1975-79 Associate Professor, Div. of Sanitary, Environmental, Hydraulic, & Coastal (SEHC) Engineering, & Associate Biologist, Sanitary Eng. Res. Lab. (SERL), UC Berkeley-Richmond.

1977-80 Research Marine Ecologist, Lawrence Berkeley Laboratory, US. Dept. of Energy, Ocean Thermal Energy Conversion Project.

1976-78 Acting Director, Sanitary Engineering Research Laboratory.

1971-75 Assistant Professor, Div. Sanitary & Hydraulic Engineering (SE), Dept. Civil Engineering & Assistant Biologist, Sanitary Eng. Research Lab. (SERL), UC Berkeley.

1970-78 Scientific Director, Clear Lake Algal Research Unit. Lakeport, California.

1970-71 Post-doctoral Fellow, Institute of Ecology, University of California at Davis.

1968-69 Graduate student, Dept. Biological Science, Univ. Dundee, Scotland (major professor Professor Sir William D. P. Stewart, F.R.S.).

1968-69 Researcher, Nat. Environmental Research Council & Nature Conservancy, UK.

1968 Visiting researcher, University College, Zimbabwe (Rhodesia), Africa.

1967-68 Visiting researcher, Royal Society African Biological Team (IBP). Lake George, Uganda, Africa.

1966-67 Visiting researcher, British Antarctic Survey, Signy Island, Antarctica.

1966 Visiting researcher, Hydrobiologisch Institut, Netherlands.

1964-68 Research Assistant to Professor G. E. Fogg, F.R.S., Dept. Botany, Westfield College, University of London, England.

**Reviewer for Government Agencies:** National Science Foundation, US. Environmental Protection Agency, Dept. of Energy, Water Resources Center (UCR), Canadian University Ph.D. thesis reviewer, US. Fish & Wildlife Agency, Natural Resources Council (UK). Calif. Dept. Fish & Game.

**Reviewer for Scientific Journals:** North Amer. Lake & Reservoir Management, Ecological Engineering, Science, Limnology & Oceanography, Amer. J. Phycology, J. Microbial Ecol., Ecology, J. Freshwater Ecol., American Naturalist Canadian J. Fish. Aquat. Sci, Hydrobiologia, J. Polar Research, Bioscience, Environmental Management, J. Chem. Ecol., Microbial Ecology., Amer. Soc Civil Engineering

**Consultant to:** California State Water Quality Control Board, California State Department of Water Resources, USEPA, California State Water Contractors, East Bay Municipal Utilities District (Oakland), Metropolitan Water District of Southern California (Los Angeles), Santa Ana Watershed Project Authority, Orange County Water District, Irvine Ranch Water District, City of Lake Elsinore, County of Lake, State of Nevada, Cities in the Denver Metro Area, Colorado, World Bank, and various local government agencies, consulting engineering companies and legal offices in California, Nevada, Oregon, Washington, Colorado, New York, Texas, Florida, Alaska, Canada, Central and South America, Central Africa, Kuwait and the Republic of China.

#### **AWARDS:**

- 2005. Grand Award from the American Academy of Environmental Engineers: Excellence in Environmental Engineering Competition. The award was given for Kennedy/Jenks KJ's work on the Lake Bard Hypolimnion Oxygenation project for which Horne was a consultant.
- 1998 Engineering Project Achievement Award (San Joaquin Marsh Restoration Project, Irvine, CA). Orange County Engineering Council and American Association of Civil Engineers. Horne played a major role in the design of this project
- 1996 Engineering Project Award. Prado Wetland Project. (in conjunction with Orange County Water District). The research of Horne & his students played a major role in the design of this large treatment wetland.

#### **SELECTED EXAMPLES OF LAKES OR RESERVOIRS CONSTRUCTED, RESTORED OR UNDER RESTORATION OFTEN USING OXYGENATION AS A MAIN TOOL FOR WATER QUALITY IMPROVEMENT (HORNE)**

