EFFECTS OF DROUGHT ON WASTEWATER TREATMENT OPERATIONS: RESEARCH NEEDS

Presentation to the SCCWRP Commission

September 9, 2016
BACKGROUND

• **Drought has already affected the mission for many of the SCCWRP member organizations**
  – Increased desire for recapture, recycle and reuse

• **Drought has other more subtle effects on operations**
  – Can change the quantity and quality of both influent and effluent

• **The Commission asked for a presentation summarizing drought effects on treatment plant operations**
  – Also asked for a summary of potential SCCWRP research on this topic
POTENTIAL ISSUE: LESS FLOW IN PIPES CAN LEAD TO COLLECTION SYSTEM ISSUES

- Homeowners and businesses use less water
  - Outdoor watering restrictions
  - More conscience of water use activities indoors

- Less flow can result in sedimentation
  - Sedimentation can lead to pipe corrosion
  - Leakage or spill potential compounded by tree roots seeking more water

- Management need: More frequent and better monitoring of pipe systems

- Research need: How to best conduct that monitoring
  - An issue not appropriate to SCCWRP’s expertise
POTENTIAL ISSUE: CHANGES IN INFLUENT QUALITY

• As homeowners and businesses cut back on usage, they produce a higher concentration flow
  – Changes of influent quality can lead to plant inefficiencies or upsets
  – For some operators, change in influent quality may also result from changing freshwater sources

• Management need: More or different treatment processes
  – Including process control monitoring

• Research need: Engineering assessments
  – Another issue that is not appropriate to SCCWRP’s expertise
POTENTIAL ISSUE: INSTREAM FLOW NEEDS

• **Drought leads to less flow in streams and rivers**
  – Less local rainfall
  – Reduced land-based runoff with less outdoor water usage
  – Increased emphasis on reuse leads to less treatment plant ambient discharge

• **Management need: Optimizing stream flow to support biota**
  – Particularly important where endangered species are present

• **Research need: Determining flow requirements for biota**
  – This is an area we are already working and poised to do more

• **Research need: Establishing biotic assessment tools for intermittent or low flow streams**
  – We are a leader and active in this field
POTENTIAL ISSUE: MORE CONCENTRATED EFFLUENT

- Reuse leads to a similar mass of contaminants in a lesser volume of water

- Management need: Understanding whether more/different treatment is needed prior to discharge

- Three potential research needs:
  - Understanding plume behavior
  - Toxicity of concentrated effluent
  - Understanding relative risk between greenhouse gas production for contaminant removal vs. contaminant effects in the ocean
UNDERSTANDING PLUME BEHAVIOR

• **A more concentrated plume leads to a heavier plume**
  - Present diffusers and plume models are based on a buoyant plume
  - Buoyant plumes rise to the thermocline and disperse
  - Heavier plume can lead to more deposition near the outfall

• **SCCWRP has held workshops on this topic**
  - Identified alternative diffuser designs appropriate to a heavier plume

• **Don’t have further plans to work on this issue**
  - Don’t anticipate that reuse options will lead to a negatively buoyant plume
  - Issue becomes more relevant if wastewater treatment becomes linked with desalination operations
Research need: Toxicity of concentrated effluent
- We are not presently working on this, but this topic aligns well with our expertise

CTAG felt this was unlikely to be a big issue
- Your plumes are generally not toxic even at full strength
- The allowable dilution in your mixing zone should still lead to a non-toxic effluent even with reuse leading to a higher concentration

Don’t presently have plans to work on this, but we could
- However, your labs are well-suited to quantify this
GREEN HOUSE GAS EMISSIONS

• Effluent regulations are based on concentration limits
  – Discharge concerns are more focused on mass
  – Concentrations may increase, but mass will be largely unaffected

• Leads to weighing of competing risks: greenhouse gas production associated with treatment vs. benefits of reduced effluent concentration

• Involves a larger view of the problem

• Not presently working on this, but the question aligns well with our expertise
  – Is this something that interests the Commission?