Comox Valley REGIONAL DISTRICT

Staff Report

Closed *Made public per Recommendation #3

DATE: September 9, 2024

FILE: 5340-09

TO: Chair and Members
Sewage Commission

FROM: James Warren
Chief Administrative Officer

Supported by James Warren,
Chief Administrative Officer
J. Warren

RE: Hudson Trunk Capacity Constraints

Purpose

To provide an update on the Hudson Trunk sewer capacity as a result of higher density developments proposed within the Hudson Trunk sewer catchment area.

Recommendations from the Chief Administrative Officer:

1. THAT a letter be prepared and sent from the Comox Valley Regional District to the Town of Comox and City of Courtenay outlining the challenges and capacity constraints of the Hudson Trunk sewer to ensure consistent messaging on capacity is provided to all interested parties.

2. THAT staff be directed to complete a servicing strategy plan for the Greenwood and Hudson Trunk sewers that considers timing and costs of infrastructure upgrades to the Comox Valley Sewer Service required to service the higher density developments now expected within the Hudson and Greenwood catchment areas.

3. THAT the Sewage Commission authorize the public release of this staff report dated September 9, 2024, once the municipalities have met with prospective developers to review the information provided in the Comox Valley Regional District letter outlining the challenges and capacity constraints of the Hudson Trunk sewer.

Executive Summary

- The Hudson Trunk sewer was constructed in 2018, includes connection to the City of Courtenay and Town of Comox sewer collection systems, and was intended to alleviate capacity constraints in the current system and to service anticipated development in the area.
- Through the detailed design, a service area was determined based on the topography and existing utilities in the area for the Hudson Trunk and a design

density of 10 units per hectare was selected, with a population density of 2.4 people per unit, consistent with developments expected within the area at the time of design.

- In recent months, several developments have been proposed that far exceed the original density used for sizing the Hudson Trunk, including three proposed developments on Aspen and Hector Roads.
- Comox Valley Regional District (CVRD), Town and City staff have been working together to better understand the impacts of this increase in density to the Hudson Trunk capacity, and additional modelling and review of the Hudson Trunk capacity has been completed by McElhanney (Appendix A).
- For the developments proposed on Hector and Aspen Roads, the Aspen Road line of the Hudson Trunk is not sufficiently sized to accommodate the full increase in flows as predicted with the current proposed density of these developments, and as such further discussions on the phasing and servicing of these properties is required.
- The original servicing plan for the Hudson Trunk sewer included construction of a pump station on Hector Road that would connect to the Hudson Trunk via a forcemain at Anderton Road.
- The timing and density of development in this corridor has changed from the original design parameters and as a result the Hector Road pump station and forcemain aren't currently included within the Development Cost Charges (DCCs) for the Comox Valley Sewer Service (CVSS).
- The modelling work has reviewed and determined the maximum available capacity for each pipe section of the Hudson Trunk. The Aspen Road leg of the existing Hudson Trunk system can support approximately 18.5L/s of additional flow before exceeding its capacity, and Parry Place can accommodate the 3.5 L/s expected from the Lannan development.
- Staff are recommending additional study work be completed to better understand the timing and cost impacts to the service of high-density development in the Hudson and Greenwood catchment areas so that these upgrades can accurately be planned for accordingly.
- CVRD staff are recommending sending a letter to the Town and City to outline the above conclusions and describe the study work planned to better understand how longer-term development can be accommodated in the gravity trunk lines.
- These letters will help ensure there is consistent messaging on the capacity of the Hudson Trunk system and to help inform the discussions the City and Town for phasing and connection of developments.

This report is being considered closed per Section 90(1)((k) of the *Community Charter* (SBC 2003) as it relates to negotiations and related discussions respecting the proposed provision of a regional district service that are at their preliminary

stages and that, in the view of the board, could reasonably be expected to harm the interests of the regional district if they were held in public.

Prepared by:	Concurrence:
Z. Berkey	***K. La Rose***
Zoe Berkey, P.Eng. Senior Engineering Analyst	Kris La Rose, P.Eng. Acting General Manager of Engineering Services

Government and Community Interests Distribution (Upon Agenda Publication)

City of Courtenay	✔
Town of Comox	✔

Background/Current Situation

In 1997 the Comox Valley Sewage Commission received a report titled "Sanitary Sewer Servicing Report for Anderton Road Area and Huband/Virginia Area" prepared by McElhanney. The report outlined sewer servicing for an area generally defined as northeast Courtenay, Seal Bay, Little River and the area between Courtenay, Comox and CFB Comox. This proposed sanitary sewer system has come to be known as the Greenwood and Hudson Trunk gravity sewers and the projects were added to the development cost charges project list in 2002.

The need and timing for the construction of the Hudson and Greenwood Trunk systems was dependent on many factors including growth, anticipated development pressure and capacity constraints. In 2018 and 2019 the Hudson and Greenwood were completed respectively.

When sizing a sewer gravity main a number of parameters and assumptions are made. During design of the Hudson Trunk the development density selected was 10 residential units per hectare with a population density of 2.4 people per unit, in line with development seen and expected in this area. In addition, considering the topography and existing utilities in the area, the area that would or could be serviced by the Hudson Trunk was determined as well. This catchment area included properties already within the Town and City boundaries along with a large portion of the Anderton corridor that is currently part of Lazo North (Electoral Area B) but expected to be annexed by the Town and City over time.

The Hudson Trunk sewer begins at the City of Courtenay boundary near Idiens Way and extends eastward along Dryden Road to Hudson Road and then northward to Knight Road to tie into existing sewers. As part of the Hudson Trunk a line was also extended along Aspen Road to ensure that the Town of Comox

could also utilize the Hudson Trunk to divert wastewater from North Comox. The original Hudson Trunk design included provision for a lift station near Hector and Anderton Roads, that would be constructed in the future and was intended to serve properties south of Idiens Way, along Hector Road, McQuinn Drive, Acacia Road and Toronitz Road.

The Hudson Trunk was constructed in 2017 and completed in 2018. Recently, several developments have been proposed that far exceed the original density used for sizing the Hudson Trunk, including three proposed developments on Aspen and Hector Roads.

CVRD staff have been working closely with City and Town staff to better understand what the impacts of these proposed developments mean in relation to capacity of the Hudson Trunk. McElhanney has completed additional modelling reviewing the Hudson Trunk sewer capacity (Appendix A) and the results are summarized below:

- The Aspen Road leg of the existing Hudson Trunk system can support approximately 18.5L/s of additional flow before exceeding its capacity. This is less than the proposed flows from the three developments in Aspen and Hector Roads, and does not consider the additional flow expected should Area B properties along Aspen Road be annexed and developed.
- Additional consideration around staging/phasing is required.

In light of the above noted capacity constraints, CVRD staff recommend sending a letter to the City and Town that includes the following:

- The proposed developments being considered by the City and Town are greater than the densities used when designing the Hudson Trunk sewer.
- As a result of this higher density there are capacity constraints within the Hudson Trunk, especially along Aspen Road where the three proposed developments within the Town are proposing to connect.
- The available capacity within the Aspen Road section of the Hudson Trunk is 18.5L/s.
- The CVRD does not have a direct approval role in respect of applications for connection to a municipal sewage collection line, even if the municipal collection line ties into a regional trunk sewer.
- Since the collection line is a municipal service, regulating connection to and use of the service is a municipal responsibility. As such how the additional capacity within the Aspen Road leg of the Hudson Tunk is allocated to development is a responsibility of the Town.
- Proposed path forward and next steps in developing a servicing strategy.

Options

The commission has the following options:

1. To direct staff to send a letter to the City and Town outlining the capacity constraints of the system and complete a servicing strategy for the Hudson and Greenwood Trunks.
2. To not proceed at this time.

As trends for higher development continue and are supported by government policies, considerable thought and analysis needs to be completed to develop a servicing strategy for the Hudson and Greenwood Trunk catchment areas that considers higher density developments, the timing of these developments and how this will impact and effect the capacity and upgrades for the CVRD's system.

A letter is recommended to be sent to the City and the Town, outlining the capacity constraints to provide consistent key messaging to all to help inform the member municipalities' discussions with developers proposing developments that will ultimately connect to the Hudson Trunk. As such, only option 1 above is recommended.

Financial Factors

Upgrades to the Hudson Trunk are not currently included within the DCC project list, as such funds for this project are not being collected as development occurs. Should upgrades to the system be required immediately, funds and DCC reserves have not been collected to pay for the capital improvements required to service development. Development of a broader strategy and incorporation of additional projects into the DCC project list that will service development should be completed to ensure that the CVRD is collecting funds to help offset the cost of capital upgrades for the system required for servicing development.

Completion of servicing strategy is likely on the order of magnitude of $50,000 to $100,000; included within the 2024-2028 financial plan is an allowance of $50,000 under engineering fees, 336-366.

Strategic Considerations - Strategic Drivers									
Fiscal Responsibility	✔	Climate Crisis and Environmental Stewardship and Protection		Community Partnerships	✔	Indigenous Relations		Accessibility, Diversity, Equity and Inclusion	

- Fiscal Responsibility: Should additional capital upgrades be required to accommodate development it is important to ensure the timing and costs of

these projects are understood and captured within the DCC bylaw for the service.

- Community Partnerships: Collaboration and planning with member municipalities in understanding and planning for development in the Hudson and Greenwood Trunk catchments is critical to ensure sewer infrastructure can support proposed development in the area.

Strategic Considerations - Regional Growth Strategy Goals							
Housing	✔	Ecosystems, Natural Areas and Parks		Local economic development	✔	Transportation	
Infrastructure	✔	Food Systems		Public Health and Safety		Climate Change	

- Housing: The CVSS needs to review and understand the limits and capacity of the gravity collection systems to better understand and be prepared for high density developments and diverse housing options planned for the Comox Valley.
- Infrastructure: Careful consideration around staging of servicing for future infrastructure is required to ensure that the CVRD is providing affordable, effective and efficient infrastructure to help service new developments while also considering costs for doing so.
- Public health and safety: Sewer servicing is imperative to support a high quality of life through the protection and enhancement of community health and safety by providing collection and treatment of municipal wastewater

Intergovernmental Factors

The CVRD does not have a direct approval role in respect of applications for connection to a municipal sewage collection line, even if the municipal collection line ties into a regional trunk sewer. Since the collection line is a municipal service, regulating connection to and use of the service is a municipal responsibility.

The CVRD does have a consultative role in relation to the municipality's consideration of certain development applications that could impact the capacity of the regional sewer system, and the CVRD and its member municipalities need to work closely together to review and consider capacity when the municipality is considering an OCP or zoning bylaw amendment for increased density of development. Such collaboration is required for implementation of effective funding strategies, and to ensure the CVRD has adequate lead time to add infrastructure in time to avoid constraining municipal development.

Local governments that are considering rezoning applications sometimes request that as a condition of adoption of the bylaw, a covenant is to be registered on title to the lands under section 219 of the *Land Title Act*. Section 219 covenants are sometimes used to secure commitments from the owner/developer for the provision of amenities or public infrastructure that is required to service the development. For example, the covenant could provide that the developer cannot subdivide or build on the lands—or can only build a limited number of residences—until a wastewater treatment facility or a water treatment plant has been suitably expanded/upgraded. Working with the member municipalities further discussion on requirements for section 219 covenants for developments should be had.

Citizen/Public Relations

To ensure consistent messaging between the CVRD, City and Town, staff are recommending that a letter be sent from the CVRD outlining the CVRD's position and planned actions to help inform the City and Towns discussions with developers.

Attachments: Appendix A – "Hudson Trunk Sewer Capacity Review - DRAFT," August 24, 2024, McElhanney Ltd.

Our File: 2211-47791-00

TECHNICAL MEMO

To	From
Kris La Rose, P.Eng. **Comox Valley Regional District**	**Matt Sanderson, P.L.Eng.** **McElhanney Ltd.**
Re	**Date**
Hudson Trunk Sewer Capacity Review	**August 27, 2024**

McElhanney has been retained by the Comox Valley Regional District (CVRD) to provide a sewer capacity assessment and computer model development for a limited section of the Hudson Trunk Sewer (HTS). These tasks are to support the CVRD's goals in managing pipe capacity with several developments forthcoming within the catchment.

This scope of work follows our June 27, 2024, proposal and subsequent discussions, as agreed by the CVRD, consisting of the following tasks:

- Develop a PCSWMM hydraulic model for the HTS, upstream of Knight Road.
- Establish an 'Original Design' development sewage loading scenario assuming 10 units / hectare as a baseline. Update due to recent development from Aspen Road – Lot 2 subdivision.
- Operate the model on a 24-hour diurnal cycle basis.
- Verify maximum flow capacity within the HTS system.
- Review and confirm sewer calculations as presented from the 2123 Hector Road servicing report.
- Review HTS responses, and recommended upgrades, related to development proposals at 941 Aspen, 2077 Hector and 2123 Hector Road.
- Establish concept-level Hector Road Lift Station design parameters.
- Review HTS responses, and recommended upgrades, related to development proposals at the Lannan Road.
- Provide a brief report summarizing findings.

Several previously completed design documents and technical guidelines were referenced for the above tasks. They include:

- HTS record drawings & 50% Design Brief, July 2016, (McElhanney 47376-01)
- Aspen Road - Lot 2 (Phase 2) record drawings, September 2022, (McElhanney 47463-00)
- Master Municipal Construction Documents (MMCD) Design Guidelines 2022
- Zoning application – 2123 Hector Road, May 2024, (Broadstreet Properties / Wedler Engineering)
- Servicing report – 941 Aspen Road & 2077 Hector Road, October 2022, (Highstreet Ventures / Islander Engineering)
- Servicing report – Lannan Road Development, March 2024, (Silverado Land Corporation / Koers Engineering)

This sewer capacity assessment has generated several new modeling scenarios which are briefly summarized below:

1. **24-01 Existing** – Described in Section 2.0, outputs in **Appendix A**. Premise: Existing Conditions Baseline Model, to compare against all other scenarios.
2. **24-01 Maximum Capacity** – Described in Section 3.0, outputs in **Appendix B**. Premise: Identify maximum hydraulic capacity without surcharge independent of population loads.
3. **24-02 2123 Hector** – Described in Section 4.0, outputs in **Appendix C**. Premise: Determine HTS response to development sewer loads as proposed in the project's servicing report, comparing against the baseline model.
4. **24-03 All Three Lots to Aspen** – Described in Section 5.0, outputs in **Appendix D**. Premise: Determine HTS response to combined sewer loads from three development proposals at 941 Aspen Road, 2077 Hector Road & 2123 Hector Road, comparing against the baseline model.
5. **24-03A Three Lots (Upgraded)** – Described in Section 5.0, outputs in **Appendix D**. Premise: Determine the HTS upgrades required to re-establish a maximum 80% system capacity based on the 24-03 model.
6. **24-04 Hector Multi-Family Projects to Hector Road Lift Station** – Described in Section 6.0, outputs in **Appendix E**. Premise: Consider servicing for the two Hector Road multi-family projects as originally envisioned in the HTS 50% Design Brief.
7. **24-04A Hector Multi-Families (Upgraded)** – Described in Section 6.0, outputs in **Appendix E**. Premise: Determine the HTS upgrades required to re-establish a maximum 80% system capacity based on the 24-04 model.

8. **24-05** Lannan Road – Described in Section 7.0, outputs in **Appendix F**. Premise: Determine HTS response due to change in density within the Lannan Road development, comparing against the baseline model.

Note: Scenarios **24-02** through **24-04** and their derivatives include the higher density proposed at Lannan Road property (Model Scenario **24-05**).

August 20th Memo Update

Following a meeting between the CVRD, Town of Comox and City of Courtenay on August 13, 2024, it was agreed that the Electoral Area 'B' properties would be removed from these assessments. Any future connections of individual neighbourhoods would require annexation into the neighbouring municipality and the sewer conveyance capacities re-assessed.

A second series of models, labeled as **24-5x**, were developed using the same sewer load scenarios but removing Area 'B' properties. This allows comparison to the original model series (**24-0x**, described in items 1-8 above) for the impact of the Area 'B' properties. The second series models include scenarios **24-51**, **24-52**, **24-53**, **24-54**, and **24-55** which are further described in their respective sections below.

Other changes made with the August 20th update include:

- The modeled pipe network was expanded downstream to the end of the HTS.
- Flows from the Lannan Road development with higher density was carried throughout the **24-5x** models.

August 27th Memo Update

During the meeting of August 21, it was noted that the **24-5x** development models contained an error applying the peaking factor in the discharge calculations to the Aspen Road corridor. The error was identified and corrected. The models were reviewed, and outputs republished for this update.

