STATE OF COLORADO

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Dedicated to protecting and improving the health and environment of the people of Colorado

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Colorado Department of Public Health and Environment

February 23, 2012

Mr. George Kast,
Produced Water Solutions Inc.
PO Box 1280
Westminster, Colorado 80036

RE: Certification, Colorado Discharge Permit System – Produced Water Treatment Facilities
Permit Number COG840000 Certification Number: COG840001

Dear Mr. Kast:

Enclosed please find a copy of the permit certification for the Produced Water Solutions facility near Rifle, CO, discharging to an irrigation ditch tributary to the Colorado River, which was issued under the Colorado Water Quality Control Act. **Please read the enclosed permit and certification, as well as this letter, which outline the requirements under this permit, and the explanation of how certain limitations were developed.** The Division holds the permittee legally liable for all permit requirements.

The following information describes how the limitations and permit requirements were developed.

Facility Information:

- **Industry Description**
  The Produced Water Solutions treatment facility (WWTF) operated near Rifle, CO, will treat wastewater associated with natural gas, oil and coalbed methane operations. This facility is subject to Colorado Department of Public Health and Environment regulations pertaining to solid waste sites and facilities and will operate under a Certificate of Designation. The facility is also subject to permitting by the Air Pollution Control Division. The discharge of treated water to adjacent surface waters requires a discharge permit from the Water Quality Control Division (WQCD).

- **Treatment Facility Description**
  Wastewater will enter a mechanical strainer, an oil/water separator, followed by a 220,000 gallon equalization tank, electro-oxidation and dissolved air filtration. Condensate from the oil/water separator will be disposed of offsite, and sludge from the dissolved air flotation unit will be landfilled. Filtrate from the sludge tank and filter press will be returned to the dissolved air flotation tank. The wastewater will then go through a series of filters (mechanical strainer, oil sorb, carbon, sand and eventually through a reverse osmosis system (RO). The RO permeate will then be aerated and discharged to an irrigation return ditch leading to the Colorado River. The brine from the RO process will be stored in a 60,000 gallon tank and trucked offsite for alternate disposal. The only discharge allowed under this permit is the RO permeate (which may need to be blended with some of the RO brine as explained later).

- **Chemical Usage**
  The application identified the following chemicals which are added to the water flow after dissolved air flotation and before entrance into the lined, storage pond. The MSDS documents for these chemicals were provided in the permit application. The MSDS sheets have been reviewed and the following chemicals are been approved for use.

Chemical Name	Purpose	Constituents of Concern
FKD 1000 and MKD 1000	Solids Digestion and odor control	Carbon and nitrogen oxides, unknown
Caustic soda	Neutralization, Membrane washing reagent	pH
Citric Acid	Membrane cleaning	pH
Ferric sulfate	Coagulation	Iron, sulfates
Aries 3640	Flocculant	unknown
AR-951	Anti-sealent	Iron and manganese
Alcoflow 750	Anti-sealent	pH
Versaflex Si	Anti-sealent	Acrylamide
Sodium Bisulfite	RO additive	Sodium, salts
Celtom 5000P	Dewatering	unknown
Calcium chloride	Permeate Conditioning	Calcium, chloride, salts

Chemicals deemed acceptable for use in waters that will or may be discharged to waters of the State are acceptable only when used in accordance with all state and federal regulations, and in strict accordance with the manufacturer's site-specific instructions.

Basis of Certification Limitations:

- **Stream Segment Information**
  The discharge is to the Colorado River, within Segment COLCLC02A of the Lower Colorado River Sub-basin, Lower Colorado River Basin, found in the Classifications and Numeric Standards for the Lower Colorado River River Basin (Regulation No. 37; last effective update effective June 30, 2010). Segment 02A is reviewable and is classified for the following beneficial uses: Recreation Class E, Aquatic Life – Class 1 Warm, Water Supply, and Agriculture.

- **Technology Based Standards**
  The limitations for oil and grease and total suspended solids are from Regulation 62, which apply to all discharges that would be covered under this General Permit.

