# APPLICATION FOR RENEWAL OF A CLASS I AIR QUALITY OPERATING PERMIT CYANCO ▪ WINNEMUCCA, NV

## APPENDIX 8: NARRATIVE DESCRIPTION
### AIR PERMIT RENEWAL

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## TABLE OF CONTENTS

**1. EXECUTIVE SUMMARY ..... 2**

**2. PROCESS DESCRIPTION ..... 3**

**3. PROCESS FLOW DIAGRAM, PLOT PLAN, AND MAP ..... 4**

## LIST OF FIGURES

FIGURE 3-1 PLANT #1 (WEST PLANT) NACN PROCESS FLOW DIAGRAM ..... 5

FIGURE 3-2 PLANT #2 (EAST PLANT) NACN PROCESS FLOW DIAGRAM ..... 6

FIGURE 3-3 PLOT PLAN OF CYANCO FACILITY ..... 7

FIGURE 3-4 LOCATION MAP OF CYANCO FACILITY WITH OTHER SURROUNDING AREA ..... 8

# 1. EXECUTIVE SUMMARY

Cyanco Company LLC. (Cyanco) owns and operates a sodium cyanide (NaCN) manufacturing facility in Winnemucca, Humboldt County, Nevada. The facility consists of two sodium cyanide production plants, Plant #1 (aka P1 or the West Plant) and P2 (aka P2 or the East Plant). Cyanco is registered with the Nevada Division of Environmental Protection (NDEP) under Facility Identification Number A0009 and currently operates under Class I Air Quality Operating Permit Number AP2819-0886.01, which was issued on August 31, 2010.

The Cyanco facility is located 7 miles west of Winnemucca, Nevada. A detailed process description is provided in Section 2 of this Appendix 8. The process flow diagrams for each plant are shown in Section 3 of this Appendix 8. The area map showing the facility location and property boundary is also provided in Section 3.

The primary raw materials for the manufacture of sodium cyanide are natural gas, ammonia, atmospheric air for oxygen, and caustic soda. This facility uses state-of-the-art technology to produce the liquid sodium cyanide product using Andrussow catalytic reactor and proprietary scrubbing system. The production process is centered on the direct production of an aqueous sodium cyanide solution by scrubbing small amounts of cyanide gas with caustic soda in a sodium cyanide absorber/converter. Unlike other Andrussow cyanide production processes used in the United States, this process does not involve the production or storage of liquid hydrogen cyanide. The final product for direct shipment to customers produced currently at the plant is a 30% NaCN concentrated solution.

The primary raw materials for production of sodium cyanide are methane, ammonia, air (for oxygen) and caustic soda. The chemistry involved in manufacturing sodium cyanide proceeds in two steps. The first step involves the partial combustion of a mixture of air, methane, and ammonia in the presence of platinum/rhodium catalyst gauze to produce a gas stream with low concentrations of hydrogen cyanide.

$$CH_4 + NH_3 + 3/2\,O_2 \rightarrow HCN + 3\,H_2O$$

Methane is supplied by an incoming natural gas pipeline. Liquid ammonia is transferred from railcars through a heat exchanger/vaporizer to the gas mixer. Ambient air is compressed, filtered, and mixed with methane and ammonia. The mixed gases are then filtered and heated in a steam heat exchanger. The three components are mixed in well-defined portions by controlling pressure, temperature, and flows of each component. The reacted gases are cooled in a waste heat exchanger to produce a low pressure process steam.

The second principle step in the process is the reaction of feed gases in the hydrogen cyanide reactor to form sodium cyanide. The reaction with caustic soda in the scrubber is represented by:

$$HCN + NaOH \rightarrow NaCN + H_2O$$

The facility uses the Andrussow Catalytic Reactor and a proprietary scrubbing system to produce a liquid sodium cyanide product. The sodium cyanide is produced by scrubbing the cyanide gas with caustic soda in the scrubber. Unlike other Andrussow cyanide production processes used in the United States, this process does not produce or store liquid hydrogen cyanide. The final product at the plant is a 30% NaCN solution produced for direct shipment to customers. Emissions from production lines in each plant are controlled by a thermal oxidizer. The thermal oxidizers denoted as TO-1 and TO-2 control emissions from P1 and P2, respectively

# 3. PROCESS FLOW DIAGRAM, PLOT PLAN, AND MAP

This section contains the process flow diagrams for P1 (Figure 3-1) and P2 ( Figure 3-2), respectively. Figure 3-3 displays the plot plan of the facility in general, while Figure 3-4 shows the surrounding area with respect to the facility location.