Other changes made with the August 27th update include:

- New pipe upgrade scenarios were added, **24-53A Three Lots to Aspen** and **24-54A Hector MF to LS** (for direct comparison to 24-03A and 24-04A, respectively).
- In response to a request from the Town, a variation to the **24-53** model to quantify how much development in the Aspen area could proceed prior to any issues develop in the HTS was generated and summarized in Section 5. This model variant is identified as scenario **24-53B**.

Tables and maps were updated and included in the relevant Appendix. Additional comments are included below to consider this change.

1. MODEL DEVELOPMENT

A detailed computer model was developed to characterize the HTS's hydraulic and sewer parameters using PCSWMM modeling software, itself derived from the US Environmental Protection Agency's Storm Water Management Model. This platform is widely held as an industry standard for hydrologic and hydraulic simulation. The software's hydraulic engine is ideal for time-based synthesis of flow conveyance in sewer applications. The platform georeferenced database allows for GIS integration. Scenario handling capabilities allow for direct comparison of various sewer loads and system responses.

The study area for this report is limited to the HTS, upstream of Knight Road. See **Figure 1**, below. The bright green outline is the catchment area. Properties within the Town of Comox area represented by light green hatching and those within the City of Courtenay by light blue hatching. The dark grey area is 2123 Hector Road, subject to a rezoning application presently considered by the Town of Comox.

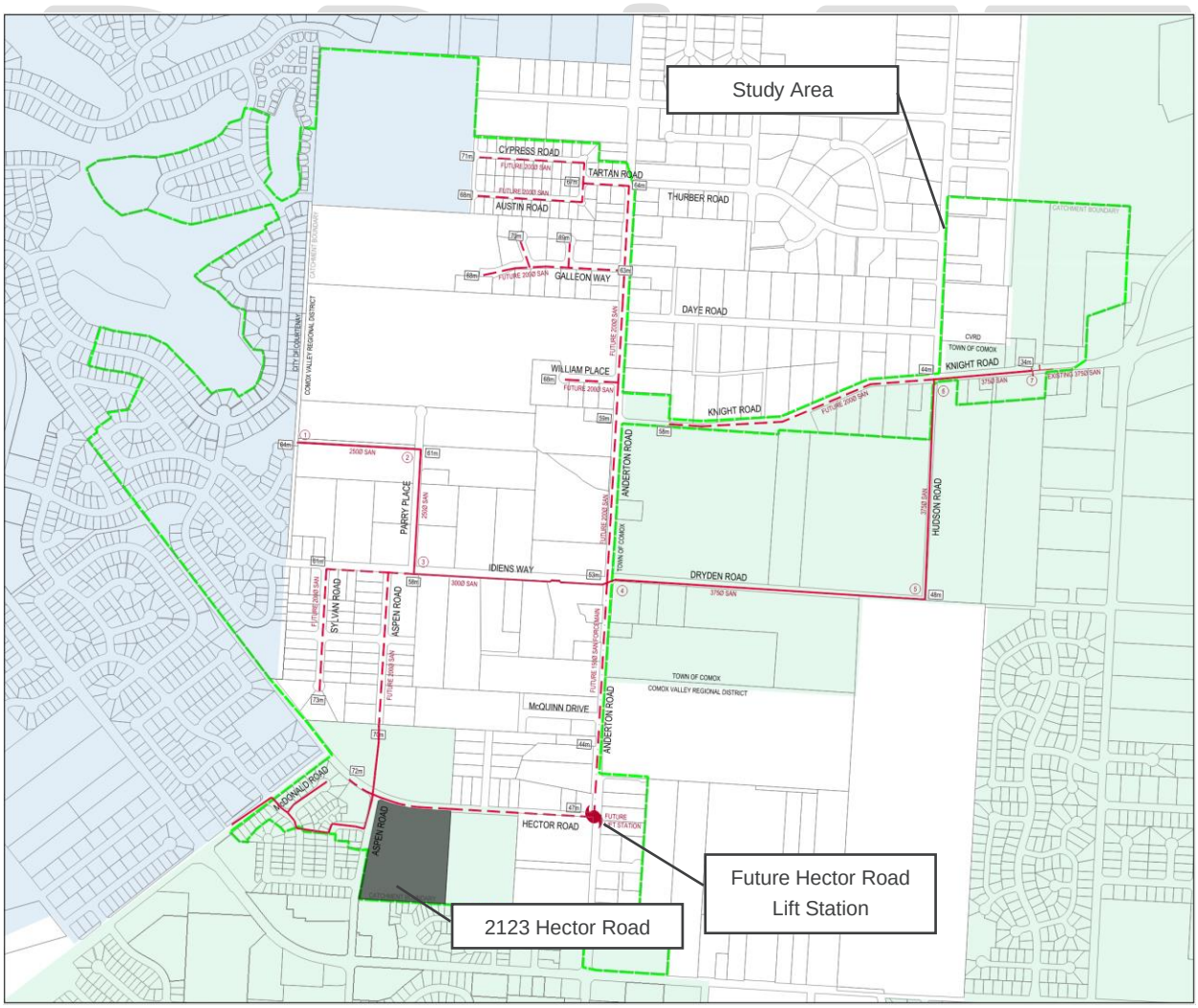

Figure 1 - Hudson Trunk Sewer Catchment Area

1.1. PHYSICAL INFRASTRUCTURE

Record drawings from the 2017-2018 construction (McElhanney 47376-01) of the HTS provided the physical data for manholes and pipes. The model was expanded to include the sewers built as part of the Valley View Lot 2 development extending into the Town of Comox. The future pump station at Hector Road, noted in the 50% Design Brief, was also included conceptually on the basis that pumped flow is generally twice as high as gravity flow. This behaviour was not originally accounted for in the HTS pipe sizing calculations.

Background scenery is based on cadastral linework downloaded from ParcelMapBC. Initial sewer loads to establish the baseline 'design condition' were derived from the HTS 50% Design Brief then segmented to a parcel-by-parcel basis.

1.2. SEWERAGE AND INFLOW / INFILTRATION RATES

The 2024 model criteria included population density and sewerage rates from the HTS 50% design memo with updates to 2022 MMCD Design Guidelines for inflow and infiltration as follows:

Parameter	Value
Development Density	10 residential units per hectare. No commercial / institutional / industrial land use
Population Density:	2.4 people per unit
Average Dry Weather Flow (ADWF)	350 L/day/capita
Infiltration Rate (land area)	0.12 L/s/ha
New system / above groundwater	0.45 L/mm dia / 100m length / hour
Old system / below groundwater	1.0 L/mm dia / 100m length / hour

Inflow and infiltration (I&I) is calculated in one of three ways. Urban and suburban areas rely on I&I calculated as a function of developed land area. Otherwise, where pipes are in very low-density areas, the calculation is determined by the pipe length, diameter and age as well as presence of groundwater. For this analysis, we understand the area to be compromised of soils with shallow groundwater and have elected to utilize the higher rate for pipe based I&I.

1.3. PIPE HYDRAULIC PARAMETERS

Manning's pipe roughness factor is used to represent friction with a conservative value of 0.013 used for all pipes to represent an 'in-service' condition.

Minimum allowable gravity velocities to maintain scouring is 0.60 m/s. Pipes with flow depth of 80% or higher are considered 'full' with the potential for replacement.

1.4. CONCEPT HECTOR ROAD LIFT STATION

The future pump station at Hector Road, noted in the 50% Design Brief, was also included conceptually on the basis that pumped flow is generally twice as high as gravity flow. This behaviour was not originally accounted for in the HTS pipe sizing calculations.

In the **24-01 Existing** model, the station has an estimated peak inflow of approximately 15 L/sec entering a 3.0m diameter wet well with pumps sufficient for 30 L/sec discharge to Anderton Road and Idiens Way intersection. These are conceptual values for conveyance purposes and will require refinement upon further design.

1.5. PEAKING FACTOR

SWMM based modeling allows for ‘time-of-day’ flow variation mimicking human behaviours based on actual data recorded in flow studies; sewer flows surge mid-morning as people get ready for their day and again in early evening. In contrast, Harmon, MMCD, BCBC, and other traditional formulae provide very conservative approaches to determining an instantaneous peak flow as a single event.

Previous flow studies have found that the actual recorded differences between maximum and minimum flows approach a 2.0x peaking factor as shown below in **Figure 2**. The time series is recalculated to establish a 3.0x peaking factor, offering an additional safety factor.

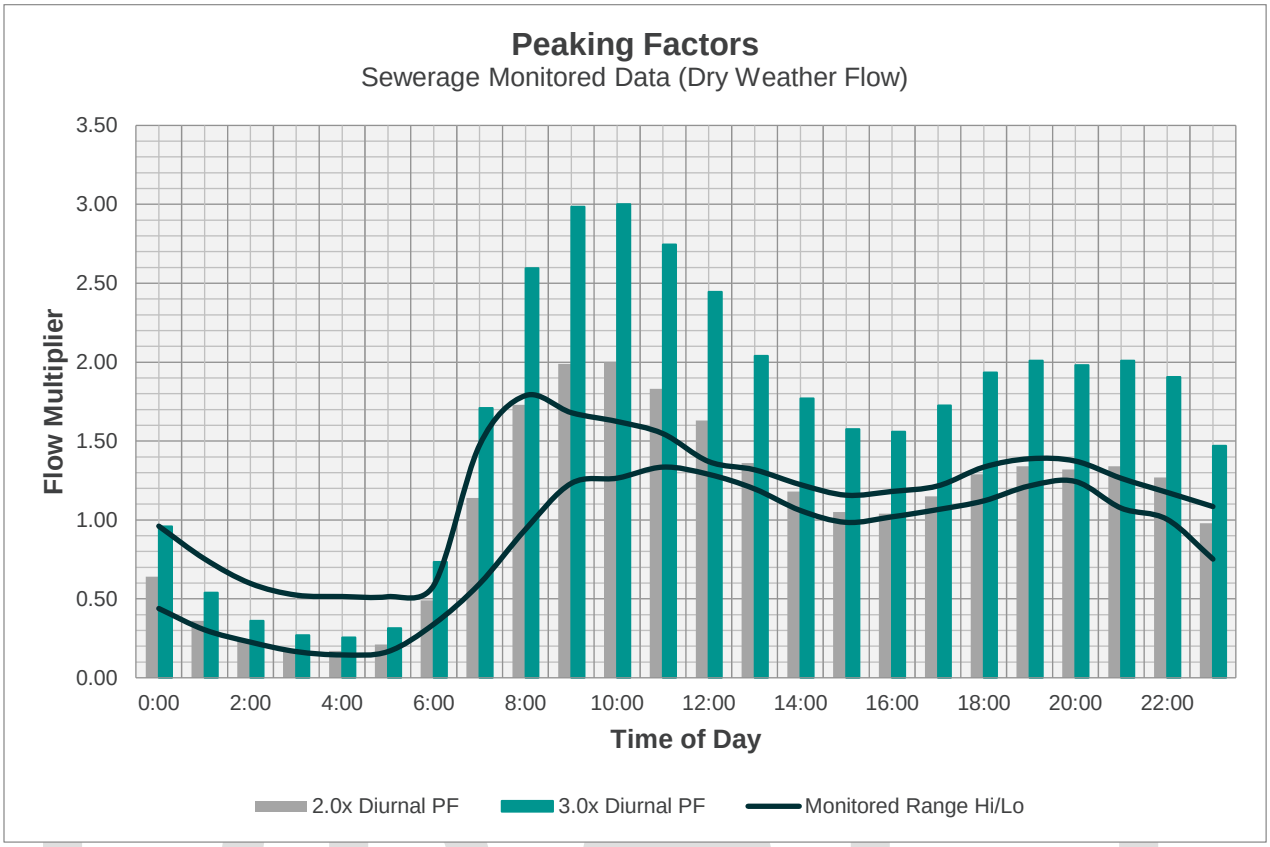

Figure 2 - Peaking Factor over 24 Hours

2. EXISTING 2024 SCENARIO RESULTS

The first model is named **24-01 Existing** and incorporates all the parameters and assumptions outlined in the sections above. This model provides the baseline for all future development impact assessments and includes all Area 'B' properties within the service area. **Appendix A** contains a table showing peak flow and capacity within each mainline pipe along with a map showing the pipes and maintenance holes.

The results show that all pipes are flowing less than 80% full. Pipe utilization is slightly higher than the original 50% Design Brief, largely due to the pump station modeling as noted above.

The **24-51 Existing** model removed the Area 'B' properties where a majority contributed to MH 20 at Anderton Road / Idiens Way / Dryden Road. This model contains approx. 75 L/sec less flow downstream of MH 20.

3. MAXIMUM CAPACITY SCENARIO RESULTS

A separate scenario, using the **24-01 Existing** model as a starting point, was generated to verify the maximum flow conveyance ability of the HTS. First, all population loads were removed from the model.

Then, beginning at the upstream end of each pipe run, flow was added until nearby downstream pipes were filled to 100% capacity. More flow was added below the full section until the next pipes were filled. This process continued until the whole system was saturated. This scenario excluded the Hector Road pump station in the system. Results listed pipe by pipe are listed in **Appendix B**. Refer to the map within **Appendix A** for pipe locations.

The maximum capacity assessment is unaffected by the Area 'B' property removals in the **24-5x** series.

4. 2123 HECTOR SERVICING IMPACTS

McElhanney has reviewed "Site Servicing Report - 2123 Hector Road, Comox, BC", November 2023, prepared for Broadstreet Properties Ltd by Wedler Engineering. Sewerage calculations were derived using Town of Comox Bylaw 1261 values, supplemented by MMCD Design Guidelines. Peak wet weather flow (PWWF) is proposed to be 9.28 L/s.

The subject property, shown in grey hatching in **Figure 1**, was originally intended to drain to the east along Hector Road to a future lift station at the Hector Road / Anderton Road intersection. However, this lift station has not yet been constructed. Instead, the proponent intends to connect to existing sewers on Aspen Road and drain north.

McElhanney generated a second model, named **24-02 2123 Hector** and founded on **24-01 Existing**, to illustrate the HTS response to the proposed development. **Appendix C** shows pipe flow and capacity for each pipe and compares to the **24-01 Existing** scenario. A map is included with the pipes shown in colors corresponding to their flow depths with no pipes exceeding 80% flow depth.

The new project consumes approximately 18-25% of available capacity in the upper Aspen Road reach of the HTS system (manholes 43 to 35). Impacts downstream along Idiens Way, Dryden Road and Hudson Road are minor.

By removing the Area 'B' properties for the **24-52 2123 Hector** model, the number of pipes that are below 50% full increase, while no pipes are over 80% full.

5. THREE PROJECTS ROUTED TO ASPEN ROAD CORRIDOR

The CVRD has received further information for an additional project to redevelop both 941 Aspen Road and 2077 Hector Road in addition to the 2123 Hector Road development (Section 4 above). All three projects propose to utilize the Aspen Road sewer system (manhole 43 to 35) for their off-site connections. Refer to **Figure 3** for location of 941 Aspen Road and 2077 Hector Road.

"Functional Servicing Report, 2077 Hector and 941 Aspen Road Multi-Family Development", October 2022, by Islander Engineering on behalf of Highstreet Ventures Inc, was reviewed for sewer connection locations and calculations. A new sewer model, founded on **24-02 2123 Hector**, was created and titled

24-03 All Three Lots to Aspen Road. Sewer loads were added as outlined in the report. The resultant pipe flows and capacities are listed in a table and illustrated on a map contained in **Appendix D**.

We note that the developments are proposing much higher intensity than the original 10 units per hectare envisioned during the Aspen Road sewer design and construction. As such, the existing pipes are significantly undersized. Flooding is predicted at MH 36 as shown by the red circle on the profile in **Appendix D**.

Much of the Hudson Trunk Sewer would require replacement (upsizing of pipes) to reestablish pipe flow depths below 80%. An auxiliary model named **24-03A All Three Lots (Upgraded)** contains pipe size increases generally in the order of one additional size. A map showing the upgrades and resultant pipe capacity results is also in **Appendix D**.

August 27th Memo Update

The **24-53** model maintains the same proposed developments at 941 Aspen, 2077 Hector and 2123 Hector, but removes all Area 'B' properties. This scenario maintains that the Aspen Road corridor requires upgrades with surcharge extending up into the upper Town of Comox system. Downstream of Aspen Road, with no Area 'B' sewer contributions, the HTS has more capacity for the proposed developments. The last two pipes on Knight Road become surcharged due to their flatter grades before joining the Greenwood Trunk.