- **Water Quality Standards**
  Limitations for metals and inorganics are based on the water quality standards specific to stream segment COLCLC02a. Note that for many of the metals, the standards relate to the hardness of the receiving stream. Since the discharge is made up or RO permeate, it is clean water with a very low hardness (approaching zero). However, as some blending with the RO brine, or with the addition of other additives that will be needed to be done in order to meet the WET limitations (the organisms on which the WET testing is to occur cannot live in a pure, ionic imbalanced water) a zero hardness will not be seen in the discharge. Hardness data for Colorado River were obtained from the rationale to the last update to the Lower Colorado River basin regulations. The average hardness is 220 mg/l based on 87 samples from the Colorado River, and the calculations are provided below.

  Note that there are known drinking water intakes on the Colorado River, however they are more than 10 miles downstream of this discharge. This distance, as well as the dilution factor, eliminate them from being applied in this certification. Therefore limitations for dissolved iron, sulfate, and manganese will not be applied. Note that limits for manganese based on aquatic life (above table) will be applied. Additionally, the 10 mg/l limit for nitrate will not be applied and the 100 mg/l limit based on agricultural uses will be substituted. For total recoverable arsenic, the 0.02 standard will be applied, as it is based on fish consumption.

  For organic parameters, the aquatic life, water supply, and water + fish limits will be applied.

- **Antidegradation**
  Because the receiving water is reviewable, an antidegradation evaluation must occur. The facility was not in place as a discharger as of September 2000, and therefore any consideration of this discharge being present as of the antidegradation baseline date is not considered. The limitations based on the antidegradation review will be determined to be 15% of the water quality standard.

Parameter	*In-Stream Water Quality Standard*			*TVS Formula: Hardness (mg/l) as CaCO3 =* 220
Aluminum, Total Recoverable	Acute	10071	µg/l	$e^{(1.3695(\ln(\text{hardness}))+1.8308)}$
	Chronic	1438	µg/l	$e^{(1.3695(\ln(\text{hardness}))-0.1158)}$
Cadmium, Dissolved	Acute	5.4	µg/l	$[1.136672-0.041838\ln(\text{hardness})]e^{(0.9151(\ln(\text{hardness}))-3.1485)}$
	Chronic	0.77	µg/l	$[1.101672-0.041838\ln(\text{hardness})]e^{(0.7998(\ln(\text{hardness}))-4.4451)}$
Hexavalent Chromium, Dissolved	Acute	16	µg/l	Numeric standards provided, formula not applicable
	Chronic	11	µg/l	Numeric standards provided, formula not applicable
Copper, Dissolved	Acute	28	µg/l	$e^{(0.9422(\ln(\text{hardness}))-1.7408)}$
	Chronic	18	µg/l	$e^{(0.8545(\ln(\text{hardness}))-1.7428)}$
Lead, Dissolved	Acute	151	µg/l	$[1.46203-0.145712\ln(\text{hardness})][e^{(1.273(\ln(\text{hardness}))-1.46)}]$
	Chronic	5.9	µg/l	$[1.46203-0.145712\ln(\text{hardness})][e^{(1.273(\ln(\text{hardness}))-4.705)}]$
Manganese, Dissolved	Acute	3882	µg/l	$e^{(0.3331(\ln(\text{hardness}))+6.4676)}$
	Chronic	2145	µg/l	$e^{(0.3331(\ln(\text{hardness}))+5.8743)}$
Nickel, Dissolved	Acute	912	µg/l	$e^{(0.846(\ln(\text{hardness}))+2.253)}$
	Chronic	101	µg/l	$e^{(0.846(\ln(\text{hardness}))+0.0554)}$
Selenium, Dissolved	Acute	18.4	µg/l	Numeric standards provided, formula not applicable
	Chronic	4.6	µg/l	Numeric standards provided, formula not applicable
Silver, Dissolved	Acute	7.9	µg/l	$\frac{1}{2}\, e^{(1.72(\ln(\text{hardness}))-6.52)}$
	Chronic	1.2	µg/l	$e^{(1.72(\ln(\text{hardness}))-9.06)}$
Uranium, Dissolved	Acute	5728	µg/l	$e^{(1.1021(\ln(\text{hardness}))+2.7088)}$
	Chronic	3578	µg/l	$e^{(1.1021(\ln(\text{hardness}))+2.2382)}$
Zinc, Dissolved	Acute	281	µg/l	$0.978e^{(0.8525(\ln(\text{hardness}))+1.0617)}$
	Chronic	243	µg/l	$0.986\, e^{(0.8525(\ln(\text{hardness}))+0.9109)}$

- **Salinity – Colorado River Basin Regulations**
  As the discharge is to the Colorado River basin, overall limits for TDS are required at either 500 mg/l, 1 ton per day, or 350 tons per year. As the RO treatment will result in extremely low TDS, and although salts may need to be added or blending with some brine may need to be done to meet the WET limits, the TDS will still need to be low. It is assumed that these criteria will be met and therefore report only requirements will be required during this permit term for verification.