**FIGURE 3-1 PLANT #1 (WEST PLANT) NACN PROCESS FLOW DIAGRAM**

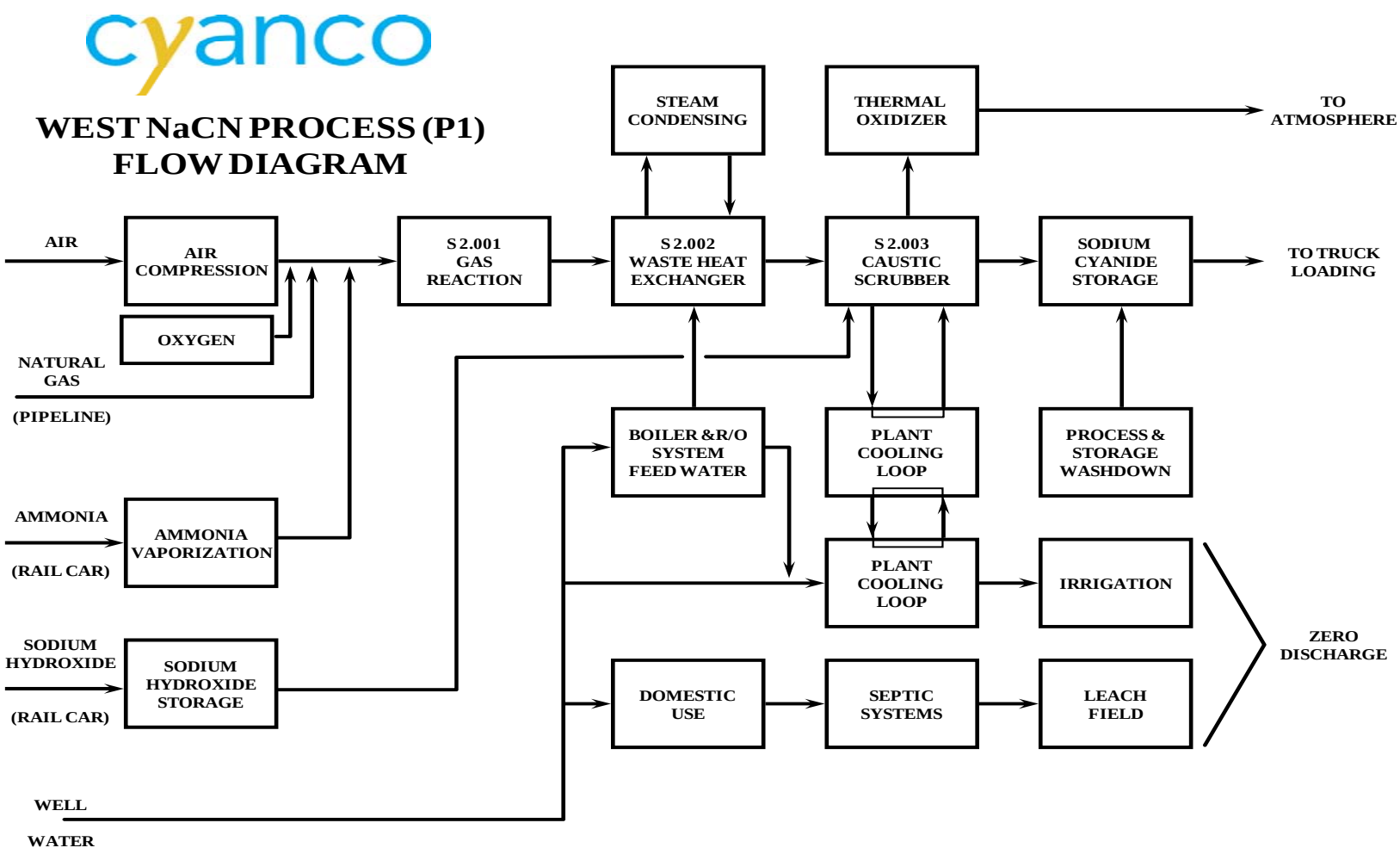

