### Plant Name
Water Recycling Plant in Nanpu Economic Development Area, Tangshan City

### Brief Description
The water recycling plant is located at Nanpu Economic Development Area of Tangshan City, with a capacity of 40,000m$^3$/day. It consists of two separate water treatment systems for domestic wastewater and industrial wastewater, occupying a construction area of 5,178.5m$^2$ and 3,514.4m$^2$ respectively. Total investment is RMB100m, all of which is on environmental spending. Source of influent is from the wastewater treatment plant located south to the water recycling plant in the economic development area.

The existing wastewater treatment plant has been operating since June 2002 and its key environmental impacts are summarized as follows:

- **Odor emission**
  - Hydrogen sulphide and ammonia emission from the plant satisfied level 2 requirement of Table 1 of Emission Standards for Odor Pollutants (GB14554-1993).

- **Noise pollution**
  - Noise pollution levels at daytime and nighttime are 45.3-52.3dB(A) and 44.7-47.9dB(A) respectively, satisfying the Emission Standard for Industrial Enterprises Noise at Boundary (GB12348-90) Type II requirement.

- **Sludge**
  - 9,120 tons of sludge are produced per annum and sent to landfill subsequently.

- **Wastewater**
  - Currently, wastewater is discharged directly. This causes wastage of water resources.

### Plant Layout
Total area of 31,300m$^2$, including plant of 10,592.5m$^2$ and greenbelt of 9,700 m$^2$.

### Influent Quality
- $\text{COD}_{cr} \leq 100\text{mg/L}$
- $\text{BOD}_5 \leq 30\text{mg/L}$
- $\text{SS} \leq 30\text{mg/L}$
- $\text{NH}_3-N \leq 25\text{mg/L}$
- pH: 6.0 to 9.0

### Effluent Quality
- Satisfying GB 18920-2002, Table 1 - Level 2
  - $\text{COD}_{cr} \leq 50\text{mg/L}$
  - $\text{BOD}_5 \leq 10\text{mg/L}$
  - $\text{SS} \leq 10\text{mg/L}$
  - $\text{NH}_3-N \leq 10\text{mg/L}$
  - pH: 6.5 to 9.0

### Labor Force
The project deploys a labor force of 20 persons, based on 360 days of operation per year.

### Brief Description of Concession Area
- **Location:**
  - Nanpu Economic Development Area is situated in the southern coastal lowland of Fengnan County, Tangshan City.

- **Topography:**
  - The geological structure of Nanou area belongs to Huabei depression. It is 1.5-3m above sea level. With a low and flat topology, its terrain slope is less than 0.14%. Its subsoil is mainly constituted of plain fill, sub-clay layer, light loam and loam.

- **Hydrology:**
  - The area is located at the bottom part of alluvial-proluvial fan. It consists of three types of aquifer. Shallow groundwater is widely distributed with saline water, which is segregated from the second...
The third aquifer is segregated from the second by sand clay. Water utilization mainly comes from mid-deep groundwater, which belongs to nahcolite (NaHCO₃) water type. The low direction of groundwater is basically consistent with that of rivers and the terrain.

Xiaojimen River-Heiyanzi drainage is the main stream in the region. Xiaojimen River is 42.2km long and covers an area of 240km². The 14.7km-long Heiyanzi drainage is the only sewage drains in the development area for discharge of industrial and domestic waste water. Sha River is another stream flowing through the region. It is 163km long and covers an area of 1,219km². It is a seasonal flood discharge river, which also accommodates water discharge from industrial enterprises alongside. The tidal barrage of Heiyanzi Drainage is built at the entrance leading to the sea.

**Climate:**
Having a warm temperate continental monsoon climate, the city has four distinct seasons. The average temperature is 11.8 degree Celsius. The dominating wind direction is south-southwest with an annual average wind speed of 4.6m/s.

