

TECHNICAL MEMO:

TO : Lynda Vanderwoerd - Village Of Linden
COPY TO : Arlen Babcock, P.Eng,- CIMA+
FROM : Dindo Pangilinan, P.Eng., PMP
DATE : November 29, 2024
SUBJECT : **CA000928-Village of Linden – North Linden ASP (NW Area)
Water Distribution and Wastewater Servicing**

1. INTRODUCTION

CIMA+ was engaged by the Village of Linden to assess the water and wastewater servicing needs for the proposed North Linden Area Structure Plan (ASP), with a particular focus on the northwest area. The proposed servicing solutions align with the recommendations outlined in the Linden Infrastructure Master Plan (CIMA+, 2021).

2. PROPOSED DEVELOPMENT

The study area, covering approximately 21.04 hectares, is divided into various land uses as shown in Figure 1 and detailed in Table 1 below:

Table 1: Proposed land use.

Proposed Development	Area (ha)
Commercial and Light Industrial	7.33
Residential	5.20
Park	2.12
Internal Roads	4.36
Pond (PUL)	1.55



Figure 1: Proposed development.

3. UTILITY SERVICING

3.1 SANITARY SEWER COLLECTION SYSTEM

The ASP area will be serviced by a gravity flow sanitary sewer system that will connect to the existing sanitary sewer mains along 6th Street NW and 5th Street NW which then connect to the sewer main along Central Avenue that drains into the wastewater lagoon. Based on the future system analysis (20-year growth horizon) in the IMP, it was noted that the trunk main leading to the lagoon will be 150% surcharged for peak wet weather flow (PWWF). This is an unacceptable condition, and a system upgrade will be required. In addition, the IMP also identified segments of the existing sewer mains along 5th Street NW and 6th Street NW that need to be replaced due to sags that create flow restrictions. The IMP recommends that these upgrades be completed before the development of upstream areas (which includes the NW ASP) or as development pressure occurs.

Non-Residential Areas

The existing 200mm sanitary sewer main along 6th Street NW shall be extended to service the proposed industrial & commercial zones within the ASP Area.

The proposed non-residential areas in the northwest include Zone M1(Industrial), Zone C2 (Commercial/Industrial Flex), and Zone M1/ROW covering approximately 7.37 ha (18.23 ac). Using the recommended design parameters stated in the IMP, the anticipated peak sanitary flow from the non-residential areas is estimated at 4.81 L/s.

Residential Areas

The existing 200mm sanitary sewer main along 5th Street NW shall be extended to service the proposed residential areas within the ASP Area.

The proposed residential areas include both Zone R2 (detached) and Zone R3 (attached) covering an area of approximately 5.22 ha (12.9 ac). The anticipated peak sanitary flow from these areas including portions of the MR/Parks area (~0.85 ha) that is assumed to contribute to the Infiltration/Inflow is estimated at 3.13 L/s.

Maximizing Trunk Main Capacity

The existing 200 mm sanitary trunk line leading to the lagoon was assessed in the wastewater model developed for the IMP to determine the amount of development in the ASP area that the trunk can support prior to reaching hydraulic capacity.

Three development scenarios were assessed, using the design criteria developed in the IMP:

- 100% Residential
- 50% Residential / 50% Industrial
- 100% Industrial

Population density for residential was assumed to be 25 people per hectare, which is slightly higher than those established under the growth projections in the IMP.

2.1 ha of residential development in the northeast was assumed to be in place.

The model was run under each scenario in an iterative process, increasing the developable area until the capacity in the trunk line was reached. The results for each scenario are as follows:

- 100% Residential – 5.5 ha of development
- 50% Residential / 50% Industrial – 5 ha of development
- 100% Industrial – 4.5 ha of development

Overall, the existing trunk line can accommodate approximately 5 hectares of new development in the ASP area before reaching its hydraulic capacity and causing surcharging, based on the design criteria established in the IMP. Conducting a detailed assessment of incoming flows in the trunk main, such as using a flow meter, could provide a more accurate measure of the available hydraulic capacity, which would correlate with the development capacity. This assessment may help delay the need for trunk line upgrades.

3.2 WATER SUPPLY AND DISTRIBUTION

The water system servicing strategy for the proposed Linden ASP (NW Area) shall align with the recommendations of the IMP. The water supply in Linden is provided by the Aqua 7 Regional Water Commission (ARWC) and delivered to the Linden reservoir through a regional transmission line. The treated water supply was designed to deliver a maximum of 14 L/s to the reservoir (~1210 m³/day) but it is currently set at a flow rate of 6 L/s (518 m³/day), as per information provided by the ARWC. The existing treated water reservoir has a total volume of ~1920 m³. The IMP indicates that the reservoir has enough capacity to accommodate the 20-year growth horizon which includes the NW areas of the Linden ASP.