- **Narrative Standards**

  Section 31.11(1)(a)(iv) of The Basic Standards and Methodologies for Surface Waters (Regulation No. 31) includes the narrative standard that State surface waters shall be free of substances that are harmful to the beneficial uses or toxic to humans, animals, plants, or aquatic life.

  Agricultural Protection

  For the Ag Policy, the interpretation of these conditions (i.e., "no harm to plants" and "no harm to the beneficial uses") and how they were to be applied in permits were contemplated by the Division as part of an Agricultural Work Group, and culminated in the most recent policy entitled Implementing Narrative Standards in Discharge Permits for the Protection of

Irrigated Crops (hereafter the Narra Standards policy). Although the water in the ɔrado River is used for irrigation water, the available dilution is greater than 100:1, and therefore the discharge is exempt from limitations for SAR and EC.

Whole Effluent Toxicity

For WET testing, although the proposed treatment would remove almost all pollutants from the wastewater, this in fact may be toxic to aquatic life as the discharge water will be too clean to support aquatic life due to ionic imbalances. The permittee will likely need to adjust the RO system to allow for some pass through of salts to maintain a suitable ionic balance, or may have to blend some of the RO brine back into the effluent or add some salts back into the discharge water prior to release. This will need to be done in order to have a chemically balanced discharge that will pass a WET test, but also maintain compliance with other permit limitations. Because of the zero low flow condition of the receiving stream, and a more permanent discharge scenario, chronic WET testing will be required.

General Information:

- **Permit Action Fees** : The Annual Fee for this certification is $ 9,880 and is invoiced every July. Do not pay this now as an invoice will be sent shortly.

- **Changes to the Certification** – Any changes that need to be made to the certification page – changes in outfalls, monitoring requirements, etc., must be submitted using the "Permit and Certification Modification form" available on our website: coloradowaterpermits.com, and signed by the legal contact.

- **Discharge Monitoring Report (DMR)** forms will be mailed out within the next month. Reports must be submitted **monthly** as long as the certification is in effect. The permittee shall provide the Division with any additional monitoring data on the permitted discharge collected for entities other than the Division. This will be supplied to the Division within 48 hours of the receipt of the data by the permittee. If forms have not been received, please contact the Division at 303-692-3517.

- **Sampling Requirements** Sampling shall occur at a point after treatment, or after the implementation of any Best Management Practices (BMPs). If BMPs or treatment are not implemented, sampling shall occur where the discharge leaves control of the permittee, and prior to entering the receiving stream or prior to discharge to land. Samples must be representative of what is entering the receiving stream.

- **Termination requirements** This certification to discharge is effective long term, even though construction and dewatering discharge are only expected for approximately three months.

- **Certification Records Information** The following information is what the Division records show for this certification.

For any changes to Contacts – Legal, Local, Billing, or DMR – a "Notice of Change of Contacts form" must be submitted to the Division. This form is also available on our web site and must be signed by the legal contact.

Facility: Produced Water Solutions Inc, Garfield County
Industrial Activities : Commercial Treatment Facility (for Produced Water) SIC Code : 1300

Legal Contact *Receives all legal documentation, pertaining to the permit certification. [including invoice; is contacted for any questions relating to the facility; and receives DMRs.]*

George Kast, President
Produced Water Solutions Inc.
PO Box 1280
Westminster, Colorado 80036

Phone number: 303-883-0644
Email: gkast@verizon.net

Facility Contact *Contacted for general inquiries regarding the facility*

Same as above

Billing Contact

Same as above

DMR Contact

Same as above

If you have any other questions please contact me at 303-692-3655.

Sincerely

Andrew Neuhart
Assessment Based Permits Unit Manager
WATER QUALITY CONTROL DIVISION

Enclosures: Certification page; General Permit

xc:

Garfield County, Local County Health Department
Permit File: COG840001

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