Per the Town's request, McElhanney created model **24-53B** to assess how much development could occur and discharge to the existing 200mm sewers on the Aspen Road, prior to upgrades being required to support the full development. For clarity, upgrades are assumed to be needed once a pipe reaches or exceeds 80% capacity. The following development could proceed prior to the Aspen Road corridor requiring upgrades with equal opportunity to two developers:

- 2123 Hector Road (Broadstreet) at 100% of project at 252 units (555 people) PWWF 9.28 L/sec
- 2077 Hector Road (Highstreet Phase 1 of 3) at 245 units (611 people) PWWF 9.24L/sec.

The Aspen Road corridor can support approximately 18.5 L/s additional flow before exceeding thresholds. Other potential servicing combinations tend to favour one developer over another. Various combinations for unfair access to service projects has not been fully investigated.

Pipe capacity is below the 80% threshold. Flatter pipe grades on Aspen Road, approaching Anderton Road and the last two pipes on Knight Road are more sensitive, but within criteria in this scenario. Outputs and map from Model **24-53B** are included in **Appendix D**.

6. HECTOR ROAD DEVELOPMENTS ROUTED TO LIFT STATION

The original HTS design included provision for a lift station near Hector and Anderton Roads. This facility was intended to service several properties south of Idiens Way, along Hector Road, McQuinn Drive, Acacia Road and Toronitz Road. **Figure 3** below shows the lift station ("LS") catchment area with properties highlighted in blue.

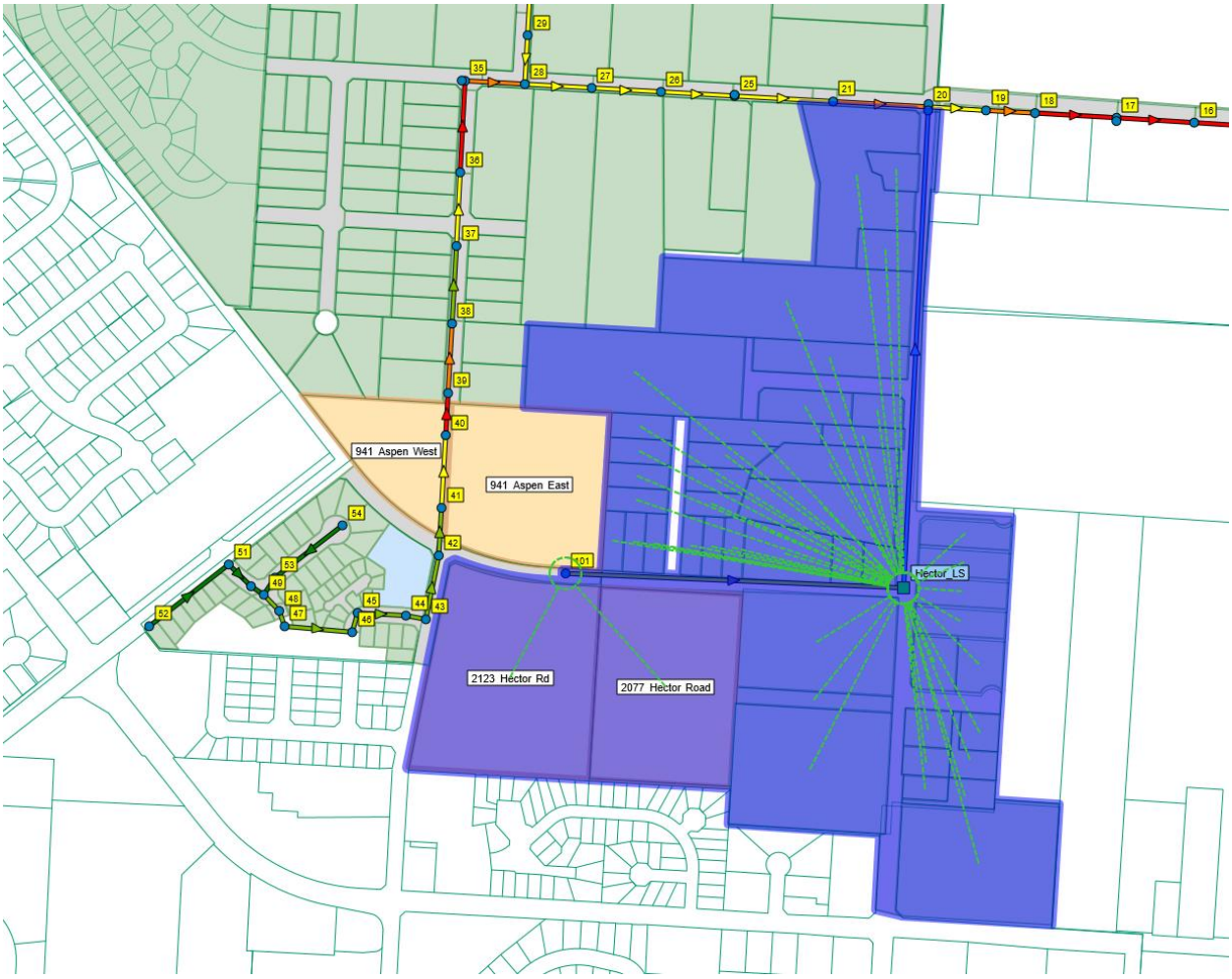

Figure 3 - Hector Road Lift Station Catchment

A separate model was developed, **24-04 Hector MF to LS**, to explore sewer system responses. Projects at 2077 and 2123 Hector Road were routed down a theoretical 250mm sewer to the Hector Road LS. The development density for these two multi-family sites is much higher than originally anticipated. One consequence is that the pumps for the Hector Road LS would need to be larger, now able to discharge at 45 L/sec, up from the original 30 L/sec (per the 50% Design Brief).

Note additional gravity sewer pipes, tributary to the Hector Road LS, are required to fulfill the servicing but were not included in the modeling. Minor shifts in sewer travel time can be expected. Further development of the servicing design is warranted should this scenario be pursued.

The topography for 941 Aspen suggests gravity sewer servicing would be connected to the Aspen Road sewers. This development is anticipated to contribute a total PWWF of 20.1 L/sec. The present-day sewers are shown to not have sufficient capacity and would result in surcharging.

Model **24-04A Hector MF (Upgrades)** was created to capture the many pipe size changes to resolve the capacity issues identified in model 24-04 and demonstrate general conformance to design guidelines.

In Model **24-54**, the lift station design output is set to 36 L/sec. The service area is limited to the 2077 and 2123 Hector Road properties contributing 18.5 L/sec PWWF. 941 Aspen development continues to utilize the Aspen Road corridor, as the land does not support draining to the Hector Road LS.

Appendix E contains a table showing the flows, capacities and needed pipe upgrades to support the **24-24-04** & **24-04A** scenarios. Two maps show the system response and locations of upgrades necessary.

7. LANNAN ROAD DEVELOPMENT

Silverado Land Corporation, within the City of Courtenay, proposes to develop approx. 12 hectares formerly known as the Lannan Forest. Originally, the HTS pipes were sized for sewer loads resulting from 10 units per hectare with 2.4 persons per unit [24 persons per hectare]. This was consistent with design assumptions at the time. In writing of this report, CVRD staff reached out and received an update to the development proposal which increased the population from 302 people to 569 or 46% increase but no change in land area. Further, inflow and infiltration rate is proposed at 0.06 L/sec/ha down from the original 0.12 L/sec/ha. With these changes, the HTS will see a net increase of 3.5 L/sec PWWF.

Model **24-05** and **24-55,** which removed sewer flows from Area ‘B’ properties, was generated to quantify the impacts of this project independently of the other proposals noted in previous sections. The model suggests that while no pipes breach the 80% full threshold, the small increase in sewer discharge from this development does reduce headspace and ability to service other areas.

Post development Models **24-02** through **24-04,** along with **24-52** through **24-54,** carry the increased Lannan Road development discharges. This approach maintains conservancy in the CVRD’s ability to convey sewer. To isolate and quantify the effect of the Aspen and Hector Road projects, readers may subtract 3.5 L/sec from the listed pipe flows downstream of SMH 28.

Appendix F contains a table outlining the flows and capacity changes due to the increased sewer load from the Lannan Road project. The associated maps show the results spatially.

8. CONCLUSIONS

Considering Area 'B' property servicing allowances at 10 units / ha & 2.4 persons / unit. **[24-0x models]**

- The development at 2123 Hector Road may be serviced by the Aspen Road sewers (manholes 43 to 35) rather than draining towards a lift station at the bottom of Hector Road at Anderton Road. All pipes remain within an 80% capacity threshold (Model Scenario **24-02**, **Appendix C**).

- Should all three proposed properties connect to the Aspen Road sewers, significant upgrades to the HTS are required (Model Scenario **24-03A**, **Appendix D**).

- Routing the two Hector Road multi-family projects to the Hector Road lift station results in larger pumps required due to the higher than 10 units / hectare density originally envisioned in the area (Model Scenario **24-04**, **Appendix E**).

- The development at 941 Aspen Road, serviced as proposed, will overwhelm several downstream sewers on Aspen Road and Idiens Way. Pipe size upgrades will be required to return servicing to the 80% capacity threshold (Model Scenario **24-04A**, **Appendix E**).

- Diverting any properties away from the Hector Road Lift Station catchment reduces the CVRD's ability to develop the lift station. Financing, and construction timing, of the lift station, and its associated collection sewers and forcemain, is beyond the scope of this report.

- The upgraded pipe sizes as presented in these scenarios re-establish a maximum 80% capacity utilization within the respective scenario (Model Scenarios **24-03A** and **24-04A**), given the proposed high-density development while maintaining 10 units per hectare elsewhere.

- Lannan Road development (Model Scenario **24-05**) does not exceed the 80% replacement threshold. However, the project's increased density contributes 3.5 L/sec more sewer than originally assumed in sizing the HTS pipes. Affording this project the additional capacity will be at the cost of servicing other lands.

- Post development Model Scenarios **24-02** through **24-04** for projects within the Town of Comox include the increased Lannan Road development discharges to ensure a conservative approach.

Considering Area 'B' properties removed. **[24-5x models – August 20 Update]**

- Removing Area 'B' properties from the baseline model frees up significant pipe capacity, particularly downstream of Anderton Road / Idiens Way / Dryden Road intersection.

- There are no pipes exceeding 80% full threshold when servicing 2123 Hector Road (Model Scenario **24-52**, **Appendix C**).

- Several pipes exceed 80% full threshold should 941 Aspen, 2077 Hector Road, and 2123 Hector Road projects connect to the Aspen Road corridor (Model Scenario **24-53, Appendix D**).

- 2123 Hector Road and 2077 Hector Road projects are both very similar in unit count and land area generating similar sewer discharges. The Aspen Road corridor can support both projects and remain below 80% full (**Model Scenario 24-53B, Appendix D**). Upgrades to the HTS would be necessary before Highstreet's remaining two phases on 941 Aspen could be serviced.

- 941 Aspen may proceed to discharge to the Aspen Road corridor without exceeding the 80% threshold. The pumped discharges of the Hector Road LS create momentary surges of flow downstream in the HTS, which render the pipes below MH 103 on Knight Road around 85% full.(Model Scenario **24-54, Appendix E**). The last two pipes on Knight Road are shown as upgrades in the **24-54A** scenario.

- Lannan Road development, Model Scenario **24-55**, independently does not adversely affect the downstream with all pipes below the 80% threshold.

9. RECOMMENDATIONS

- As evident from the development applications discussed above and trends for higher density housing in government policies, we recommend a reassessment of population loads within the HTS catchment. Future development is anticipated to be higher than the 10 units per hectare that was assumed in the original HTS design.

- A servicing staging plan is recommended to consider outcomes from a high-density population study noted above and combined with anticipated timelines for the four proposed projects. This may include interim service phases using existing sewers with an upgrade sequencing plan and cost estimates.

- Maintain the HTS sewer model to track pipe capacity to service future developments and existing areas within Area 'B'.

We trust this information is satisfactory. We look forward to discussing these outcomes.

Sincerely,
McElhanney Ltd.

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MS/njg

CC: CVRD, Marc Rutten, P.Eng, Zoe Berkey, P.Eng.

Revision History

Date		Status	Revision	Author
July 15, 2024		Draft	Rev 0	MS
July 26, 2024		Draft	Rev 1	MS
August 20, 2024		*Draft*	*Rev 2*	*MS*
August 27, 2024		*Draft*	*Rev 3*	*MS*

Limitation

This report has been prepared for the exclusive use of the Comox Valley Regional District. The material in it reflects the best judgement of the Consultant in light of the information available to the Consultant at the time of preparation. As such, McElhanney, its employees, sub-consultants and agents will not be liable for any losses or other consequences resulting from the use or reliance on the report by any third party.

APPENDIX A

Model 24-01 Existing Hudson Trunk Sewer Flows and Capacities

Comox Valley REGIONAL DISTRICT

2024-08-27
ER / AM
Rev 3

Comox Valley Regional District Sanitary Model Analysis

Hudson Trunk

				24-01 Pre-Development (Existing)		24-51 Pre-Development (Existing)	
SMH	Downstream Pipe Diameter (mm)	Downstream Pipe Slope (%)	Total Pipe Capacity (L/s)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)
43	200	0.47	22.5	2.5	22%	2.5	22%
42	200	0.63	25.1	2.5	24%	2.5	21%
41	200	0.51	22.8	4.8	30%	2.6	22%
40	200	0.51	22.9	4.8	30%	2.6	22%
39	200	0.55	24.0	5.5	32%	2.6	22%
38	200	3.23	61.8	6.2	22%	2.7	15%
37	200	2.96	58.0	6.4	24%	2.7	15%
36	200	0.58	25.0	6.8	35%	2.8	22%
35	200	0.74	28.1	11.2	44%	2.8	21%
34	250	0.50	42.1	25.7	55%	23.3	52%
33	250	1.29	67.8	25.8	43%	23.4	41%
32	250	0.40	37.9	28.0	59%	23.4	53%
31	250	0.49	41.5	29.0	59%	23.5	52%
30	250	0.97	58.8	30.0	51%	23.6	44%
29	250	1.05	61.2	30.0	50%	23.6	43%
28	300	0.56	72.9	42.3	54%	26.5	42%
27	300	0.60	74.9	44.2	55%	26.6	41%
26	300	1.17	104.3	45.9	46%	26.7	34%
25	300	2.56	152.7	47.3	48%	26.8	33%
21	300	0.47	66.8	47.4	60%	26.9	43%
20	375	1.08	182.2	98.4	52%	26.9	26%
19	375	1.02	175.8	98.5	58%	27.0	26%
18	375	0.50	124.8	98.6	65%	27.1	32%
17	375	0.51	124.9	98.7	65%	27.2	32%
16	375	0.45	117.8	99.0	69%	27.4	32%
15	375	0.40	111.2	99.0	69%	27.5	33%
14	375	0.44	116.2	98.8	67%	27.6	33%
13	375	0.43	114.9	98.8	65%	27.6	32%
12	375	0.44	116.4	98.9	68%	27.7	33%
11	375	0.44	116.1	98.7	66%	27.8	33%

Comox Valley REGIONAL DISTRICT

2024-08-27
ER / AM
Rev 3

Comox Valley Regional District Sanitary Model Analysis

Hudson Trunk

				24-01 Pre-Development (Existing)		24-51 Pre-Development (Existing)	
SMH	Downstream Pipe Diameter (mm)	Downstream Pipe Slope (%)	Total Pipe Capacity (L/s)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)
10	375	0.42	113.2	98.5	68%	27.9	33%
9	375	0.48	121.4	98.3	65%	28.0	32%
8	375	0.53	127.5	98.2	64%	28.1	32%
7	375	0.51	125.7	98.0	64%	28.2	32%
6	375	0.97	171.9	98.0	54%	28.3	27%
5	375	0.90	166.1	98.0	55%	28.4	28%
4	375	3.71	342.4	102.7	38%	28.7	20%
3	375	3.69	332.0	102.9	38%	28.9	20%
2	375	4.02	349.7	104.9	37%	29.3	19%
1	375	2.63	283.8	107.8	43%	29.4	21%
111	-	-	-	-	-	29.9	21%
110	-	-	-	-	-	30.1	21%
109	-	-	-	-	-	30.1	27%
108	-	-	-	-	-	30.2	28%
107	-	-	-	-	-	31.4	27%
106	-	-	-	-	-	31.4	31%
105	-	-	-	-	-	31.5	34%
104	-	-	-	-	-	31.6	37%
103	-	-	-	-	-	31.6	47%
102	-	-	-	-	-	31.7	47%

Pipes over 80% capacity will be highlighted.