The existing water distribution system in Linden consists of a large number of 100 mm and 150 mm diameter pipes (west side of the Village). These pipes are generally considered inadequate to deliver the minimum fire flow requirements, especially for commercial, industrial, and institutional developments.

The proposed water distribution system for the ASP area shall connect to the existing water mains along 5th Street NW and 6th Street NW and will be looped for redundancy. The anticipated water demands, based on the recommended design parameters stated in the IMP are as follows:

Non-Residential Areas

- + Average Day Demand (ADD) = 0.68 L/s
- + Maximum Day Demand (MDD) = 1.36 L/s
- + Peak Hour Demand (PHD) = 2.72 L/s

Residential Areas

- + Average Day Demand (ADD) = 0.42 L/s
- + Maximum Day Demand (MDD) = 0.84 L/s
- + Peak Hour Demand (PHD) = 1.68 L/s

To ensure that the existing water distribution can provide an adequate level of service for the 20-year horizon, the IMP recommends the following system upgrades:

- + A 200 mm pipe on the north end of the Village connecting 1st Street NW with 5th Street NW to ensure network connectivity and allow for adequate available fire flow in the northern portions.

- + A 200 mm pipe connecting 5th Street NW and 6th Street NW along 1st Ave NW. This pipe is necessary to ensure network connectivity and allow for adequate available fire flow in the industrial areas.

Fire Flow Requirements

It should be noted however that even with these upgrades, the available fire flow for the industrial and commercial areas is still not sufficient to meet the fire flow requirements for these types of land uses which can vary between 200 L/s – 300 L/s. However, these would be an unrealistic target for the Village, considering that its current infrastructure was not sized to accommodate these flows. As such, the IMP recommends that the Village require new developments of Industrial, Commercial, and Institutional land uses to include some level of on-site fire protection in their design.

For new commercial, industrial, and institutional developments, it is essential to include their own fire protection systems. Due to the limitations of the municipal hydrant system, which cannot provide the necessary fire flow rates for these types of land uses, developers must design and implement on-site fire suppression systems. This approach ensures that adequate fire protection is available, safeguarding both the properties and the occupants, and aligning with the recommendations of the Infrastructure Master Plan.

4. CONCLUSION

a. Sanitary Sewer Collection System:

- i. The ASP area will be serviced by gravity flow sanitary sewer system that connects to existing sewer mains along 6th Street NW and 5th Street NW.
- ii. The Linden IMP recommends that segments of the existing sewer mains along 5th Street NW and 6th Street NW be replaced due to sag which causes flow restrictions. Such upgrades need to be implemented prior to any upstream development or as development pressure occurs.
- iii. The Linden IMP indicates that segments of the existing trunk main leading to the lagoon will experience a 150% surcharge during peak wet weather flow (PWWF) over the 20-year growth horizon, necessitating upgrades.
- iv. The existing trunk main's capacity was also assessed to determine the development limit before reaching its hydraulic capacity under the following scenarios, assuming a residential population density of 25 people per hectare:
 - o 100% Residential: 5.5 hectares of new development
 - o 50% Residential / 50% Industrial: 5 hectares of new development
 - o 100% Industrial: 4.5 hectares of new development

Therefore, the existing trunk line can support approximately 5 hectares of new development before surcharging.

- v. A detailed flow assessment may provide higher certainty of available capacity, potentially delaying trunk line upgrades.

b. Water Supply and Distribution System:

- i. The water system servicing strategy for the North Linden ASP (NW Area) aligns with the Infrastructure Master Plan (IMP).
- ii. The Linden reservoir, supplied by the Aqua 7 Regional Water Commission (ARWC), has adequate capacity to support the 20-year growth horizon which include the northwest areas of the North Linden ASP.
- iii. The existing 100 mm and 150 mm distribution pipes (west side of the Village) are inadequate for fire flow requirements in commercial, industrial, and institutional areas.
- iv. The proposed distribution system shall connect to existing mains along 5th Street NW and 6th Street NW with loop connections for redundancy.
- v. The required system upgrades consist of:
 - o 200 mm pipe on the north end connecting 1st Street NW with 5th Street NW.
 - o 200 mm pipe connecting 5th Street NW and 6th Street NW along 1st Ave NW.
- vi. The existing municipal distribution system cannot meet high fire flow rates (200-300 L/s) for industrial and commercial areas. As such, new developments must include on-site fire protection systems.

5. LIMITATIONS

Any use which a third party makes of this memo, or any reliance or decision to be made based on it, are the responsibility of such third parties. CIMA+ accepts no responsibility for any damages, if any, suffered by any third party as a result of decisions made or actions based on this document.