**FIGURE 3-2 PLANT #2 (EAST PLANT) NACN PROCESS FLOW DIAGRAM**

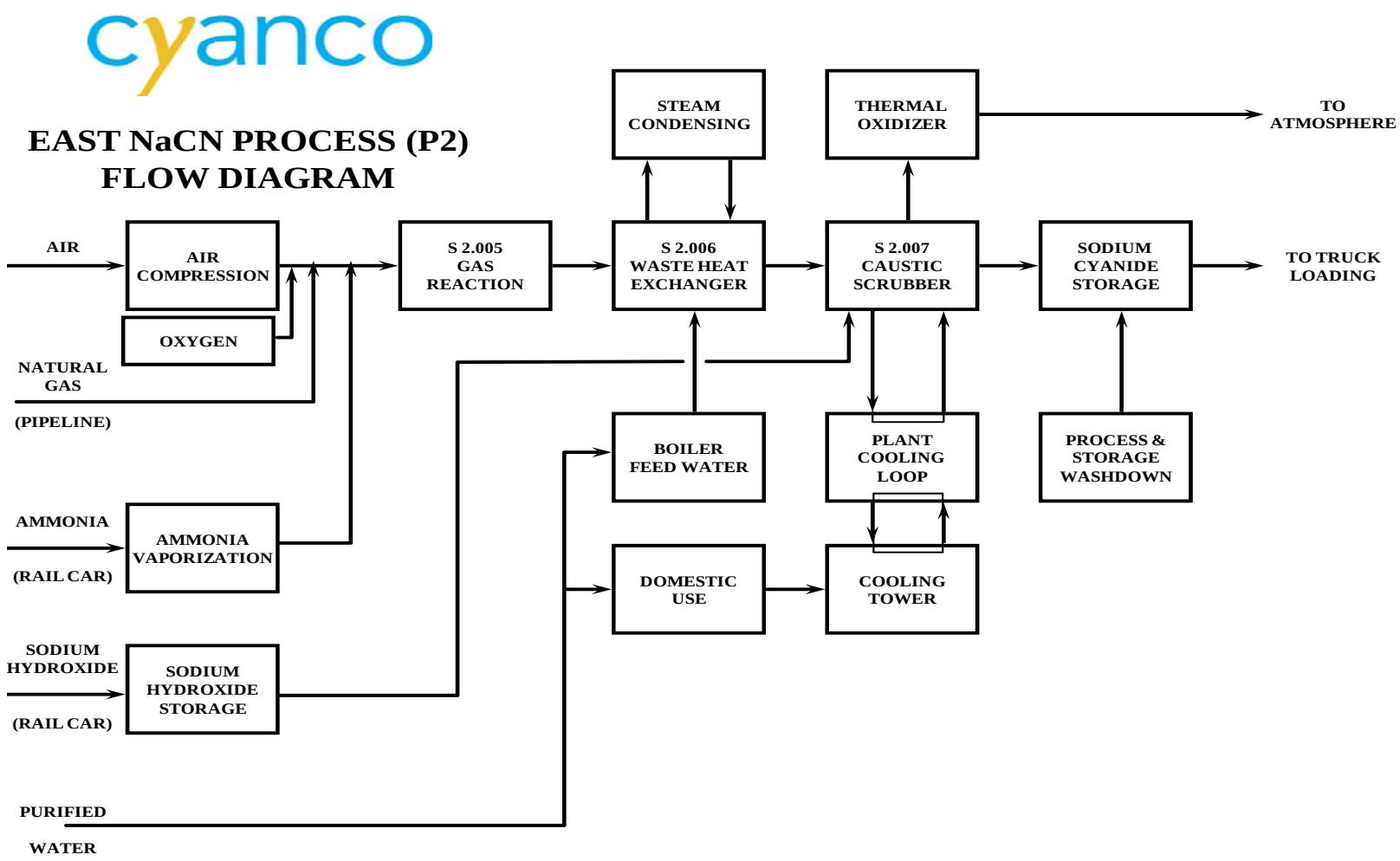