LEGEND
Junctions
Outfalls
Storages
Conduits
< 0.25
0.25 - 0.5
0.5 - 0.8
0.8 - 1
> 1
Pumps
Subcatchments
Res
Park
Multi-Residential
ROW
CVRD-Town-City-Comp-Linework only
34A
34
33
32
31
30
29
35
28
27
26
25
21
20
19
18
17
16
15
14
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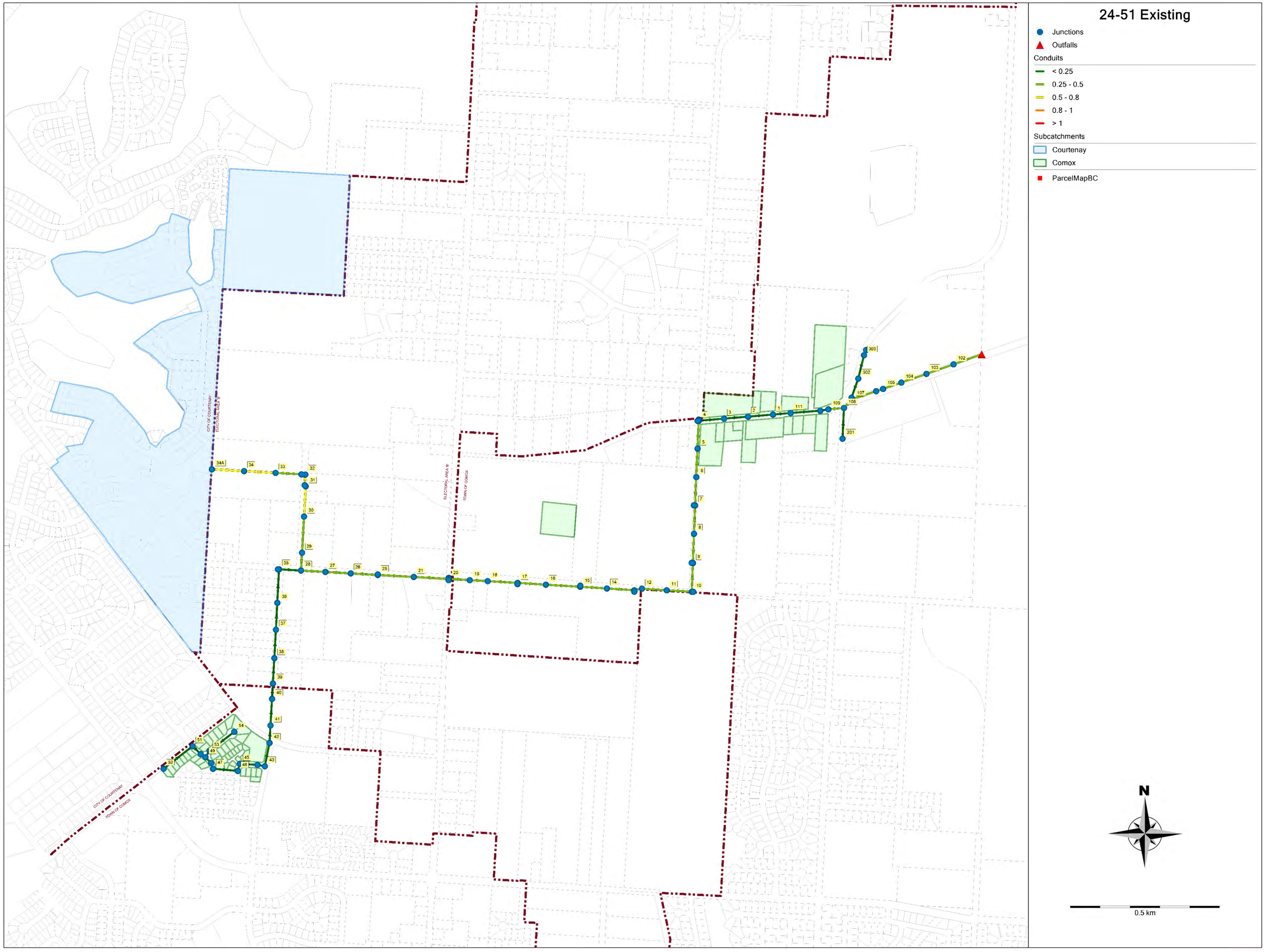
43
Hector_LS
24-01 Existing
N
400 m


24-51 Existing
Junctions
Outfalls
Conduits
< 0.25
0.25 - 0.5
0.5 - 0.8
0.8 - 1
> 1
Subcatchments
Courtenay
Comox
ParcelMapBC
CITY OF COURTENAY
ELECTORAL AREA 'B'
TOWN OF COMOX
N
0.5 km

APPENDIX B

Model 24-01 Maximum Capacity Flows

Comox Valley REGIONAL DISTRICT

2024-07-15
NG / AM
Rev 0

Comox Valley Regional District Sanitary Model Analysis

Hudson Trunk - Maximum Pipe Capacity

				Pre-Development (Existing)	
SMH	Downstream Pipe Diameter (mm)	Downstream Pipe Slope (%)	Total Pipe Capacity (L/s)	Peak Flow (L/s)	Pipe Utilization (d/D, %)
43	200	0.47	22.5	22.5	100%
42	200	0.63	26.2	22.5	86%
41	200	0.51	23.4	22.5	96%
40	200	0.51	23.2	22.5	97%
39	200	0.55	24.5	22.5	92%
38	200	3.23	59.2	22.5	38%
37	200	2.96	56.3	22.5	40%
36	200	0.58	25.0	22.5	90%
35	200	0.74	28.2	27.9	99%
34	250	0.50	41.7	37.5	90%
33	250	1.29	67.0	37.5	56%
32	250	0.40	37.9	37.5	99%
31	250	0.49	41.7	37.5	90%
30	250	0.97	58.8	38.3	65%
29	250	1.05	60.7	38.3	63%
28	300	0.56	72.7	66.2	91%
27	300	0.60	75.2	66.2	88%
26	300	1.17	105.0	66.2	63%
25	300	2.56	153.8	66.2	43%
21	300	0.47	66.2	66.2	100%
20	375	1.08	181.2	114.2	63%
19	375	1.02	175.6	114.2	65%
18	375	0.50	124.1	114.2	92%
17	375	0.51	124.1	114.2	92%
16	375	0.45	117.7	114.2	97%
15	375	0.40	111.9	114.2	**102%**
14	375	0.44	115.3	114.2	99%
13	375	0.43	115.3	114.2	99%
12	375	0.44	116.5	114.2	98%
11	375	0.44	116.5	114.2	98%
10	375	0.42	113.0	114.2	**101%**
8	375	0.53	126.8	114.2	90%
7	375	0.51	125.4	114.2	91%
6	375	0.97	172.0	165.2	96%
5	375	0.90	166.8	165.2	99%
4	375	3.71	339.5	285.2	84%
3	375	3.69	335.5	285.2	85%
2	375	4.02	352.0	285.2	81%
1	375	2.63	285.2	285.2	100%

Pipes over 100% capacity will be highlighted.

APPENDIX C

Model 24-02 2123 Hector Road Development Results

Comox Valley REGIONAL DISTRICT

2024-08-27
ER / AM
Rev 2

Comox Valley Regional District Sanitary Model Analysis

Hudson Trunk - 2123 Hector Road

				24-01 Existing (Pre-Development)		24-02 2123 Hector (Post Development)		24-51 Pre-Development (Existing)		24-52 2123 Hector (Post Development)	
SMH	Downstream Pipe Diameter (mm)	Downstream Pipe Slope (%)	Total Pipe Capacity (L/s)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)
43	200	0.47	22.5	2.5	22%	11.7	49%	2.5	22%	12.0	50%
42	200	0.63	25.1	2.5	24%	11.7	49%	2.5	21%	12.0	47%
41	200	0.51	22.8	4.8	30%	13.9	54%	2.6	22%	12.0	49%
40	200	0.51	22.9	4.8	30%	13.9	54%	2.6	22%	12.0	49%
39	200	0.55	24.0	5.5	32%	14.6	54%	2.6	22%	12.1	48%
38	200	3.23	61.8	6.2	22%	15.2	35%	2.7	15%	12.1	31%
37	200	2.96	58.0	6.4	24%	15.4	42%	2.7	15%	12.2	36%
36	200	0.58	25.0	6.8	35%	15.7	56%	2.8	22%	12.2	48%
35	200	0.74	28.1	11.2	44%	20.1	62%	2.8	21%	12.3	46%
34	250	0.50	42.1	25.7	55%	28.2	58%	23.3	52%	26.9	56%
33	250	1.29	67.8	25.8	43%	28.2	45%	23.4	41%	27.0	44%
32	250	0.40	37.9	28.0	59%	30.5	62%	23.4	53%	27.0	58%
31	250	0.49	41.5	29.0	59%	31.4	62%	23.5	52%	27.1	57%
30	250	0.97	58.8	30.0	51%	32.3	53%	23.6	44%	27.2	48%
29	250	1.05	61.2	30.0	50%	32.3	52%	23.6	43%	27.2	47%
28	300	0.56	72.9	42.3	54%	53.3	62%	26.5	42%	39.5	52%
27	300	0.60	74.9	44.2	55%	55.2	63%	26.6	41%	39.6	51%
26	300	1.17	104.3	45.9	46%	56.8	53%	26.7	34%	39.7	43%
25	300	2.56	152.7	47.3	48%	58.1	55%	26.8	33%	39.8	42%
21	300	0.47	66.8	47.4	60%	58.1	69%	26.9	43%	39.9	54%
20	375	1.08	182.2	98.4	52%	109.1	56%	26.9	26%	40.0	32%
19	375	1.02	175.8	98.5	58%	109.2	63%	27.0	26%	40.0	33%
18	375	0.50	124.8	98.6	65%	109.3	70%	27.1	32%	40.1	39%
17	375	0.51	124.9	98.7	65%	109.3	71%	27.2	32%	40.2	39%
16	375	0.45	117.8	99.0	69%	109.8	75%	27.4	32%	40.5	40%
15	375	0.40	111.2	99.0	69%	109.7	76%	27.5	33%	40.5	40%

Comox Valley REGIONAL DISTRICT

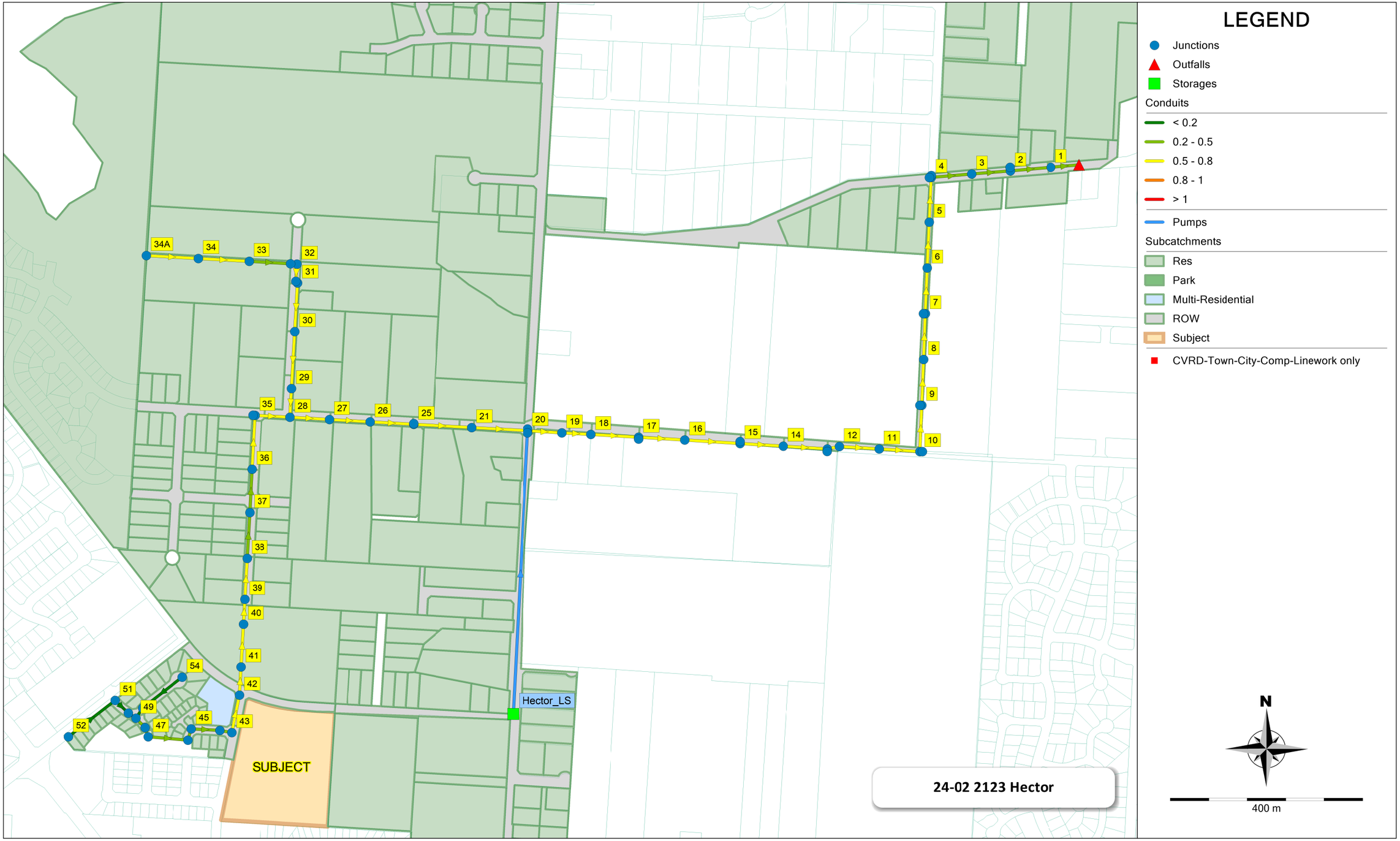
2024-08-27
ER / AM
Rev 2

Comox Valley Regional District Sanitary Model Analysis

Hudson Trunk - 2123 Hector Road

				24-01 Existing (Pre-Development)		24-02 2123 Hector (Post Development)		24-51 Pre-Development (Existing)		24-52 2123 Hector (Post Development)	
SMH	Downstream Pipe Diameter (mm)	Downstream Pipe Slope (%)	Total Pipe Capacity (L/s)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)
14	375	0.44	116.2	98.8	67%	109.3	72%	27.6	33%	40.6	40%
13	375	0.43	114.9	98.8	65%	109.3	69%	27.6	32%	40.7	40%
12	375	0.44	116.4	98.9	68%	109.4	74%	27.7	33%	40.8	40%
11	375	0.44	116.1	98.7	66%	108.9	71%	27.8	33%	40.8	40%
10	375	0.42	113.2	98.5	68%	108.3	72%	27.9	33%	40.9	40%
9	375	0.48	121.4	98.3	65%	107.9	70%	28.0	32%	41.0	40%
8	375	0.53	127.5	98.2	64%	107.6	68%	28.1	32%	41.1	39%
7	375	0.51	125.7	98.0	64%	107.3	68%	28.2	32%	41.2	39%
6	375	0.97	171.9	98.0	54%	107.3	57%	28.3	27%	41.3	33%
5	375	0.90	166.1	98.0	55%	107.2	58%	28.4	28%	41.4	34%
4	375	3.71	342.4	102.7	38%	111.9	40%	28.7	20%	41.7	24%
3	375	3.69	332.0	102.9	38%	112.1	40%	28.9	20%	41.9	24%
2	375	4.02	349.7	104.9	37%	114.1	39%	29.3	19%	42.4	23%
1	375	2.63	283.8	107.8	43%	117.0	45%	29.4	21%	42.6	25%
111	-	-	-	-	-	-	-	29.9	21%	43.1	25%
110	-	-	-	-	-	-	-	30.1	21%	43.8	26%
109	-	-	-	-	-	-	-	30.1	27%	43.8	32%
108	-	-	-	-	-	-	-	30.2	28%	43.9	34%
107	-	-	-	-	-	-	-	31.4	27%	44.7	32%
106	-	-	-	-	-	-	-	31.4	31%	44.8	37%
105	-	-	-	-	-	-	-	31.5	34%	44.8	41%
104	-	-	-	-	-	-	-	31.6	37%	44.9	46%
103	-	-	-	-	-	-	-	31.6	47%	45.0	58%
102	-	-	-	-	-	-	-	31.7	47%	45.1	57%

Pipes over 80% capacity will be highlighted.