CIMA+ reserves the right to amend the memo if new information is collected or if the information provided to CIMA+ used in this analysis is found to be inaccurate.

6. CLOSING

CIMA+ trusts that the information contained in this memo meets your requirements. Please do not hesitate to contact the undersigned if you have any questions or require additional information.

Prepared By

Reviewed By

Dindo Pangilinan, P.Eng., PMP
Project Manager-Infrastructure

Arlen Babcock, P.Eng.
Manager- Infrastructure

DRAFT

APPENDIX A: North Linden ASP Concept Plan

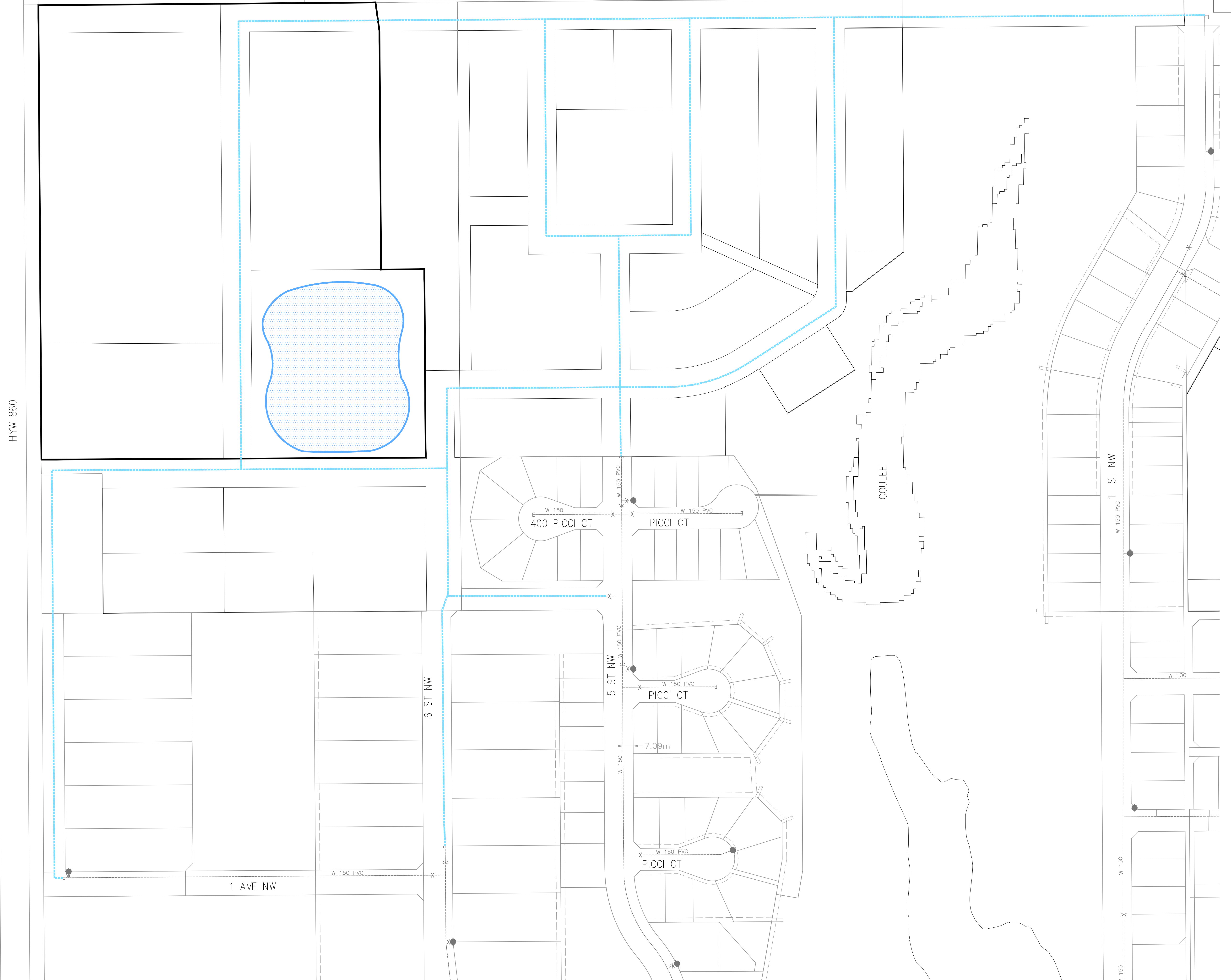
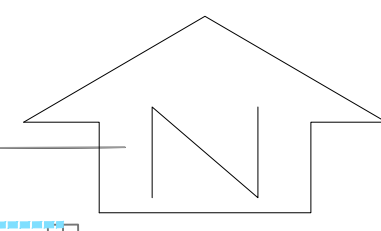
NORTH LINDEN ASP
 LINDEN, ALBERTA

