

أرامكو السعودية
Saudi Aramco



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Wastewater Conservation & Reuse

Agenda

- *Saudi Aramco Environmental Policy*
- *Conservation Efforts*
- *Practical Examples of Work*
 - *Low Tech*
 - *High Tech*
- *Reuse Performance / Direction*
- *Conclusion / Summary*

Saudi Aramco Env. Policy

“The Company will Promote environmentally sound waste disposal practices and cost effective waste minimization through source reduction, reuse and recycling.”

Conservation Mandate

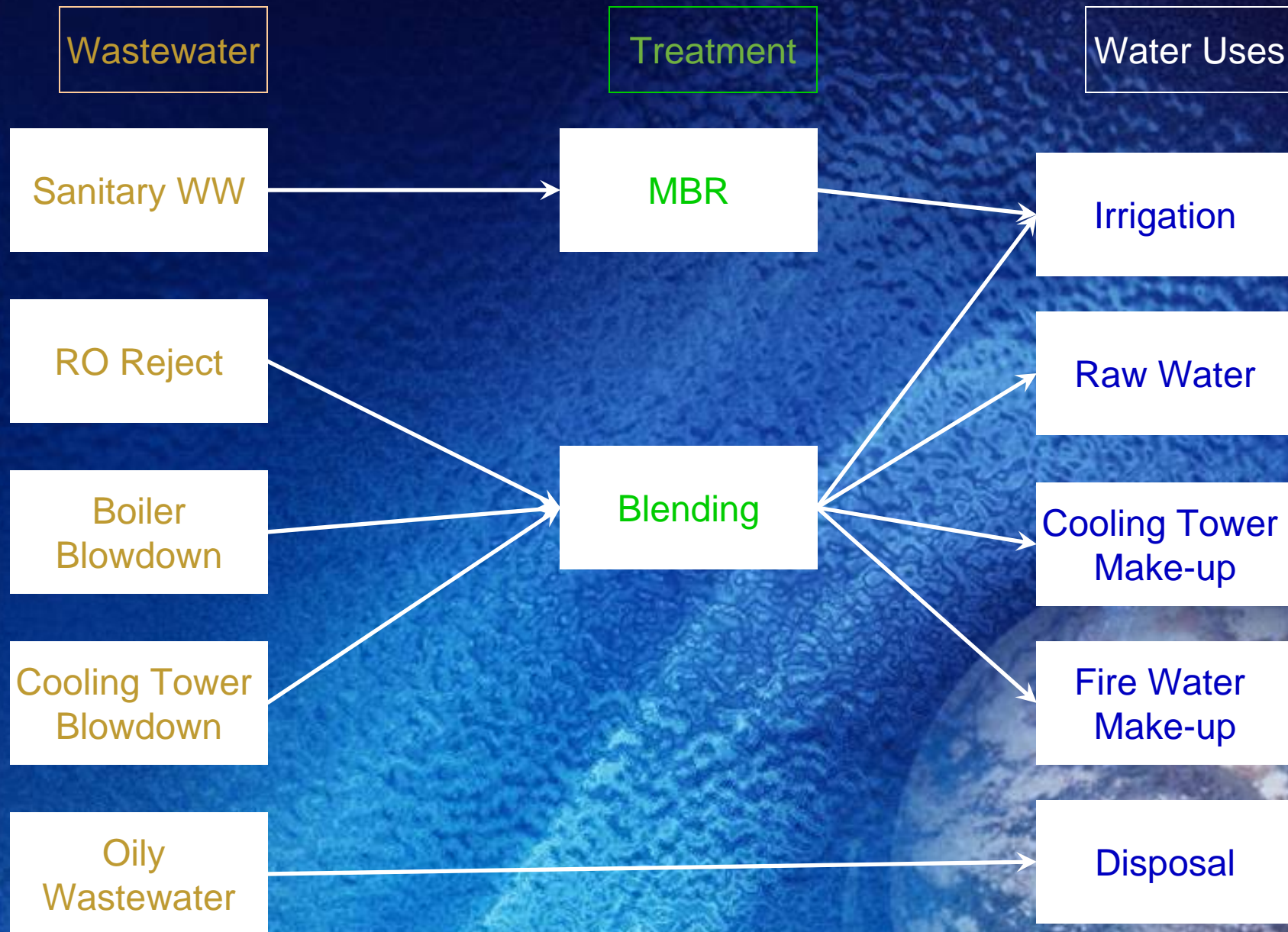
- *First Conserve*
 - *Waste Minimization Audits*
 - *Water Conservation Audits*
- *Treat & Reuse*
 - *Sanitary Wastewater*
 - *Industrial / Oily Wastewater*
- *Dispose Appropriately*

Economic Evaluation - Basis

- *Groundwater is a Limited Resource*
 - *Value = Cost of Desalinated Sea Water*
 - *~\$10 / 1000 gallons*