LEGEND
Junctions
Outfalls
Storages
Conduits
< 0.2
0.2 - 0.5
0.5 - 0.8
0.8 - 1
> 1
Pumps
Subcatchments
Res
Park
Multi-Residential
ROW
Subject
CVRD-Town-City-Comp-Linework only
34A
34
33
32
31
30
29
35
28
27
26
25
21
20
19
18
17
16
15
14
12
11
10
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3
2
1
36
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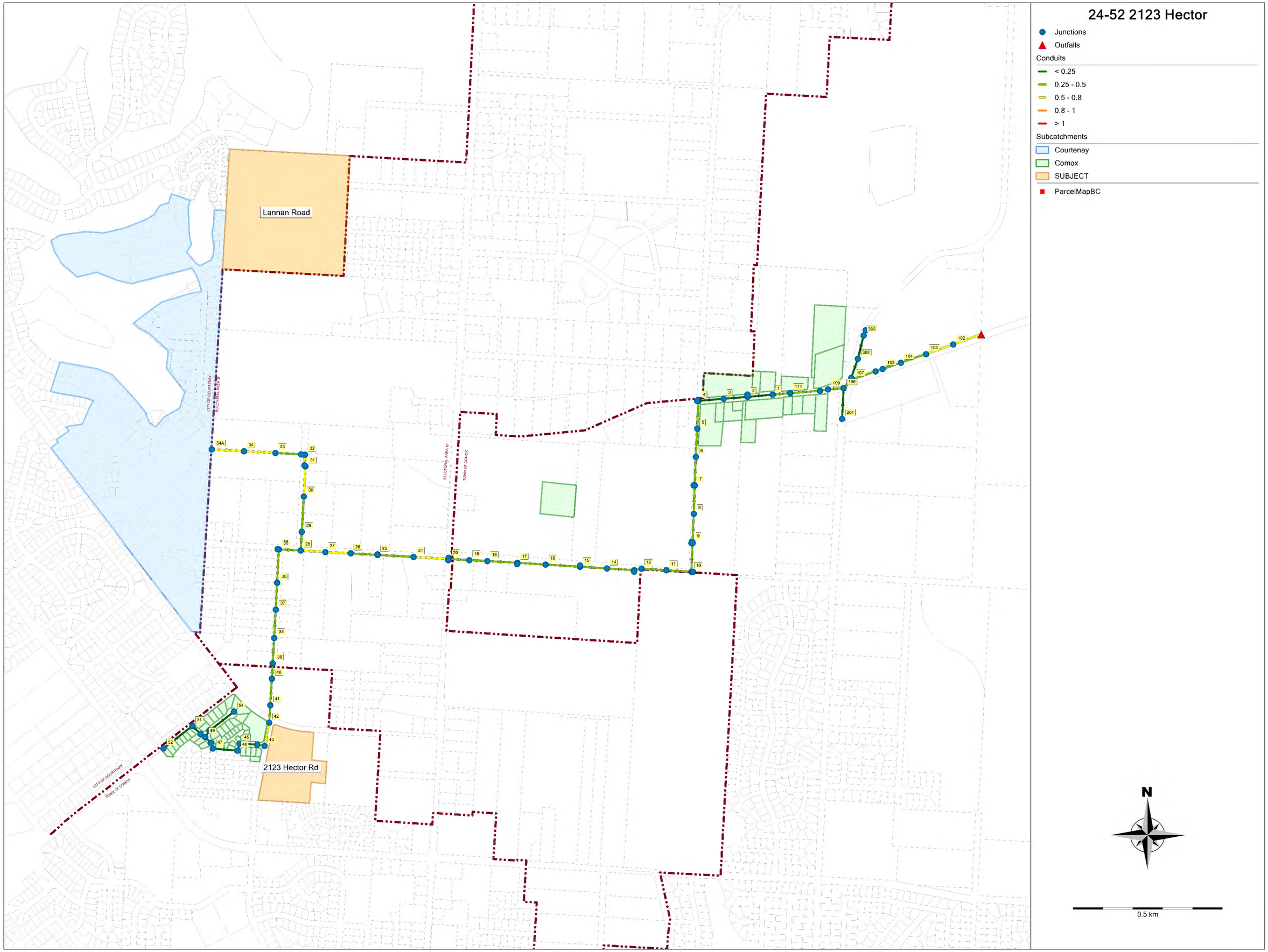
43
54
51
49
52
47
45
Hector_LS
SUBJECT
24-02 2123 Hector
N
400 m


Lannan Road
2123 Hector Rd
CITY OF COURTENAY
ELECTORAL AREA B
TOWN OF COMOX
ELECTORAL AREA B
TOWN OF COMOX
CITY OF COURTENAY
TOWN OF COMOX
24-52 2123 Hector
Junctions
Outfalls
Conduits
< 0.25
0.25 - 0.5
0.5 - 0.8
0.8 - 1
> 1
Subcatchments
Courtenay
Comox
SUBJECT
ParcelMapBC
N
0.5 km

APPENDIX D

Model 24-03 All Three Lots to Aspen Road

Comox Valley REGIONAL DISTRICT

Comox Valley Regional District Sanitary Model Analysis

Hudson Trunk - All Three Lots

				24-01 Existing (Pre-Development)		24-03 All Three Lots (Post Development)		24-03A All Three Lots (Upgrade) (Post Development)			24-51 Existing (Pre-Development)		24-53 All Three Lots (Post Development)		24-53A All Three Lots (Upgrade) (Post Development)		
SMH	Downstream Pipe Diameter (mm)	Downstream Pipe Slope (%)	Total Pipe Capacity (L/s)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Upgraded Pipe Diameter (mm)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Upgraded Pipe Diameter (mm)
43	200	0.47	22.5	2.5	22%	13.4	100%	2.4	22%		2.5	22%	13.4	100%	11.7	58%	
42	200	0.63	25.1	2.5	24%	34.7	100%	2.4	15%	250	2.5	21%	34.6	100%	34.7	65%	250
41	200	0.51	22.8	4.8	30%	34.7	100%	2.4	16%	250	2.6	22%	34.6	100%	34.7	67%	250
40	200	0.51	22.9	4.8	30%	41.2	100%	3.9	16%	300	2.6	22%	41.0	100%	41.1	54%	300
39	200	0.55	24.0	5.5	32%	41.9	93%	4.6	17%	300	2.6	22%	41.1	93%	41.2	53%	300
38	200	3.23	61.8	6.2	22%	42.6	84%	5.2	12%	300	2.7	15%	41.1	81%	41.2	33%	300
37	200	2.96	58.0	6.4	24%	42.8	100%	5.3	12%	300	2.7	15%	41.2	100%	41.3	41%	300
36	200	0.58	25.0	6.8	35%	42.3	100%	5.7	19%	300	2.8	22%	41.2	100%	41.3	53%	300
35	200	0.74	28.1	11.2	44%	46.8	100%	10.1	23%	300	2.8	21%	41.3	93%	41.4	50%	300
34	250	0.50	42.1	25.7	55%	29.3	59%	21.1	49%		23.3	52%	26.9	56%	26.9	56%	
33	250	1.29	67.8	25.8	43%	29.4	46%	21.1	38%		23.4	41%	27.0	44%	27.0	44%	
32	250	0.40	37.9	28.0	59%	31.6	64%	23.3	53%		23.4	53%	27.0	58%	27.0	58%	
31	250	0.49	41.5	29.0	59%	32.7	64%	24.3	53%		23.5	52%	27.1	57%	27.1	57%	
30	250	0.97	58.8	30.0	51%	33.6	54%	25.1	46%		23.6	44%	27.2	48%	27.2	48%	
29	250	1.05	61.2	30.0	50%	33.6	76%	25.1	45%		23.6	43%	27.2	59%	27.2	59%	
28	300	0.56	72.9	42.3	54%	81.0	100%	36.2	36%	375	26.5	42%	68.5	74%	68.6	74%	375
27	300	0.60	74.9	44.2	55%	83.0	87%	38.1	36%	375	26.6	41%	68.6	72%	68.7	72%	375
26	300	1.17	104.3	45.9	46%	84.7	68%	39.7	31%	375	26.7	34%	68.7	59%	68.8	59%	375
25	300	2.56	152.7	47.3	48%	86.1	77%	41.0	30%	375	26.8	33%	68.8	66%	68.9	66%	375
21	300	0.47	66.8	47.4	60%	86.2	88%	41.0	40%	375	26.9	43%	68.9	80%	69.0	80%	375
20	375	1.08	182.2	98.4	52%	137.2	65%	92.0	50%		26.9	26%	68.9	43%	69.0	43%	
19	375	1.02	175.8	98.5	58%	137.2	84%	92.1	51%		27.0	26%	69.0	46%	69.1	46%	
18	375	0.50	124.8	98.6	65%	137.0	100%	92.2	47%	450	27.1	32%	69.1	52%	69.2	52%	450
17	375	0.51	124.9	98.7	65%	135.0	100%	92.3	47%	450	27.2	32%	69.2	52%	69.3	52%	450
16	375	0.45	117.8	99.0	69%	133.9	100%	92.4	48%	450	27.4	32%	69.4	53%	69.5	54%	450
15	375	0.40	111.2	99.0	69%	130.4	95%	92.4	49%	450	27.5	33%	69.5	55%	69.6	55%	450
14	375	0.44	116.2	98.8	67%	128.9	86%	92.5	48%	450	27.6	33%	69.6	54%	69.7	54%	450
13	375	0.43	114.9	98.8	65%	128.5	84%	92.5	48%	450	27.6	32%	69.6	53%	69.8	53%	450
12	375	0.44	116.4	98.9	68%	128.5	91%	92.5	48%	450	27.7	33%	69.7	54%	69.8	54%	450
11	375	0.44	116.1	98.7	66%	128.3	91%	92.5	48%	450	27.8	33%	69.8	54%	69.9	54%	450
10	375	0.42	113.2	98.5	68%	128.3	88%	92.5	49%	450	27.9	33%	69.9	55%	70.0	55%	450
9	375	0.48	121.4	98.3	65%	128.1	83%	92.4	48%	450	28.0	32%	70.0	53%	70.1	53%	450
8	375	0.53	127.5	98.2	64%	128.1	80%	92.3	47%	450	28.1	32%	70.1	52%	70.2	52%	450
7	375	0.51	125.7	98.0	64%	127.9	78%	92.2	47%	450	28.2	32%	70.2	53%	70.3	53%	450
6	375	0.97	171.9	98.0	54%	127.9	64%	92.1	52%		28.3	27%	70.3	44%	70.4	44%	
5	375	0.90	166.1	98.0	55%	128.0	66%	92.0	53%		28.4	28%	70.4	45%	70.5	45%	
4	375	3.71	342.4	102.7	38%	132.7	44%	96.7	37%		28.7	20%	70.6	31%	70.8	31%	
3	375	3.69	332.0	102.9	38%	133.0	44%	96.9	37%		28.9	20%	70.8	31%	71.0	31%	

Comox Valley REGIONAL DISTRICT

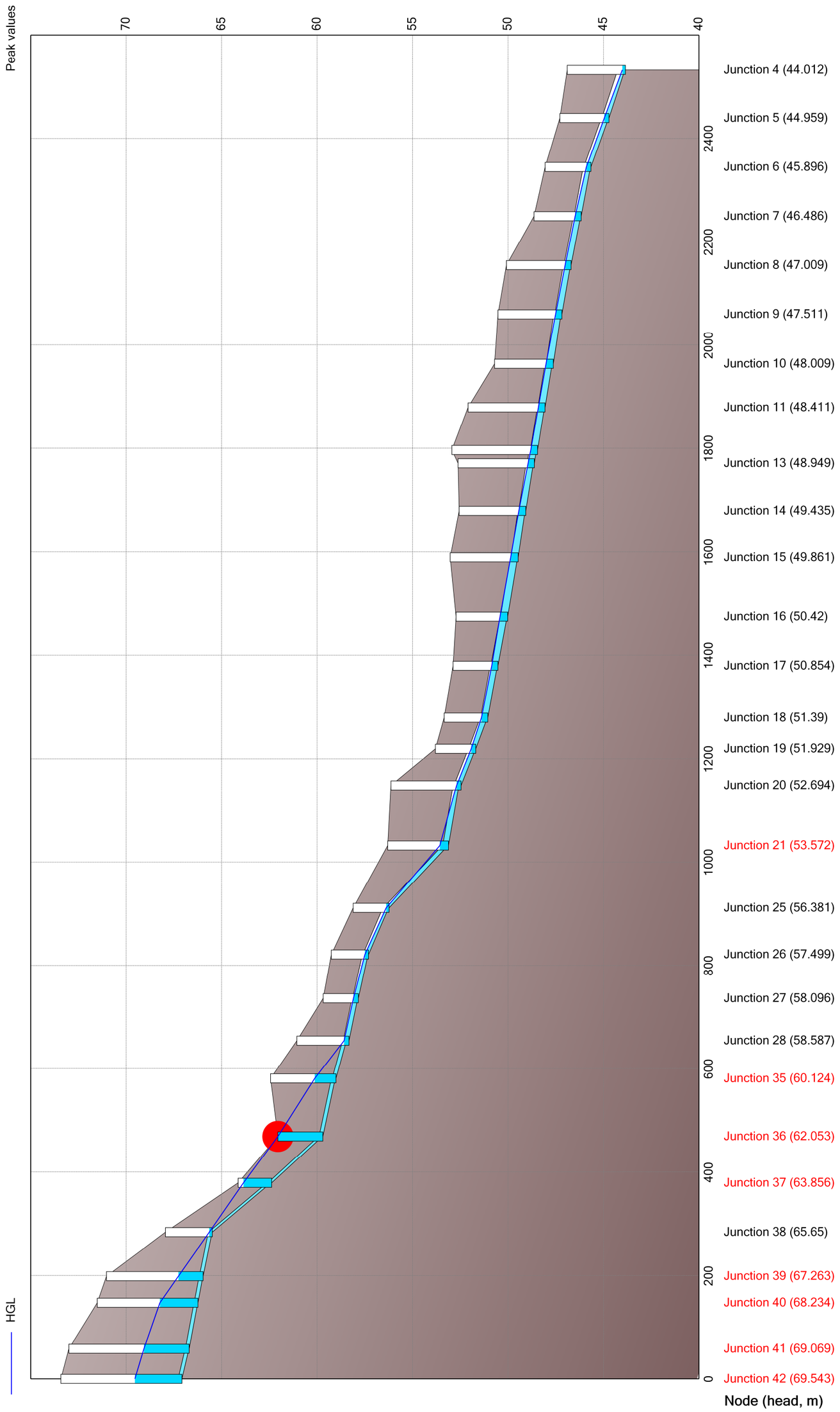
Comox Valley Regional District Sanitary Model Analysis