1. **Camanche Reservoir, Mokelumne River, California** (425,000 acre-feet, EBMUD). Sediment and deep water oxygenation. Problem: occasional large salmonid fish kills (up to 155,000 fish per event) in hatchery and river, especially in dry periods. Solution: Designed water quality survey, analyzed results, wrote reports, determined hydrogen sulfide the major cause of problem, determined in situ H<sub>2</sub>S oxidation kinetics, recommended a submerged down-flow contact oxygenator (SDCO or Speece Cone) pure oxygenation installation using 6-8 tons oxygen/day. System installed 1993 at total cost of \$1.6 million and has run successfully since with no fish kills (annual running cost < \$ 75,000, 1993-2002). Side benefits were reversal of eutrophication in reservoir. (East Bay MUD, Brown & Caldwell Engineers). By 1999 the restoration was complete enough to allow power generation which more than pays for running costs. System is still working

well in 2006. [http://www.browncaldwell.com/ISOQs/I-6340502a \(Water Quality Mgmt\).pdf](http://www.browncaldwell.com/ISOQs/I-6340502a (Water Quality Mgmt).pdf)

2. **Upper San Leandro Reservoir (~ 90,000 af, EBMUD).** Hypolimnion and sediment oxygenation. Problem was taste and odor produced by blue-green algae and increase DOC also produced by algae. Solution was to recommend some form of pure oxygenation to reduce internal cycling on nutrients and reverse eutrophication as at Camanche Reservoir. My role was advisor to several engineering firms and EBMUD on studies on the problem. I also supervised research on the project at UC Berkeley. Due to lack of electrical power near the dam, a SDCO could not be used and a bubble plume system was installed by Mobley Engineering in 2002. Improvement in water quality noted by 2005 especially in DOC and algae with no T&O (so far) since installation. [http://www.mobleyengineering.com/images/pub\\_uppersanleandro.nalms2003.pdf](http://www.mobleyengineering.com/images/pub_uppersanleandro.nalms2003.pdf).

3. **Indian Creek Reservoir, Alpine Co., California (~ 5,000 feet).** This former site of the effluent from South Shore, Lake Tahoe (STPUD) is now disused but eutrophic. Working with Kennedy-Jenks (Reno) in 2004 and then STPUD in 2006 I assisted in a limnological evaluation and then did the pre-design for a Speece Cone type pure oxygen system to ensure good trout habitat. Data from 2009 indicate dissolved oxygen in the bottom waters increased from zero to saturation (~ 6 mg/L) at this altitude and temperature in the relatively warm hypolimnion.

4. **Marston Reservoir, Denver Colorado.** This 16,000 af reservoir is underused due to T&O problems and an anoxic hypolimnion. Working with CDM (Denver) I did the analysis of the cure and the pre-design for a Speece Cone type pure oxygen system in 2006-07. Total cost was ~ \$3.5 million and included some dredging and other needed modifications. The oxygenation system proper was less than half the total excluding excavation and concrete pad. Data from 2009-10 confirm improved oxygen in the deeper waters.

5. **Cherry Creek Reservoir, Lakewood nr Denver Colorado (~ 9,000 af).** Part of team to evaluate nuisance blue-green algae problems and suggest solutions. Worked with AMEC, Colorado to design a vigorous mixing-bottom aeration systems designed to reduce blue-green algae, especially large bloom-forming species. Installed in 2009; first two years of operation showed decline of blue-green algae to almost zero. <http://www.clrma.org/files/lakearchive/Cherry%20Creek%20Reservoir.pdf>

6. **Los Vaqueros Reservoir hypolimnetic oxygenation, Contra Costa County, CA (~ 80,000 af)** is one of only two large reservoirs constructed in the last 25 years and was first filled in February 1999. Cost was about \$250 million. It is undergoing initial water quality changes and I was responsible for determining the expected oxygen demand. I recommended a pure oxygen, whole hypolimnion system. The sizing of the system and which method to use, bubbles or a Speece Cone is currently under study. Reduction of elimination of taste and odor algae blooms is a major concern. I have since worked on the plan to expand the reservoir to ~ 250,000 af.

7. **Canning-Swan Estuaries, Perth Western Australia;** restoration by side stream oxygenation. These two estuaries-rivers have had recent algae blooms, low oxygen and some fish kills. In April 1998 I visited the sites, reviewed the data and recommended side stream oxygenation to solve the problems. A test system was installed in the smaller system (Swan River) in December 1998 (Australian summer), proved successful and a much larger system was installed in 1999. Water quality has improved markedly but some problems with large storm flow BOD have been discovered and the system may need some redesign to account for this new source of oxygen demand.