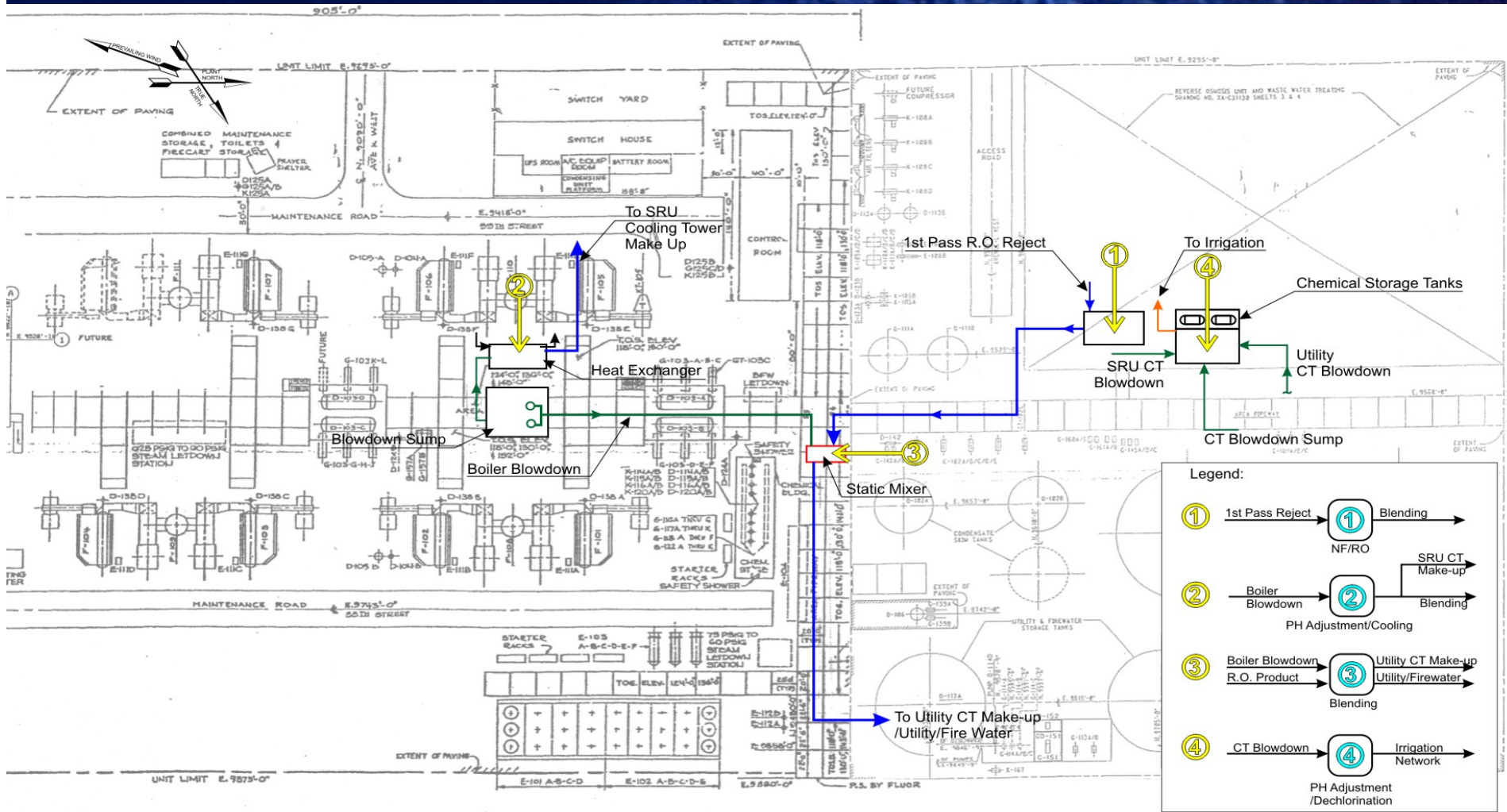
Water Conservation Audits

- *Gas Plant Industrial Reuse Audit*
 - *Quantified all Water Uses*
 - *Evaluated Water Quality Requirements*
 - *Mapped Water Use Location*
 - *Quantified all Water Disposed*
 - *Evaluated Disposed Water Quality*
 - *Mapped Water Disposal Location*
 - *Identified Acceptable Low Tech Reuse*
 - *Economic Evaluations*