Hudson Trunk - All Three Lots

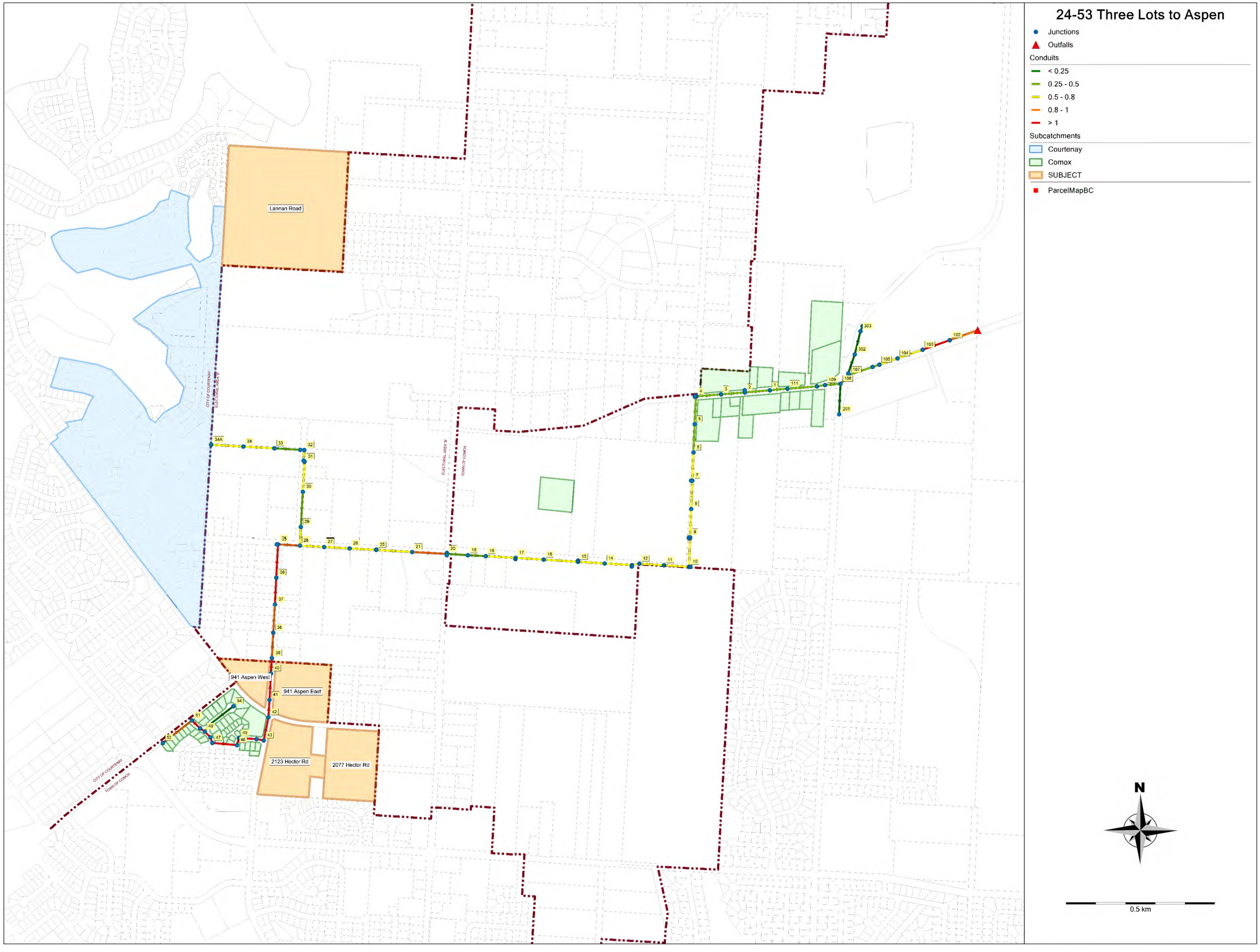
				24-01 Existing (Pre-Development)		24-03 All Three Lots (Post Development)		24-03A All Three Lots (Upgrade) (Post Development)			24-51 Existing (Pre-Development)		24-53 All Three Lots (Post Development)		24-53A All Three Lots (Upgrade) (Post Development)		
SMH	Downstream Pipe Diameter (mm)	Downstream Pipe Slope (%)	Total Pipe Capacity (L/s)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Upgraded Pipe Diameter (mm)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Upgraded Pipe Diameter (mm)
2	375	4.02	349.7	104.9	37%	135.0	43%	98.9	36%		29.3	19%	71.3	31%	71.5	31%	
1	375	2.63	283.8	107.8	43%	137.9	49%	101.8	41%		29.4	21%	71.5	33%	71.7	33%	
111	-	-	-	-	-	-	-	-	-		29.9	21%	72.0	33%	72.2	33%	
110	-	-	-	-	-	-	-	-	-		30.1	21%	72.7	34%	72.9	34%	
109	-	-	-	-	-	-	-	-	-		30.1	27%	72.7	42%	72.9	43%	
108	-	-	-	-	-	-	-	-	-		30.2	28%	72.8	45%	73.0	45%	
107	-	-	-	-	-	-	-	-	-		31.4	27%	73.6	42%	73.8	42%	
106	-	-	-	-	-	-	-	-	-		31.4	31%	73.7	49%	73.9	49%	
105	-	-	-	-	-	-	-	-	-		31.5	34%	73.7	54%	73.9	54%	
104	-	-	-	-	-	-	-	-	-		31.6	37%	73.8	74%	74.0	57%	
103	-	-	-	-	-	-	-	-	-		31.6	47%	73.8	100%	74.1	55%	
102	-	-	-	-	-	-	-	-	-		31.7	47%	73.8	85%	74.1	55%	

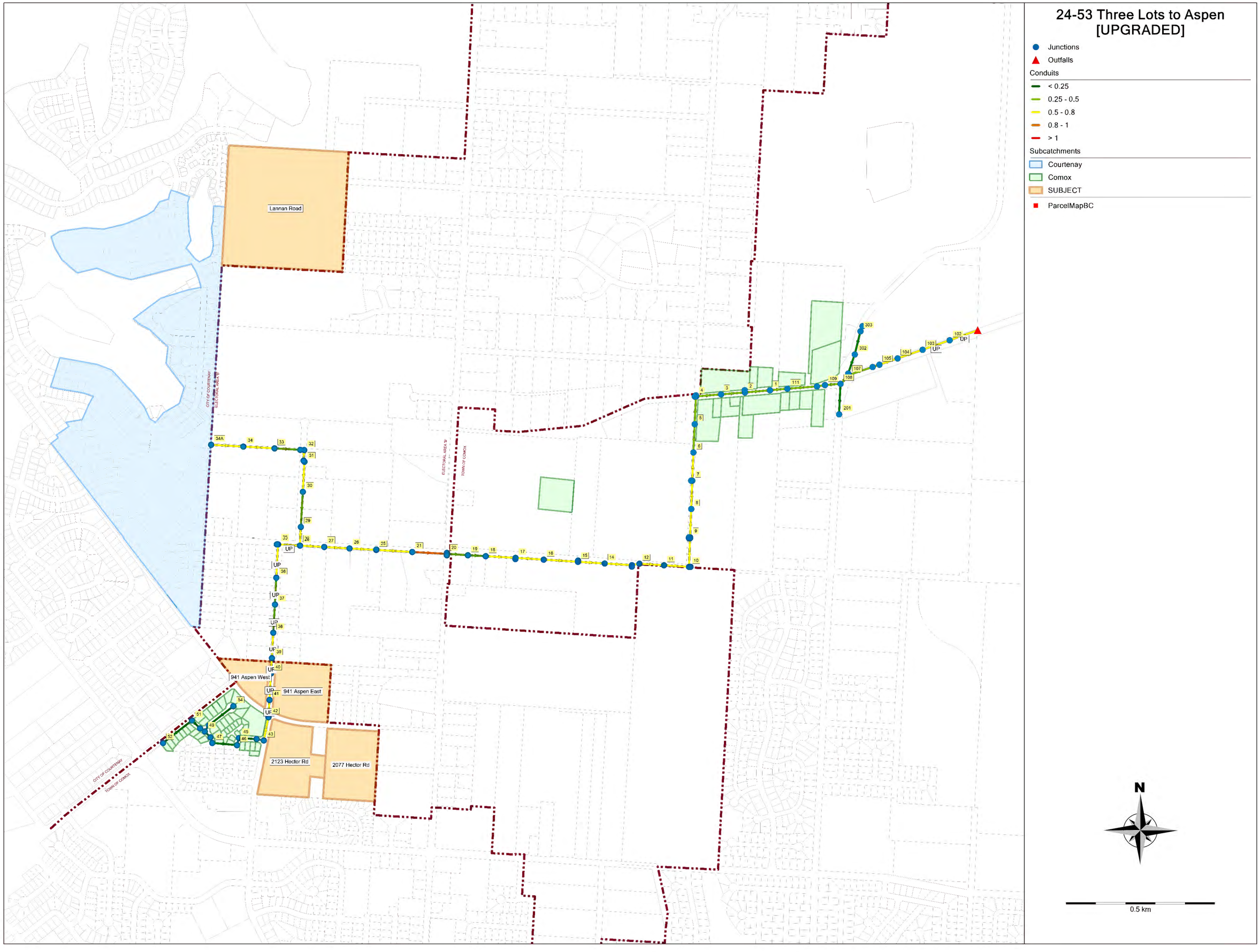
Pipes over 80% capacity are highlighted.


Legend
Junctions
Outfalls
Storages
Conduits
< 0.25
0.25 - 0.5
0.5 - 0.8
0.8 - 1
> 1
Pumps
Subcatchments
Res
Park
Multi-Residential
ROW
Subject
CVRD-Town-City-Comp-Linework only
941 Aspen West
941 Aspen East
2123 Hector Rd
2077 Hector Road
Hector_LS
24-03 Three Lots to Aspen
N
400 m


Peak values
70
65
60
55
50
45
40
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Junction 4 (44.012)
Junction 5 (44.959)
Junction 6 (45.896)
Junction 7 (46.486)
Junction 8 (47.009)
Junction 9 (47.511)
Junction 10 (48.009)
Junction 11 (48.411)
Junction 13 (48.949)
Junction 14 (49.435)
Junction 15 (49.861)
Junction 16 (50.42)
Junction 17 (50.854)
Junction 18 (51.39)
Junction 19 (51.929)
Junction 20 (52.694)
Junction 21 (53.572)
Junction 25 (56.381)
Junction 26 (57.499)
Junction 27 (58.096)
Junction 28 (58.587)
Junction 35 (60.124)
Junction 36 (62.053)
Junction 37 (63.856)
Junction 38 (65.65)
Junction 39 (67.263)
Junction 40 (68.234)
Junction 41 (69.069)
Junction 42 (69.543)
Node (head, m)
HGL


Legend
Junctions
Outfalls
Storages
Conduits
< 0.25
0.25 - 0.50
0.50 - 0.80
0.80 - 1
> 1
Pumps
Subcatchments
Res
Park
Multi-Residential
ROW
Subject
CVRD-Town-City-Comp-Linework only
941 Aspen West
941 Aspen East
2123 Hector Rd
2077 Hector Road
Hector_LS
24-03A Three Lots (Upgraded)
N
400 m


24-53 Three Lots to Aspen
Junctions
Outfalls
Conduits
< 0.25
0.25 - 0.5
0.5 - 0.8
0.8 - 1
> 1
Subcatchments
Courtenay
Comox
SUBJECT
ParcelMapBC
Lannan Road
941 Aspen West
941 Aspen East
2123 Hector Rd
2077 Hector Rd
CITY OF COURTENAY
TOWN OF COMOX
ELECTORAL AREA 'B'
N
0.5 km


24-53 Three Lots to Aspen [UPGRADED]
Junctions
Outfalls
Conduits
< 0.25
0.25 - 0.5
0.5 - 0.8
0.8 - 1
> 1
Subcatchments
Courtenay
Comox
SUBJECT
ParcelMapBC
Lannan Road
941 Aspen West
941 Aspen East
2123 Hector Rd
2077 Hector Rd
CITY OF COURTENAY
TOWN OF COMOX
ELECTORAL AREA 'B'
UP
DP
N
0.5 km

Comox Valley REGIONAL DISTRICT

2024-08-27
ER / AM
Rev 0

Comox Valley Regional District Sanitary Model Analysis

Hudson Trunk -First Phases Aspen

				24-51 Existing (Pre-Development)		24-53B First Phases Aspen (Post Development)	
SMH	Downstream Pipe Diameter (mm)	Downstream Pipe Slope (%)	Total Pipe Capacity (L/s)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)
43	200	0.47	23.0	2.5	22%	11.7	52%
42	200	0.63	25.9	2.5	21%	21.0	69%
41	200	0.51	23.6	2.6	22%	21.0	73%
40	200	0.51	23.6	2.6	22%	21.0	72%
39	200	0.55	24.2	2.6	22%	21.0	68%
38	200	3.23	58.7	2.7	15%	21.1	41%
37	200	2.96	55.6	2.7	15%	21.1	53%
36	200	0.58	25.3	2.8	22%	21.2	68%
35	200	0.74	28.5	2.8	21%	21.2	64%
34	250	0.50	41.9	23.3	52%	26.9	56%
33	250	1.29	67.2	23.4	41%	27.0	44%
32	250	0.40	37.5	23.4	53%	27.0	58%
31	250	0.49	41.8	23.5	52%	27.1	57%
30	250	0.97	58.2	23.6	44%	27.2	48%
29	250	1.05	60.6	23.6	43%	27.2	48%
28	300	0.56	71.9	26.5	42%	48.5	59%
27	300	0.60	75.0	26.6	41%	48.6	58%
26	300	1.17	103.7	26.7	34%	48.6	48%
25	300	2.56	154.7	26.8	33%	48.7	49%
21	300	0.47	66.6	26.9	43%	48.8	61%
20	375	1.08	183.2	26.9	26%	48.9	35%
19	375	1.02	176.8	27.0	26%	49.0	37%
18	375	0.50	123.9	27.1	32%	49.1	43%
17	375	0.51	124.0	27.2	32%	49.2	43%
16	375	0.45	118.5	27.4	32%	49.4	44%
15	375	0.40	111.8	27.5	33%	49.5	45%

Comox Valley REGIONAL DISTRICT

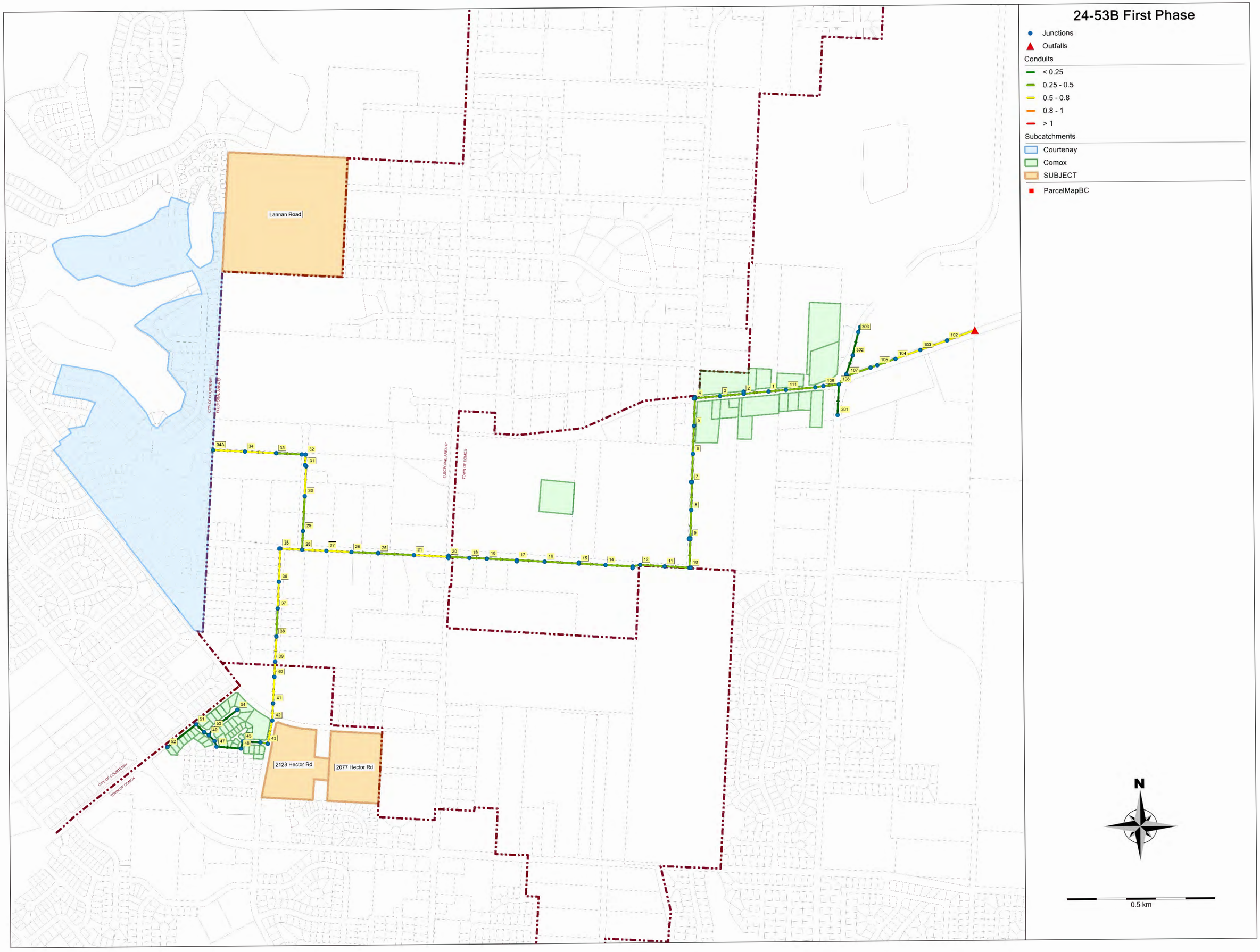
2024-08-27
ER / AM
Rev 0

Comox Valley Regional District Sanitary Model Analysis

Hudson Trunk -First Phases Aspen

				24-51 Existing (Pre-Development)		24-53B First Phases Aspen (Post Development)	
SMH	Downstream Pipe Diameter (mm)	Downstream Pipe Slope (%)	Total Pipe Capacity (L/s)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)
14	375	0.44	115.5	27.6	33%	49.6	45%
13	375	0.43	115.5	27.6	32%	49.6	44%
12	375	0.44	115.6	27.7	33%	49.7	44%
11	375	0.44	116.8	27.8	33%	49.8	44%
10	375	0.42	112.5	27.9	33%	49.9	45%
9	375	0.48	120.5	28.0	32%	50.0	44%
8	375	0.53	126.6	28.1	32%	50.1	43%
7	375	0.51	124.7	28.2	32%	50.2	44%
6	375	0.97	172.9	28.3	27%	50.3	37%
5	375	0.90	167.0	28.4	28%	50.4	38%
4	375	3.71	332.7	28.7	20%	50.6	26%
3	375	3.69	333.1	28.9	20%	50.9	26%
2	375	4.02	350.6	29.3	19%	51.3	26%
1	375	2.63	282.1	29.4	21%	51.6	28%
111	-	-	-	29.9	21%	52.1	28%
110	-	-	-	30.1	21%	52.7	28%
109	-	-	-	30.1	27%	52.8	36%
108	-	-	-	30.2	28%	52.9	38%
107	-	-	-	31.4	27%	53.7	36%
106	-	-	-	31.4	31%	53.7	41%
105	-	-	-	31.5	34%	53.8	45%
104	-	-	-	31.6	37%	53.9	52%
103	-	-	-	31.6	47%	53.9	66%
102	-	-	-	31.7	47%	54.0	64%

Pipes over 80% capacity are highlighted.