8. **Lake Elsinore CA.** Designed four-component lake restoration and enhancement system (oxygenation/aeration, summer and winter wetlands, biomanipulation, fish population modification) for this shallow 3000 acre eutrophic lake. Project of up to \$15 million will begin in spring 2002 and should be completed in 2006. I continue to provide advice to the EVWD and JPA and will carry out studies on the offsets of aeration on the N & P budgets as part of the TMDL which allows some water re-use from the nearby WWTP.

9. **Croton Reservoirs (New York).** Hypolimnetic aeration. Part of review team for Metcalf & Eddy on performance and improvement of these reservoirs that had various water quality problems including poor color.

10. **Upper San Leandro Reservoir, Oakland California (V ~ 90,000 af).** Hypolimnetic oxygenation. Carried out studies on the lake for EBMUD with others over several years. Recommended HO to reduce internal loading of nutrients (ammonia and phosphate) and thus overall planktonic blue-green algae problems and thus decrease unusually high odor in drinking water supply (geosmin ~ 3,000 ppb). Carried out first survey of post-HO conditions in 2002.

11. **East Side Reservoir, Southern California (~ 850,000 af).** New reservoir design for water quality. This Metropolitan Water District of Southern California reservoir is one of two large reservoirs constructed in California in the last 25 years. Water quality is a high priority and the system will be used as a storage facility with use in normal, dry and drought years. I carried out the initial modeling and other water quality predictions for combinations of six possible sites, three possible water regimes, and two potential water sources and ranked them in order of water quality potential. The reservoir cost \$2.3 billion was filled in 1999. [http://en.wikipedia.org/wiki/Diamond\\_Valley\\_Lake](http://en.wikipedia.org/wiki/Diamond_Valley_Lake)

12. **Mountain Lake, San Francisco Presidio, California (2.4 acres lake + surrounding wetland).** Initial design and planning 1996. This mixture of small natural lake and wetland has become silted in. Design includes restoration of lake by dredging and enhancement of surrounding wetlands. Included limnology of area, effects of golf course, sediment (lead) pollution determination and conceptual design document in 2000. Cost \$500,000. (Golden Gate National Recreation Area & City of San Francisco). Restoration to begin in spring 2001. Solar powered aeration was recommended to restore the lake as part of the sustainable goal for this park. Piecemeal improvements under way including sediment analysis and removal of large eucalyptus trees that colored the water brown. <http://openspace2100.org/node/45>

13. **Clear Lake, California (1,250,000 acre-feet).** Problem: excessive eutrophication in California's largest, but shallow, lake. Cause of eutrophication unknown. Solution: Supervised water quality study including whole lake and watershed N & P budgets, analyzed data (1970-73). Found lake naturally eutrophic, algae growth limited by nitrogen and iron. Recommended new low concentrations copper tests and test aeration of one arm of the lake. Low copper doses did not prove appropriate; aeration (1,000 cfm, cost \$275,000 1995 dollars) showed internal loading of N+P could be reduced. Arab-Israeli war increased fuel costs so project was not made lake-wide. (Lake County Flood Control District).

14. **San Luis Reservoir California.** Worked with MWH on possible use of lowest 300,000 af of this large reservoir (V ~ 2 MAF) in terms of algae blooms, drinking water intake locations, algae-filter clogging relationships, other algae controls. 2001-3.

15. **Los Vaqueros Reservoir expansion.** Co-author of white paper on feasibility of expansion from 100,000 to 500,000 af in terms of algae and drinking water supply improvements (December 2003).

16. **Lake Onondaga, New York State.** Hypolimnetic oxygenation. Part of the Parsons team to reduce mercury methylation in water (and thus in fish) in Lake Onondaga (V = 110,000 af). Lead author on a white paper to Honeywell on use of HO to stop methylation by changing oxygen and redox conditions (January 2004).

17. **Halfway Reservoir, Las Vegas Nevada.** Assisted MWH, Pasadena in design of this new reservoir to store Virgin River water fall 2005. Estimated water quality made simple model of resulting problems.

18. **Pardee Reservoir, Mokelumne River, California (295,000 af).** In winter 2005-06, the reservoir water produced filter clogging that reduced filter runs from 75 to 10 hours in the EBMUD water treatment plant. I worked with EBMUD to determine the cause [a bloom of the large colonial diatom *Aulacoseira* (formerly *Melosira*) combined with unusually calm and sunny February weather and nitrate increases from a burn area in the watershed]. Recommended in-line steel micro-strainers or copper/ other algaecides. Reviewed toxicity tests for algaecides.