### Summary of Environment

<table>
<thead>
<tr>
<th>- Ambient air quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average daily concentration of SO₂ is 0.010-0.039mg/m³ during non-heating period and 0.85-0.136mg/m³ during heating period, which both satisfied level 2 standard of Ambient Air Quality Standard GB3095-1996. Average daily concentration of total suspended particles (TSP) is 0.25-0.72mg/m³ during non-heating period, 38% above the standard. TSP concentration is 0.31-0.74mg/m³ during heating period, 50% above the standard.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>- Water quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concentration of permanganate, biological oxygen demand (BOD), fluoride, sulphate and non-ionic oxygen exceeded Type III standard for surface water. According to the sampling analysis of the environmental quality report of Nanpu region, the pH value, chloride and fluoride concentration of groundwater exceeded the Standards for Drinking Water Quality (GB5749-85). Permanganate, fluoride, sulfate, bridging oxygen-ion are the main pollutants in the water.</td>
</tr>
</tbody>
</table>

### Environmental Protection Targets

- Located at the western part of Nanpu Economic Development Area, the water recycling plant is adjacent to the waste water treatment plant and surrounded by saline-alkaline wasteland. The power plant of Tangshan Sanyou Chemical Group is 500m to its east. To its west, there is a freight railway of Tangshan Sanyou soda plant. There is no village within 3km range from the plant.

- Key environmental protection target is to satisfy the below standards:
  - Ambient Air Quality Standard (GB3095-1996): Level 2
  - Standard of Environmental Noise of Urban Area (GB3096-93): Type 2

### Standards Applied

- **Environmental Standards**
  - Ambient Air Quality Standard (GB3095-1996): Level 2
  - Environmental Quality Standard for Surface Water (GB3838-2002): Type III during shrimp cultivating period and Type V during non-shrimp cultivating period
- **Seawater Quality Standard (GB3097-1997): Type III**
- **Standard of Environmental Noise of Urban Area (GB3096-93): Type 2**

**Waste Disposal Standards**
- **Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant (GB 18918-2002): Table 1 – Level 2**
- **Emission Standards for Odor Pollutants (GB14554-1993): Table 1 – Level 2**
- **Emission Standard for Industrial Enterprises Noise at Boundary (GB12348-90): Type II**
- **Standards for Pollution Control on the Storage and Disposal Site for General Industrial Solid Wastes (GB18599-2001)**

**Overall Control Standard**
The plant is estimated to reduce the pollutants discharged from the wastewater treatment plant as follows:
- Chemical oxygen demand (COD): 1440t/a
- NH₃-N: 360t/a
- Sludge: 0

<table>
<thead>
<tr>
<th>Treatment Technique</th>
<th>Water treatment process for domestic wastewater</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tubular static mixer (flocculants) → Small eyelet grid reaction tank → Inclined lamellar sedimentation tank → V-type filter → Chlorination disinfection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Treatment Technique</th>
<th>Water treatment process for industrial wastewater</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Antibacterial dosing tank → Continuous micro-membrane filtration (CMF) → Reverse osmosis (RO) system → Chlorination disinfection</td>
</tr>
</tbody>
</table>

**Main Pollutants Discharged**

<table>
<thead>
<tr>
<th>Category</th>
<th>Source of pollution</th>
<th>Pollutant</th>
<th>Concentration and Amount Before processing</th>
<th>After processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>Influent</td>
<td>COD</td>
<td>100mg/L, 1440t/a</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SS</td>
<td>30mg/L, 432t/a</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NH₃-N</td>
<td>25mg/L, 360t/a</td>
<td>0</td>
</tr>
<tr>
<td>RO concentrated water</td>
<td>COD</td>
<td>100mg/L, 252t/a</td>
<td>50mg/L, 126t/a</td>
<td>20mg/L, 50.4t/a</td>
</tr>
<tr>
<td></td>
<td>SS</td>
<td>30mg/L, 75.6t/a</td>
<td>20mg/L, 50.4t/a</td>
<td>10mg/L, 25.2t/a</td>
</tr>
<tr>
<td></td>
<td>NH₃-N</td>
<td>25mg/L, 63t/a</td>
<td>10mg/L, 25.2t/a</td>
<td>20mg/L, 50.4t/a</td>
</tr>
<tr>
<td>Backwash water</td>
<td>COD</td>
<td>100mg/L, 72t/a</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>SS</td>
<td>200mg/L, 144t/a</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>NH₃-N</td>
<td>15mg/L, 10.8t/a</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Chemical washing water</td>
<td>pH</td>
<td>2-11</td>
<td>6-9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SS</td>
<td>200mg/L, 0.48t/a</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Solid</td>
<td>Solid waste</td>
<td>Sludge</td>
<td>880t/a</td>
<td>0</td>
</tr>
</tbody>
</table>
| Noise             | Noise level of various pumping systems is measured at 75-
90dB(A) while that of ventilator is at 80-90dB(A). After the application of vibration damping and sound insulation, noise level at boundary is estimated to reduce to 20-25dB(A), meeting the corresponding standard.