24-53B First Phase
Junctions
Outfalls
Conduits
< 0.25
0.25 - 0.5
0.5 - 0.8
0.8 - 1
> 1
Subcatchments
Courtenay
Comox
SUBJECT
ParcelMapBC
Lannan Road
2123 Hector Rd
2077 Hector Rd
CITY OF COURTENAY
TOWN OF COMOX
ELECTORAL AREA 'B'
N
0.5 km

APPENDIX E

Model 24-04 Hector Multi-Family Projects to Lift Station

Comox Valley REGIONAL DISTRICT

Comox Valley Regional District Sanitary Model Analysis

Hudson Trunk - 2123 Hector Road

				24-01 Existing (Pre-Development)		24-04 Hector MF to LS (Post Development)		24-04A Hector MF (Upgrades) (Post Development)			24-51 Existing (Pre-Development)		24-54 Hector MF to LS (Post Development)		24-54A Hector MF (Upgrades) (Post Development)		
SMH	Downstream Pipe Diameter (mm)	Downstream Pipe Slope (%)	Total Pipe Capacity (L/s)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Upgraded Downstream Pipe Diameter (mm)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Upgraded Downstream Pipe Diameter (mm)
43	200	0.47	22.5	2.5	22%	2.4	22%	2.4	22%		2.5	22%	2.4	22%	2.4	22%	
42	200	0.63	25.1	2.5	24%	2.4	21%	2.4	21%		2.5	21%	2.4	48%	2.4	48%	
41	200	0.51	22.8	4.8	30%	2.4	22%	2.4	22%		2.6	22%	22.6	78%	22.6	78%	
40	200	0.51	22.9	4.8	30%	3.9	27%	3.9	20%	250	2.6	22%	22.6	78%	22.6	78%	250
39	200	0.55	24.0	5.5	32%	4.6	29%	4.6	21%	250	2.6	22%	22.6	72%	22.6	72%	250
38	200	3.23	61.8	6.2	22%	5.2	20%	5.2	15%	250	2.7	15%	22.7	43%	22.7	43%	250
37	200	2.96	58.0	6.4	24%	5.3	22%	5.3	16%	250	2.7	15%	22.7	56%	22.7	56%	250
36	200	0.58	25.0	6.8	35%	5.7	32%	5.7	24%	250	2.8	22%	22.8	72%	22.8	72%	250
35	200	0.74	28.1	11.2	44%	10.1	41%	10.1	30%	250	2.8	21%	22.8	67%	22.8	67%	250
34	250	0.50	42.1	25.7	55%	21.1	49%	21.1	49%		23.3	52%	26.9	56%	26.9	56%	
33	250	1.29	67.8	25.8	43%	21.1	38%	21.1	38%		23.4	41%	27.0	44%	27.0	44%	
32	250	0.40	37.9	28.0	59%	23.3	53%	23.3	53%		23.4	53%	27.0	58%	27.0	58%	
31	250	0.49	41.5	29.0	59%	24.3	53%	24.3	53%		23.5	52%	27.1	57%	27.1	57%	
30	250	0.97	58.8	30.0	51%	25.1	46%	25.1	46%		23.6	44%	27.2	48%	27.2	48%	
29	250	1.05	61.2	30.0	50%	25.1	45%	25.1	45%		23.6	43%	27.2	48%	27.2	48%	
28	300	0.56	72.9	42.3	54%	36.2	49%	36.2	49%		26.5	42%	50.1	60%	50.1	60%	
27	300	0.60	74.9	44.2	55%	38.1	50%	38.1	50%		26.6	41%	50.2	59%	50.2	59%	
26	300	1.17	104.3	45.9	46%	39.7	43%	39.7	43%		26.7	34%	50.2	49%	50.2	49%	
25	300	2.56	152.7	47.3	48%	41.0	43%	41.0	43%		26.8	33%	50.3	50%	50.3	50%	
21	300	0.47	66.8	47.4	60%	41.0	55%	41.0	55%		26.9	43%	50.4	62%	50.4	62%	
20	375	1.08	182.2	98.4	52%	92.0	50%	92.0	50%		26.9	26%	86.5	49%	86.5	49%	
19	375	1.02	175.8	98.5	58%	92.2	55%	92.1	51%		27.0	26%	86.8	53%	86.8	53%	
18	375	0.50	124.8	98.6	65%	92.1	62%	92.2	47%	450	27.1	32%	86.7	60%	86.7	60%	450
17	375	0.51	124.9	98.7	65%	92.2	62%	92.3	47%	450	27.2	32%	86.8	60%	86.8	60%	450
16	375	0.45	117.8	99.0	69%	92.5	65%	92.4	48%	450	27.4	32%	87.1	62%	87.1	62%	450
15	375	0.40	111.2	99.0	69%	92.1	65%	92.4	49%	450	27.5	33%	86.8	62%	86.8	62%	450
14	375	0.44	116.2	98.8	67%	91.9	64%	92.5	48%	450	27.6	33%	86.6	61%	86.6	61%	450
13	375	0.43	114.9	98.8	65%	91.9	62%	92.5	48%	450	27.6	32%	86.7	60%	86.7	60%	450
12	375	0.44	116.4	98.9	68%	92.0	64%	92.5	48%	450	27.7	33%	86.5	61%	86.5	61%	450
11	375	0.44	116.1	98.7	66%	91.4	63%	92.5	48%	450	27.8	33%	86.4	61%	86.4	61%	450
10	375	0.42	113.2	98.5	68%	91.0	64%	92.5	49%	450	27.9	33%	86.0	62%	86.0	62%	450
9	375	0.48	121.4	98.3	65%	90.6	62%	92.4	48%	450	28.0	32%	85.7	60%	85.7	60%	450
8	375	0.53	127.5	98.2	64%	90.3	61%	92.3	47%	450	28.1	32%	85.4	59%	85.4	59%	450
7	375	0.51	125.7	98.0	64%	90.0	61%	92.0	62%		28.2	32%	85.1	59%	85.1	59%	
6	375	0.97	171.9	98.0	54%	89.9	51%	91.9	52%		28.3	27%	85.0	50%	85.0	50%	
5	375	0.90	166.1	98.0	55%	89.8	52%	91.8	53%		28.4	28%	84.9	51%	84.9	51%	
4	375	3.71	342.4	102.7	38%	94.5	36%	96.5	37%		28.7	20%	85.0	34%	85.0	34%	

Comox Valley REGIONAL DISTRICT

Comox Valley Regional District Sanitary Model Analysis

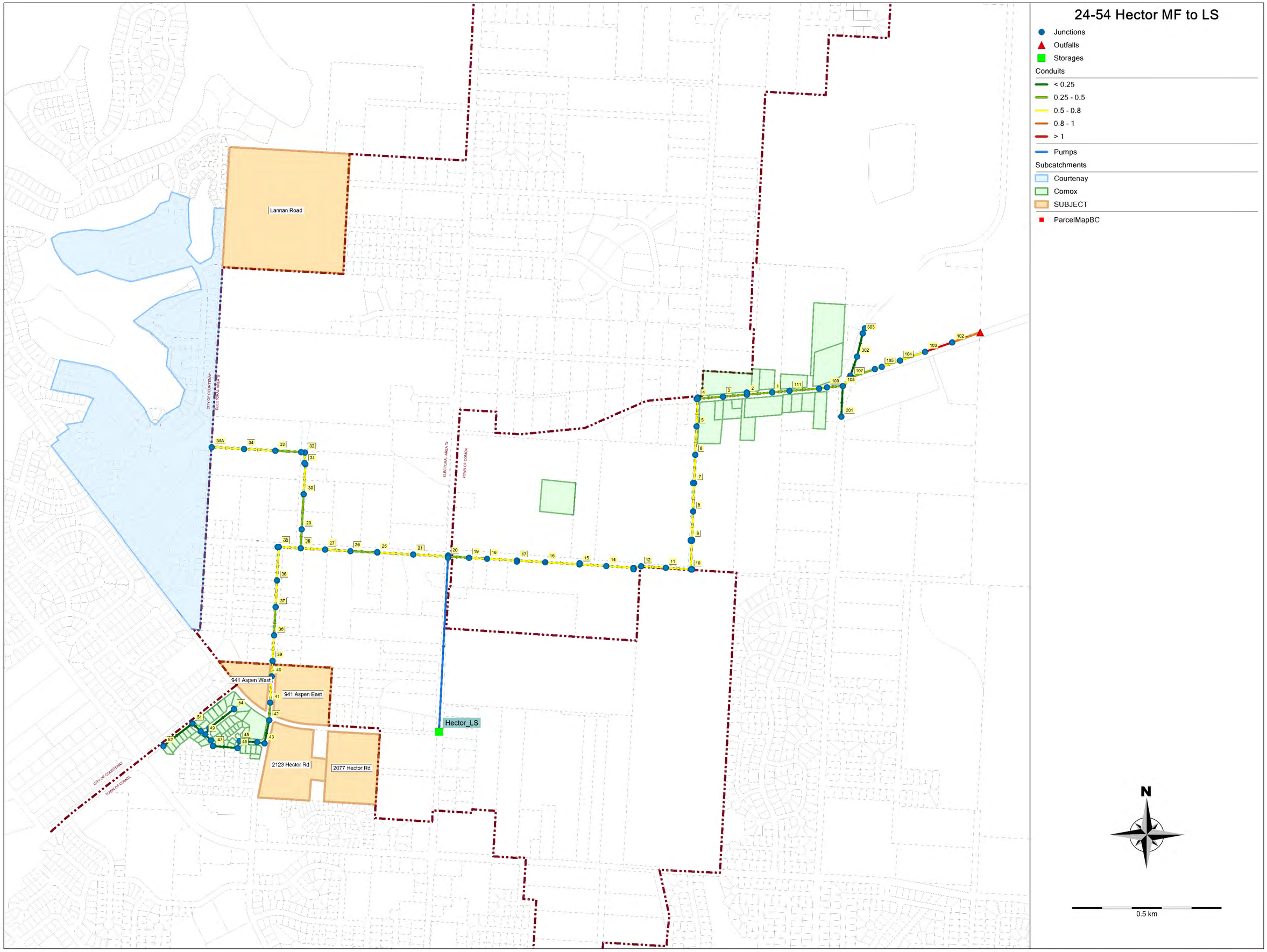
Hudson Trunk - 2123 Hector Road

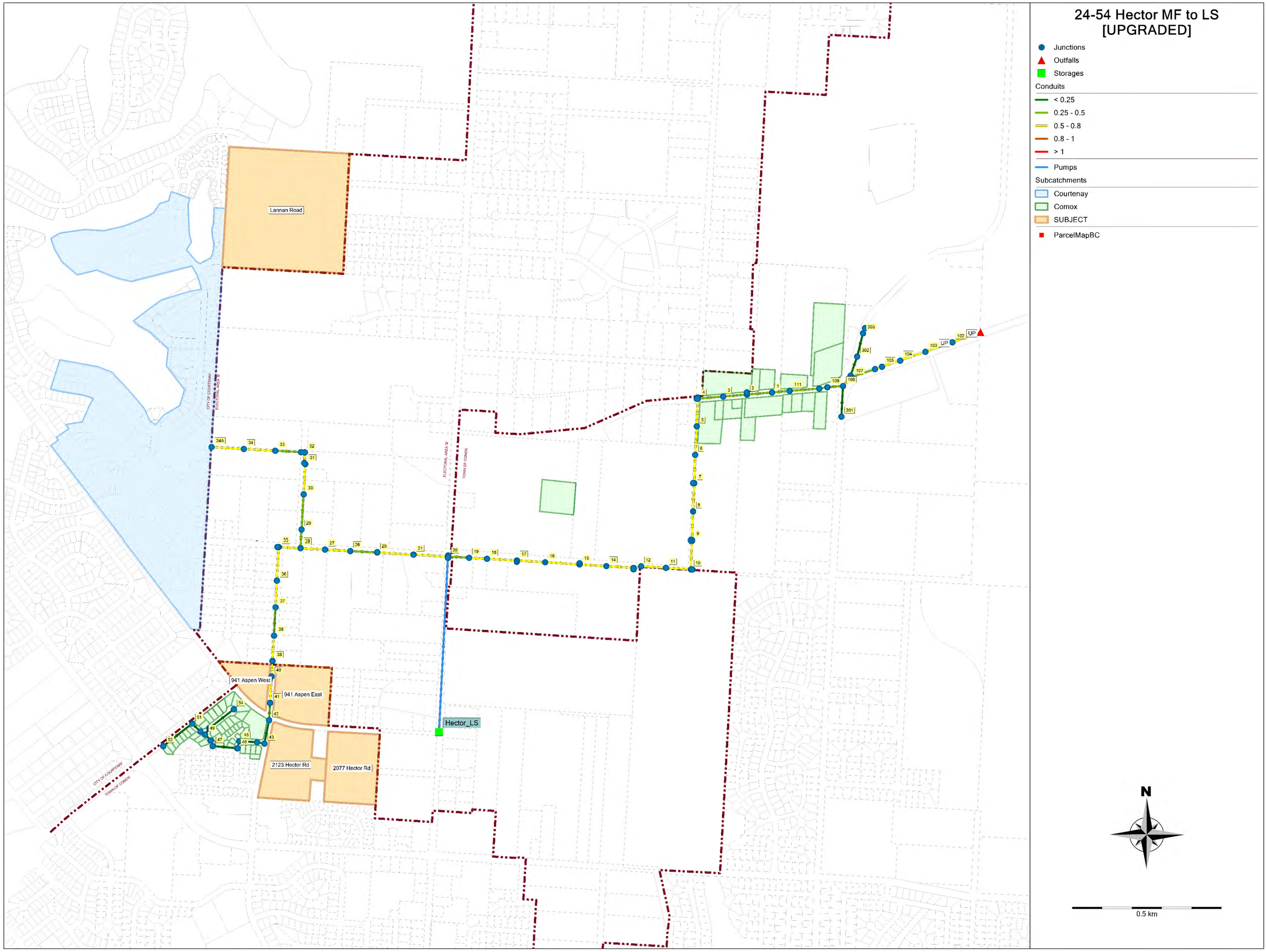
				24-01 Existing (Pre-Development)		24-04 Hector MF to LS (Post Development)		24-04A Hector MF (Upgrades) (Post Development)			24-51 Existing (Pre-Development)		24-54 Hector MF to LS (Post Development)		24-54A Hector MF (Upgrades) (Post Development)		
SMH	Downstream Pipe Diameter (mm)	Downstream Pipe Slope (%)	Total Pipe Capacity (L/s)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Upgraded Downstream Pipe Diameter (mm)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Upgraded Downstream Pipe Diameter (mm)
3	375	3.69	332.0	102.9	38%	94.7	36%	96.7	37%		28.9	20%	85.2	34%	85.2	34%	
2	375	4.02	349.7	104.9	37%	96.7	36%	98.7	36%		29.3	19%	85.6	34%	85.6	34%	
1	375	2.63	283.8	107.8	43%	99.6	41%	101.6	41%		29.4	21%	85.8	36%	85.8	36%	
111	-	-	-	-	-	-	-	-	-		29.9	21%	86.2	36%	86.2	36%	
110	-	-	-	-	-	-	-	-	-		30.1	21%	86.9	37%	86.9	37%	
109	-	-	-	-	-	-	-	-	-		30.1	27%	86.9	47%	86.9	47%	
108	-	-	-	-	-	-	-	-	-		30.2	28%	87.0	50%	87.0	50%	
107	-	-	-	-	-	-	-	-	-		31.4	27%	87.8	47%	87.8	47%	
106	-	-	-	-	-	-	-	-	-		31.4	31%	87.8	55%	87.8	55%	
105	-	-	-	-	-	-	-	-	-		31.5	34%	87.7	60%	87.7	60%	
104	-	-	-	-	-	-	-	-	-		31.6	37%	87.8	76%	87.8	64%	
103	-	-	-	-	-	-	-	-	-		31.6	47%	87.9	100%	87.9	61%	
102	-	-	-	-	-	-	-	-	-		31.7	47%	87.9	88%	86.8	60%	

Pipes over 80% capacity will be highlighted.