**CONCEPTUAL WATER
 SERVICING**

LEGEND

--- PROP. W 200 WATER MAIN

● PROP. STORMWATER MANAGEMENT FACILITY



DATE : JUNE 12, 2024 SCALE : 1:1250



PROJECT No : CA000928 FIGURE W-1





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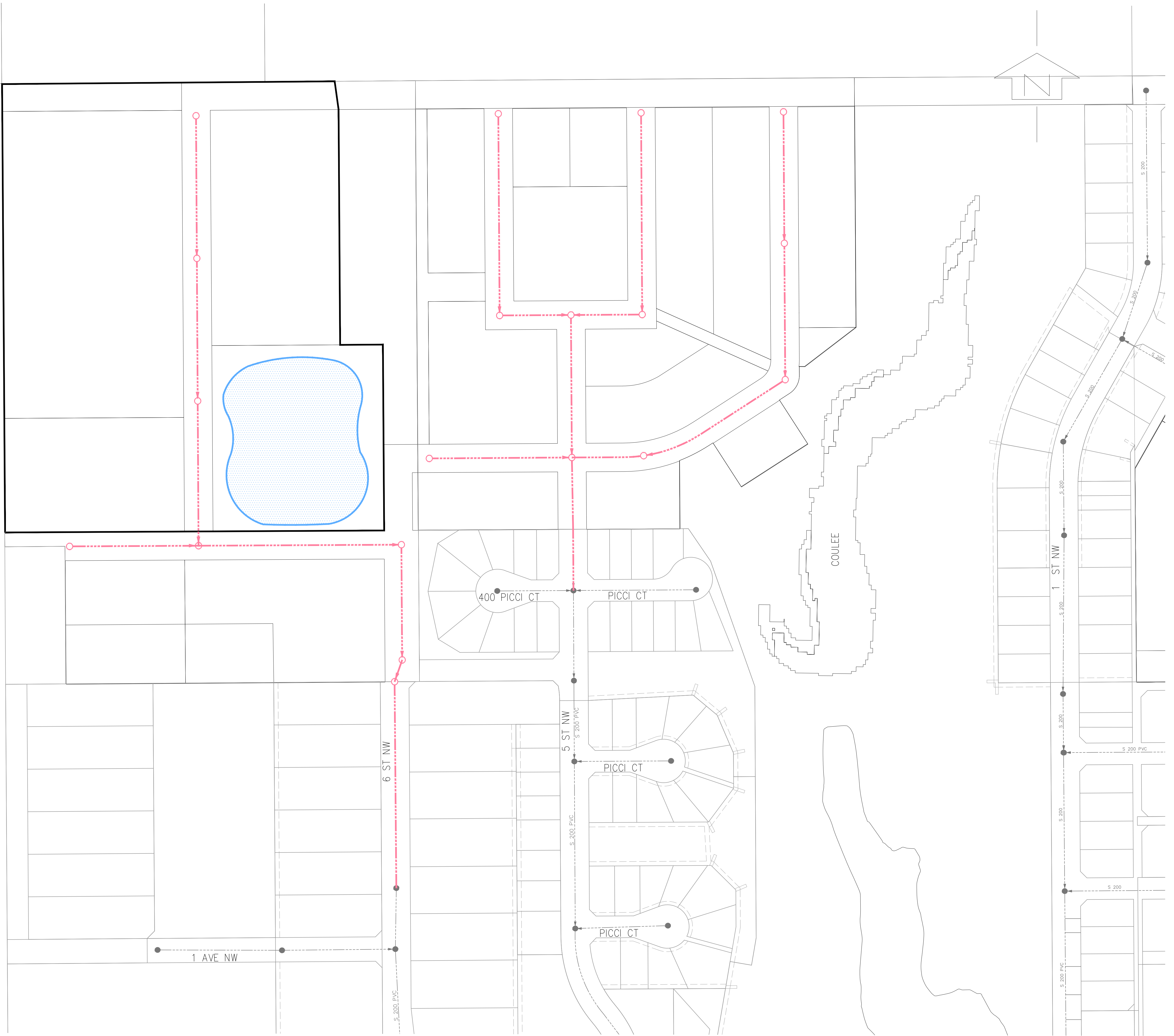
NORTH LINDEN ASP
LINDEN, ALBERTA

**CONCEPTUAL SANITARY
SEWER SERVICING**

LEGEND

- PROP. S 200 SANITARY SEWER
-  PROP. SANITARY MANHOLE
-  EX. S 200 SANITARY SEWER
-  EX. SANITARY MANHOLE
-  PROP. STORMWATER
MANAGEMENT FACILITY

HWY 806



DATE : JUNE 12, 2024 SCALE : 1:1250



PROJECT No : CA000928 FIGURE S-1