19. **Wilderness Club Lakes, Montana.** Wrote Lake Management Plan for the three natural and three new smaller lakes for this up-scale development working with Sherwood Engineers, San Francisco.

20. **Dunbarton Quarry Lake.** The small (20 acres) but deep (300 ft.) quarry is scheduled for closure and conversion to an East Bay Regional Parks District recreational fishing lake when it fills with water. I did the initial design for the propeller mixing and proposed oxygenation system working with Brown & Caldwell Engineers in 2005-06.

21. **Klamath River reservoirs.** These four eutrophic hydropower reservoirs owned by PacifiCorp have nuisance-toxic blue-green algae. I proposed an aeration-mixing system in 2007. Details are being worked out in 2008.

#### **f. Replacement of the Water Impoundment Device (The dam)**

At its last meeting the District decided to proceed with the exploration of modifying or removing the dam structure depending on what the science says on how we can improve that area. Director Norris was going to meet with a Professor from Oregon State University which I understand took place and we should then have additional information beyond what the two hydrologists provided. In addition the District decided to start the dam replacement permitting process through the Army Corps of Engineers. Key to moving this process forward would be direction from the Board about what would be the preferred design to put in that application. We had options vetted by PBS Engineering which included full or partial removal and options of using sand bags or concrete blocks. Any of these would work according to the engineers and pluses and minuses were provided in last month's packet and presentation. Staff is seeking additional direction from the board on how it might choose to proceed.

## New Business:

**A. Devils Lake Grant Opportunity: TigerSharks Surf Club.** We have received a request for \$1500 through the newly formed non-profit Liquid Apex 45 ran by the same folks Skye Anderson and Keith Galbraith of KLG adventures, and recipients of 2015 Lake Steward Award. Staff recommends funding request.

### LIQUID APEX 45

PO Box 709 • Lincoln City, OR 97367 • Phone: 503-961-5933  
E-Mail: [skyeft4surf@gmail.com](mailto:skyeft4surf@gmail.com)



Date: 29 April 2015

Paul Robertson/Lake Manager  
Devils Lake Water Improvement District  
Oregon Coast Community College  
North County Campus Room 132  
3788 SE High School Drive, Lincoln City, OR 97367

Dear Devils Lake Water Improvement District:

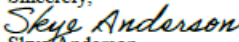
We appreciate and fully support the Tigersharks Surf Club and Devils Lake Water Improvement District partnership. Your donations have helped the club, kids and families significantly. With your help KLG Adventures has been able to provide many scholarships and purchase used wetsuits and booties for member use. We have recently opened up enrollment for our 4<sup>th</sup> season and will be starting up again mid- to late may. We are anxious for the upcoming season and utilizing the lake as much as possible!

Tigersharks Surf Club is still being operated by KLG Adventures, but new to this year is the formation of a nonprofit by the name of Liquid Apex 45. The nonprofit has been filed and approved with the state of Oregon as a Domestic Nonprofit Corporation and has an EIN, 47-3497944. We were able to secure donations to help with the filing fees, which has allowed us to move forward with our federal application for 501(c)3 status. We are hoping for a response in a reasonable amount of time with the newly available 1023 EZ application, which is set up with a goal of processing smaller nonprofits faster and more efficiently.

Liquid Apex 45 is a nonprofit in which we will be raising money to assist with our current Tigersharks Surf Club program as well as expand our capabilities with potentially more programs and more educational and safety classes and programs. The goal of the nonprofit is to raise money to fund education and instruction on the use of cold-water safety practices to enjoy local outdoor activities for positivity to build healthy lifestyles, keep youth out of trouble and away from negative environments.

Keith and I are honored to have received the Lake Steward award from the district and we would like to continue to contribute to the stewardship of the lake in as many ways as we can. Liquid Apex 45 is formally requesting a contribution in the amount of \$1500.00 from Devils Lake Water Improvement District to assist with scholarships for the 2015 season, equipment costs and operating costs. With Oregon surf shop closing, our equipment costs have gone up significantly in order to have enough equipment to operate. Your donation will again help us successfully operate the Tigersharks Surf Club for another season.

Thank you for your time and support. We look forward to hearing from you.

Sincerely,  
  
Skye Anderson  
Director

  
Keith Galbraith  
Director

Staff recommends funding request.

Devils Lake Water Improvement District  
Staff Reports: 2015-05-14