Legend
Junctions
Outfalls
Storages
Conduits
< 0.25
0.25 - 0.5
0.5 - 0.8
0.8 - 1
> 1
Pumps
Subcatchments
Res
Park
Multi-Residential
ROW
Subject
CVRD-Town-City-Comp-Linework only
34A
34
33
32
31
30
29
28
27
26
25
21
20
19
18
17
16
15
14
12
11
10
9
8
7
6
5
4
3
2
1
35
36
37
38
39
40
941 Aspen West
941 Aspen East
54
51
49
52
47
45
43
42
101
Hector_LS
2123 Hector Rd
2077 Hector Road
24-04 Hector MF to LS
N
400 m


Legend
Junctions
Outfalls
Storages
Conduits
< 0.25
0.25 - 0.5
0.5 - 0.8
0.8 - 1
> 1
Pumps
Subcatchments
Res
Park
Multi-Residential
ROW
Subject
CVRD-Town-City-Comp-Linework only
34A
34
33
32
31
30
29
28
27
26
25
21
20
19
16
15A
1
2
3
4
5
6
7
UP
36
941 Aspen West
941 Aspen East
54
51
49
52
47
45
43
42
101
Hector_LS
2123 Hector Rd
2077 Hector Road
24-04A Hector MF to LS (Upgraded)
N
400 m


24-54 Hector MF to LS
Junctions
Outfalls
Storages
Conduits
< 0.25
0.25 - 0.5
0.5 - 0.8
0.8 - 1
> 1
Pumps
Subcatchments
Courtenay
Comox
SUBJECT
ParcelMapBC
Lannan Road
941 Aspen West
941 Aspen East
2123 Hector Rd
2077 Hector Rd
Hector_LS
CITY OF COURTENAY
ELECTORAL AREA 'B'
TOWN OF COMOX
N
0.5 km


24-54 Hector MF to LS [UPGRADED]
Junctions
Outfalls
Storages
Conduits
< 0.25
0.25 - 0.5
0.5 - 0.8
0.8 - 1
> 1
Pumps
Subcatchments
Courtenay
Comox
SUBJECT
ParcelMapBC
Lannan Road
941 Aspen West
941 Aspen East
2123 Hector Rd
2077 Hector Rd
Hector_LS
CITY OF COURTENAY
TOWN OF COMOX
ELECTORAL AREA 'B'
N
0.5 km

APPENDIX F

Model 24-05 Lannan Road Development

Comox Valley REGIONAL DISTRICT

2024-08-27
ER / AM
Rev 2

Comox Valley Regional District Sanitary Model Analysis

Hudson Trunk - 24-05 Lannon Road

				24-01 Existing (Pre-Development)		24-05 Lannon Road (Post Development)		24-51 Existing (Pre-Development)		24-55 Lannon Road (Post Development)	
SMH	Downstream Pipe Diameter (mm)	Downstream Pipe Slope (%)	Total Pipe Capacity (L/s)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)
34A	250	0.50	42.0	25.6	57%	25.6	57%	23.2	54%	26.8	59%
34	250	0.50	42.1	25.7	55%	25.6	55%	23.3	52%	26.9	56%
33	250	1.29	67.8	25.8	43%	25.6	43%	23.4	41%	27.0	44%
32A	250	0.69	49.6	25.8	51%	25.6	51%	23.4	48%	27.0	53%
32	250	0.40	37.9	28.0	59%	27.8	59%	23.4	53%	27.0	58%
31A	250	0.12	20.6	28.0	59%	27.8	58%	23.4	53%	27.0	57%
31	250	0.49	41.5	29.0	59%	28.7	59%	23.5	52%	27.1	57%
30	250	0.97	58.8	30.0	51%	29.6	50%	23.6	44%	27.2	48%
29	250	1.05	61.2	30.0	50%	29.6	49%	23.6	43%	27.2	47%
28	300	0.56	72.9	42.3	54%	41.3	53%	26.5	42%	30.1	45%
27	300	0.60	74.9	44.2	55%	43.2	54%	26.6	41%	30.2	44%
26	300	1.17	104.3	45.9	46%	44.9	46%	26.7	34%	30.3	37%
25	300	2.56	152.7	47.3	48%	46.2	47%	26.8	33%	30.4	36%
21	300	0.47	66.8	47.4	60%	46.2	59%	26.9	43%	30.5	46%
20	375	1.08	182.2	98.4	52%	97.1	52%	26.9	26%	30.5	28%
19	375	1.02	175.8	98.5	58%	97.2	58%	27.0	26%	30.6	28%
18	375	0.50	124.8	98.6	65%	97.3	64%	27.1	32%	30.7	34%
17	375	0.51	124.9	98.7	65%	97.4	65%	27.2	32%	30.8	34%
16	375	0.45	117.8	99.0	69%	97.7	68%	27.4	32%	31.0	34%
15	375	0.40	111.2	99.0	69%	97.7	68%	27.5	33%	31.1	35%
14	375	0.44	116.2	98.8	67%	97.6	66%	27.6	33%	31.2	35%
13	375	0.43	114.9	98.8	65%	97.6	65%	27.6	32%	31.2	35%
12	375	0.44	116.4	98.9	68%	97.7	67%	27.7	33%	31.3	35%
11	375	0.44	116.1	98.7	66%	97.5	66%	27.8	33%	31.4	35%
10	375	0.42	113.2	98.5	68%	97.3	67%	27.9	33%	31.5	35%
9	375	0.48	121.4	98.3	65%	97.1	65%	28.0	32%	31.6	34%
8	375	0.53	127.5	98.2	64%	97.0	63%	28.1	32%	31.7	34%

Comox Valley REGIONAL DISTRICT

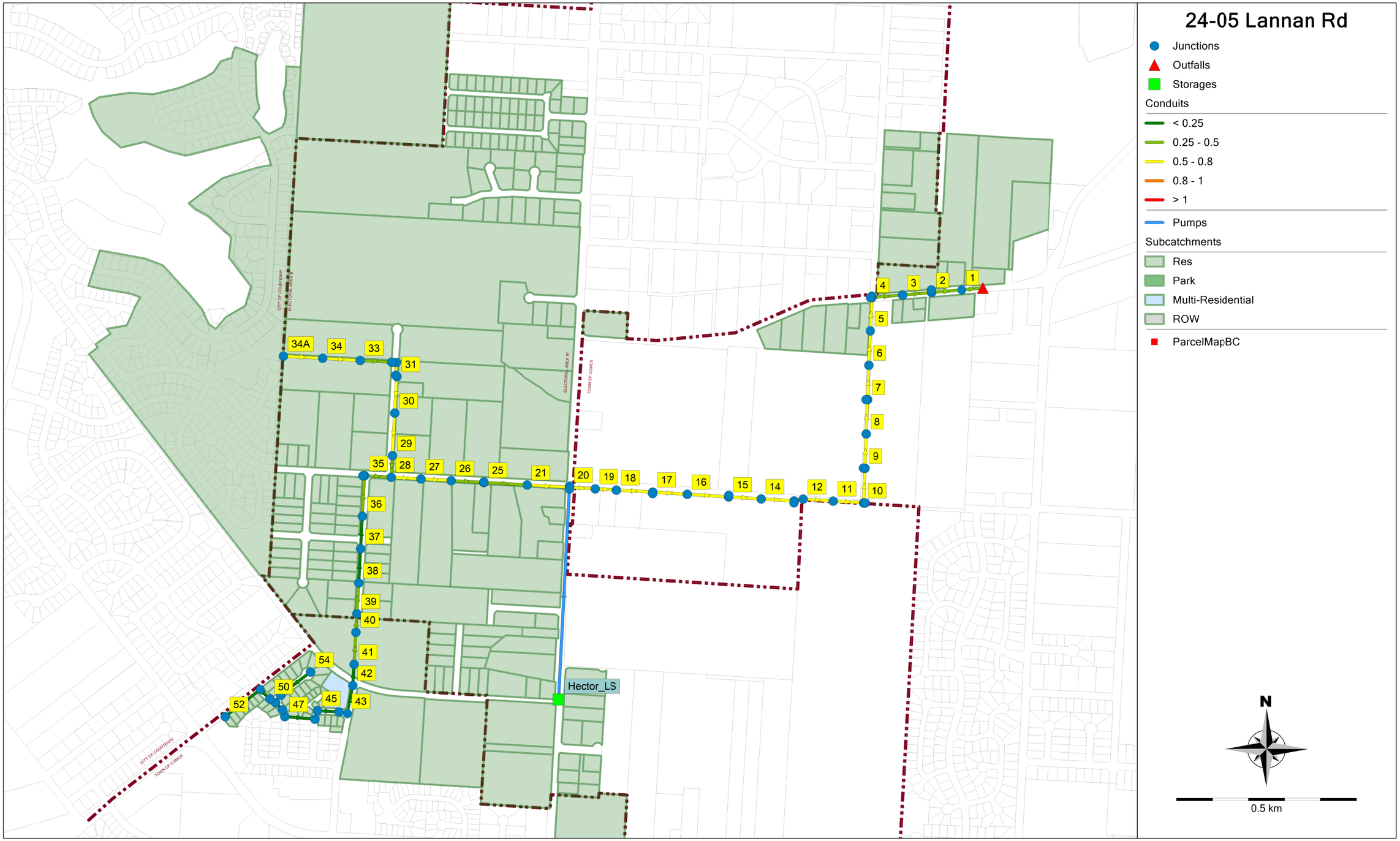
2024-08-27
ER / AM
Rev 2

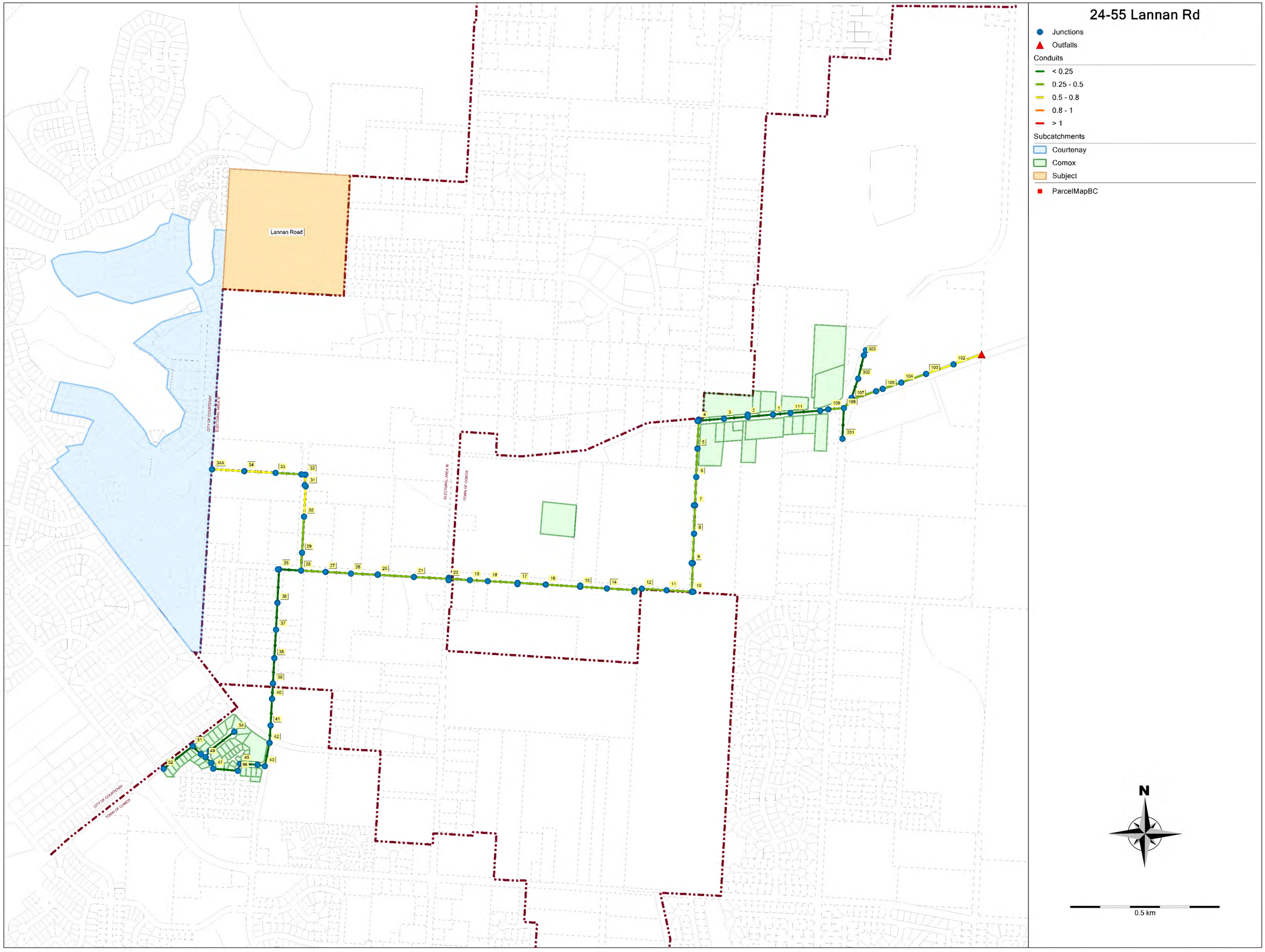
Comox Valley Regional District Sanitary Model Analysis

Hudson Trunk - 24-05 Lannon Road

				24-01 Existing (Pre-Development)		24-05 Lannon Road (Post Development)		24-51 Existing (Pre-Development)		24-55 Lannon Road (Post Development)	
SMH	Downstream Pipe Diameter (mm)	Downstream Pipe Slope (%)	Total Pipe Capacity (L/s)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)	Peak Flow (L/s)	Pipe Utilization (d/D, %)
7	375	0.51	125.7	98.0	64%	96.8	64%	28.2	32%	31.8	34%
6	375	0.97	171.9	98.0	54%	96.8	54%	28.3	27%	31.9	29%
5	375	0.90	166.1	98.0	55%	96.8	55%	28.4	28%	32.0	30%
4	375	3.71	342.4	102.7	38%	101.5	38%	28.7	20%	32.3	21%
3	375	3.69	332.0	102.9	38%	101.7	38%	28.9	20%	32.5	21%
2	375	4.02	349.7	104.9	37%	103.7	37%	29.3	19%	33.0	21%
1	375	2.63	283.8	107.8	43%	106.6	42%	29.4	21%	33.2	22%
111	-	-	-	-	-	-	-	29.9	21%	33.7	22%
110	-	-	-	-	-	-	-	30.1	21%	34.3	23%
109	-	-	-	-	-	-	-	30.1	27%	34.4	29%
108	-	-	-	-	-	-	-	30.2	28%	34.5	30%
107	-	-	-	-	-	-	-	31.4	27%	35.3	29%
106	-	-	-	-	-	-	-	31.4	31%	35.3	33%
105	-	-	-	-	-	-	-	31.5	34%	35.4	36%
104	-	-	-	-	-	-	-	31.6	37%	35.5	40%
103	-	-	-	-	-	-	-	31.6	47%	35.5	50%
102	-	-	-	-	-	-	-	31.7	47%	35.6	50%

Pipes over 80% capacity will be highlighted.


24-05 Lannan Rd
Junctions
Outfalls
Storages
Conduits
< 0.25
0.25 - 0.5
0.5 - 0.8
0.8 - 1
> 1
Pumps
Subcatchments
Res
Park
Multi-Residential
ROW
ParcelMapBC
CITY OF COURTENAY
ELECTORAL AREA 'A'
ELECTORAL AREA 'B'
TOWN OF COMOX
Hector_LS
N
0.5 km


Lannan Road
CITY OF COURTENAY
ELECTORAL AREA 'B'
TOWN OF COMOX
CITY OF COURTENAY
TOWN OF COMOX
24-55 Lannan Rd
Junctions
Outfalls
Conduits
< 0.25
0.25 - 0.5
0.5 - 0.8
0.8 - 1
> 1
Subcatchments
Courtenay
Comox
Subject
ParcelMapBC
N
0.5 km