**FIGURE 3-3 PLOT PLAN OF CYANCO FACILITY**

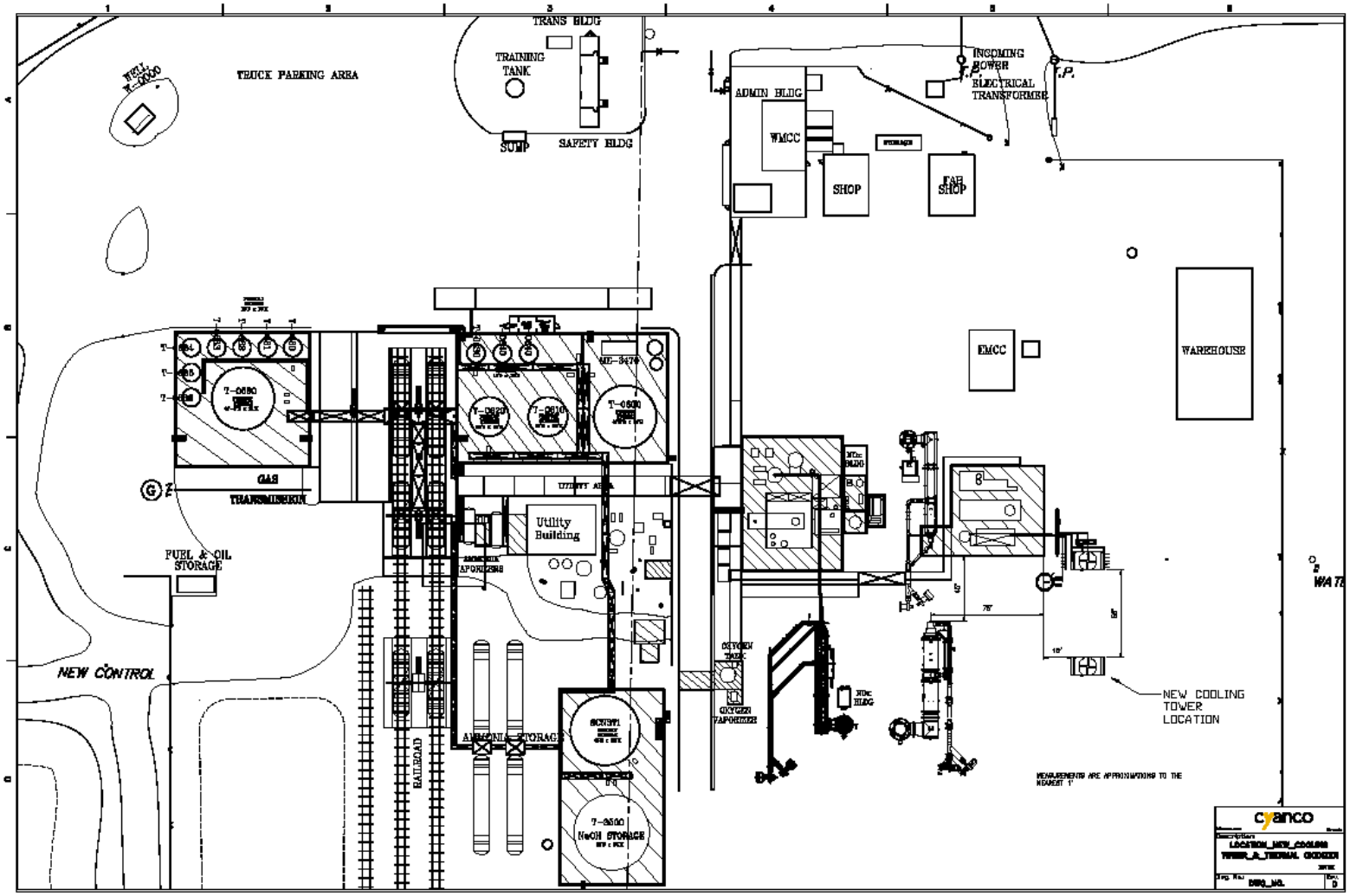