Low Technology Reuse / Disposal Options

Typical Plant Arrangement



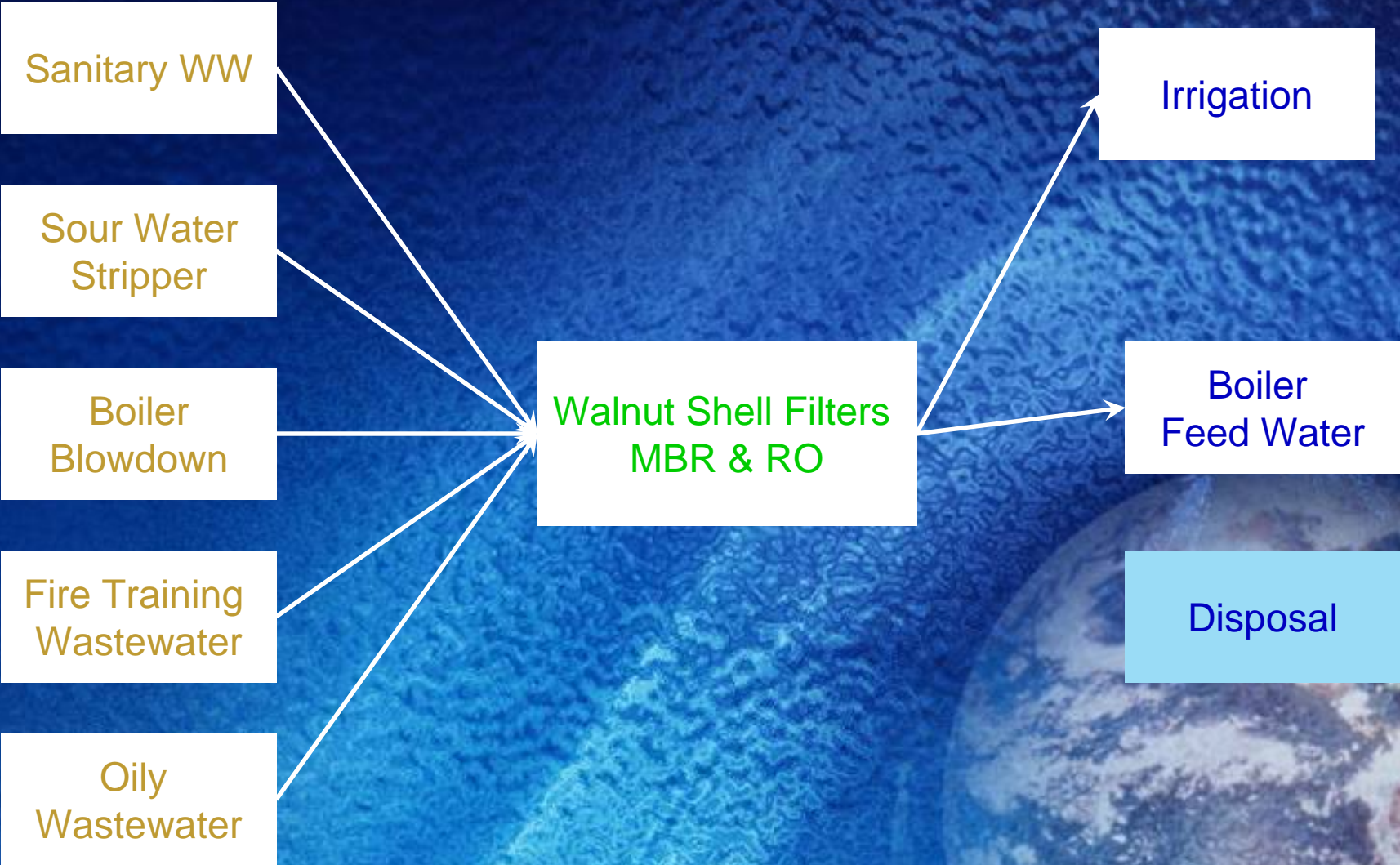
Acceptable Low Tech Reuse Matches

<i>Wastewater Source</i>	<i>Potential Reuse (Minimal Treatment)</i>
<i>Boiler Blow down</i>	<i>Raw Water Makeup / Irrigation</i>
<i>RO Reject</i>	<i>Raw Water Makeup / Irrigation</i>
<i>Sanitary Wastewater</i>	<i>Irrigation</i>
<i>Cooling Tower Blowdown</i>	<i>Fire Water Makeup</i>

WW Reuse – New High Tech Options

- *JGP Industrial WW Reuse*
 - *Combine Sanitary & Oily Wastewater*
 - *API & Walnut Shell Filters*
 - *MBR Treatment (carbon assisted)*
 - *RO to Provide Boiler Feed Water*
 - *Annual Cost Savings > \$1 MM*

JGP – Carbon Assisted MBR & RO



WW Reuse Performance / Direction

- *Sanitary Wastewater*
 - *72% Reused*
 - *Projects to raise to over 94%*
 - *All WW Treatment Systems > 100 m³/day*
- *Oily Wastewater*
 - *Most Discharged to Evaporation Ponds*
 - *Moving to Beneficially Reuse*
 - *Oil Field Pressure Maintenance*
 - *High Tech Oil Removal & MBR*

Conclusion

- **Water Conservation Goals**
 - *Appropriately Value Water*
 - *Minimize Consumption & Maximize Reuse*
- **Water Audits**
 - *Low & High Tech Reuse Options*
- **Provide Acceptable Treatment for Discharges**
 - *Moving to Beneficial Reuse Options*

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*Thank You
For Your
Time*