Other
The percentage of green coverage will reach 31% upon the construction, which benefits the ecological environment in the region.

Summary of Key Environmental Impacts during Operation

- **Odor emission**
  No new odor pollutants will be emitted as neither heating boiler nor canteen will be built. With the adoption of physiochemical treatment of wastewater, odor emission is insignificant. As a result, the concentrations of hydrogen sulphide, ammonia and other odors satisfy level 2 of Table 1 of Emission Standards for Odor Pollutants (GB14554-1993). The large scale greening project can further improve the surrounding environment and is thus, of limited environmental impact.

- **Wastewater**
  1. Backwash water generated from V-type filter, CMF membrane and RO membrane is the main wastewater, in which COD and SS are the main pollutants. Instead of being discharged, backwash water will be recycled to the pre-treatment process for repeated processing.
  2. Chemical washing for CMF and RO membranes is performed on monthly basis, generating 2,400 tonnes of chemical waste water per annum. It is mainly constituted of acidic and alkaline substances. After neutralization, it is discharged to the industrial wastewater treatment plant for processing.
  3. Concentrated water generated from RO is the only wastewater discharged. Daily discharge amounts to 7,000m³. It is high in salt concentration and low in COD and SS concentration, thus enabling it to meet the Table 1 – Level 2 requirement of the Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant (GB 18918-2002).

- **Noise**
  Noise level of various pumping systems is measured at 75-90dB(A) while that of ventilator is at 80-90dB(A). After the application of vibration damping, sound insulation and absorption, noise level at boundary can be effectively reduced to 20-25dB(A), meeting the corresponding standard. Moreover, the project plant is far from residential area, posing relatively low impact on the environment.

- **Solid Waste**
  Solid waste mainly consists of sludge, with an annual discharge amount of 880 tons. It is delivered for landfill treatment, together with the sludge from the wastewater treatment plant in Nanpu area.

Conclusion and Recommendation

- **Conclusion**
  1. With a total investment of RMB100m and a capacity of 40,000m³/day, the water recycling plant under contemplation will share the existing infrastructure facilities with the wastewater treatment plant in Nanpu Development Area. The facilities include water supply, electricity, heating boiler, maintenance, office buildings
2. The contemplated plant is located to the north of wastewater treatment plant in Nanpu Economic Development Area of Tangshan City, Hebei Province. The project site selection has been approved by the advisory committee of Nanpu Area and its construction is in line with the requirements in the master plan.

3. Major environmental impacts during construction are noise pollution and dust pollution. Noise pollution level can be reduced by proper planning of construction time and adopting low-noise design equipment. Dust pollution can also be greatly alleviated by frequent sprinkling, covering transport vehicles with canvas and timely cleanup of construction wastes.

4. Major environmental impacts during operation period include wastewater, odor, noise and solid waste. Respective pollution control and mitigants are in place to reduce its impacts. (Please refer to the section ‘Summary of Key Environmental Impacts during Operation’)

5. The construction of water recycling is expected to significantly reduce the amount of pollutants discharged from the wastewater treatment plant to below levels:
   - Chemical oxygen demand(COD): 1440t/a
   - NH₃-N: 360t/a
   - Sludge: 0

6. The project is in compliance with national policy. With the adoption of mature production process and energy-saving and pollution reduction controls in place, the project poses limited adverse effects on the environment and fulfills the clean production standards.

**Recommendation**

1. Endeavor to protect the ecological environment while enhancing the production efficiency during construction and operation period

2. Strengthen the environmental awareness of employees through training to ensure effective ongoing implementation of pollution control mechanisms