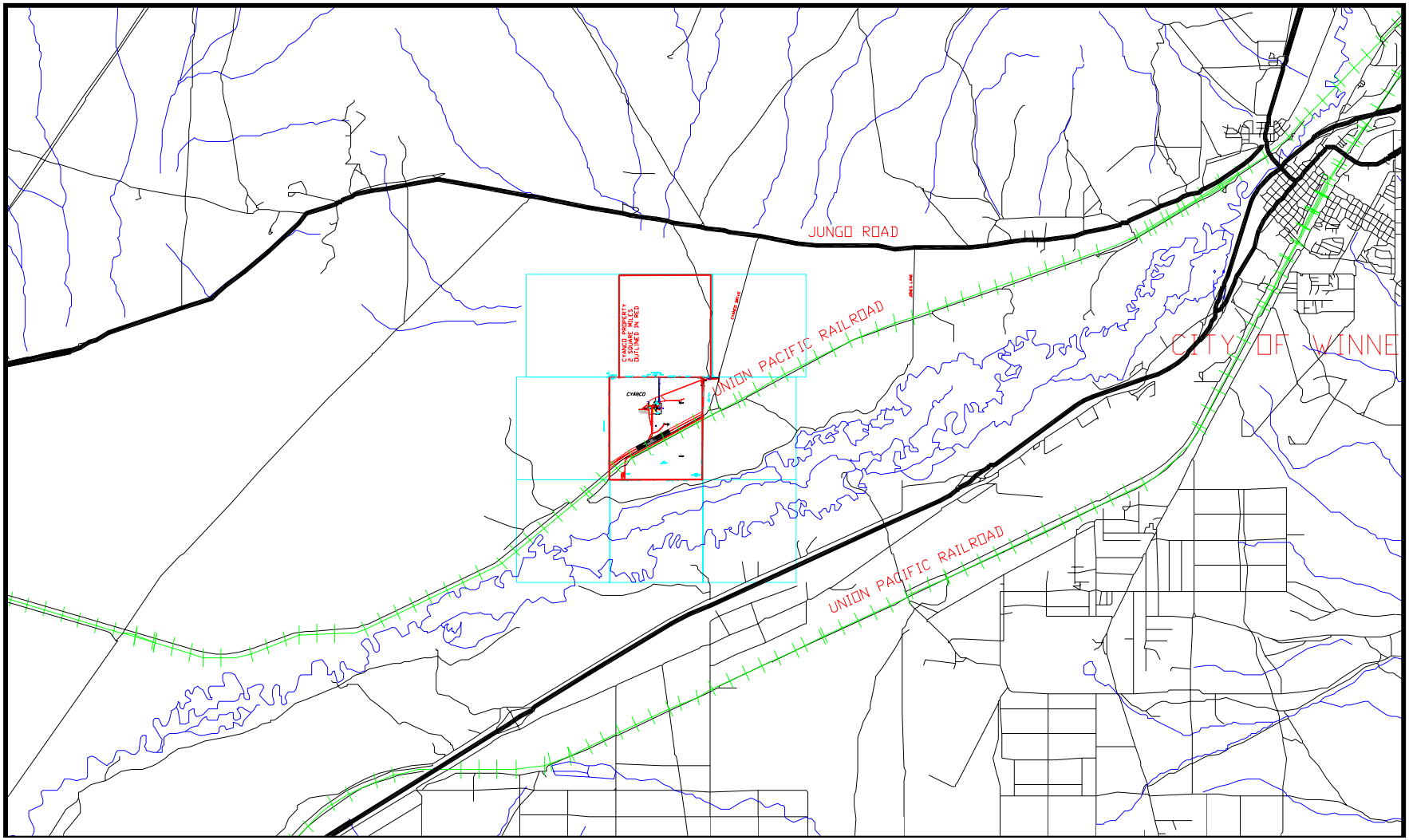
**FIGURE 3-4 LOCATION MAP OF CYANCO FACILITY WITH OTHER SURROUNDING AREA**