Red River Exhibition
Water Distribution System
Capacity Study
Revised Fire Flow Analysis

Original Water Model Analysis
by KGS Group Winnipeg
March 2014

Stantec

Prepared for:
Red River Exhibition Park

Prepared by:
Stantec Consulting Ltd.



May 31, 2016

1.0 INTRODUCTION

Stantec Consulting Ltd. was contacted to assist the Red River Exhibition Park to plan for future expansion of their undeveloped grounds located on west side of Winnipeg, Manitoba. The Client wishes to submit a revised fire flow analysis section of the previously prepared report from KGS Group titled, *Water Distribution System Capacity Study, March 2014*, in order to complete the Precinct Plan for submission to the City of Winnipeg.

2.0 WATER NETWORK ANALYSIS MODEL

2.1 EXISTING MODEL DESCRIPTION

A computer model of the water distribution system was created using WaterCAD to calculate the available fire flow capacity within the Red River Exhibition Park area. A combination of record drawings and pre-design drawings were used to input pipe lengths and diameters. Elevation data was not used in this exercise as the area under consideration has no appreciable change in elevation and therefore will not have an impact on the model results. The model incorporated the following City of Winnipeg Water Design Guidelines:

- Watermain diameter <= 200 mm – Hazen Williams C Value of 120
- Watermain diameter > 200 mm – Hazen Williams C Value of 130
- Available fire flow stated at 140 kPa residual pressure during Maximum Day Demand
- 150 mm to 300 mm diameter watermain – AWWA C900 DR18 PVC
- 350 mm to 500 mm diameter watermain – AWWA C905 DR18 PVC
- Maximum water velocity during fire event – 3.0 m/s

The following Maximum Day Demand flows were modeled as identified in Section 5 of the March 2014, KGS report:

- Existing Maximum Day Demand – 20.7 L/s
- Future Maximum Day Demand – 52.0 L/s

Discrete water demand locations were not provided therefore the flow was divided evenly among active nodes for the existing and future scenarios respectively.

Water supply data used in the model was provided by the City as hydrant test flow results at the intersection of Portage Avenue and Racetrack Road. The data used for modeling is illustrated in the following figure.

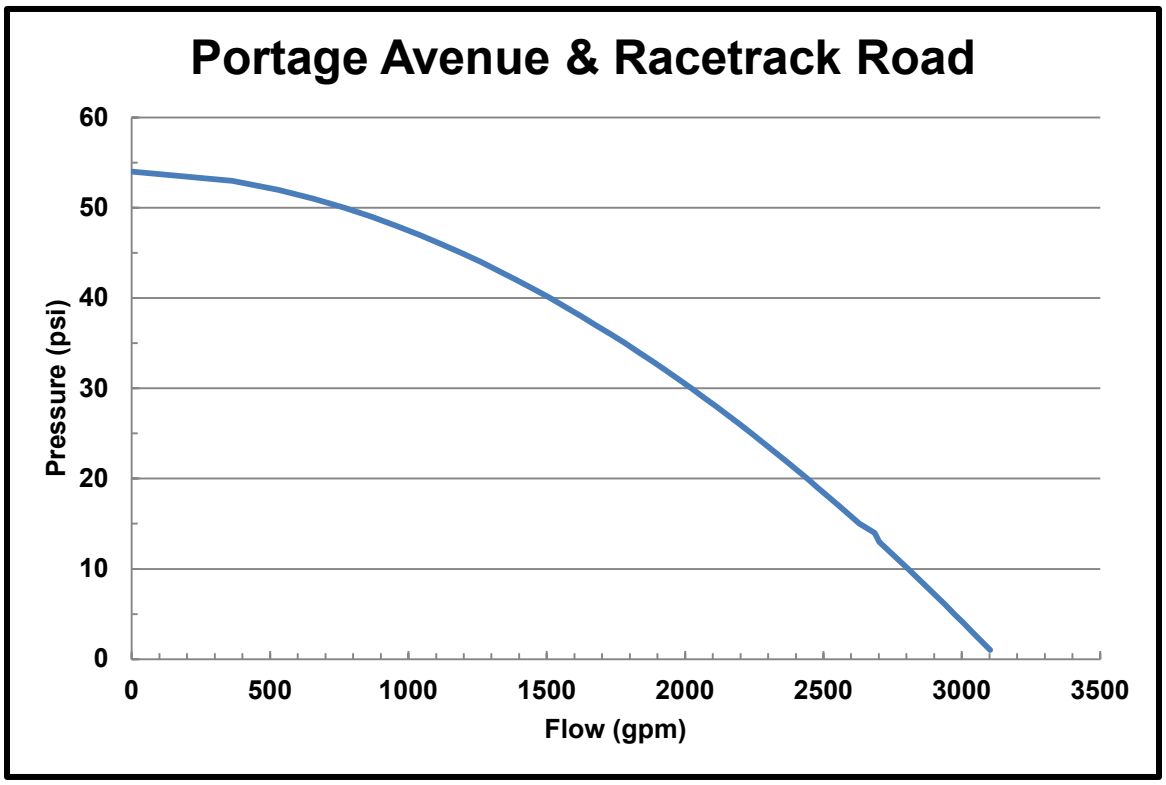


Figure 1: Hydrant Test Flow Data

2.2 FUTURE MODEL DESCRIPTION

Stantec Winnipeg has previously provided pipe infrastructure plans for the Westport Festival area. This data was directly incorporated into the future model without alterations. A future tie-in point was added near the intersection of Saskatchewan Avenue and the Perimeter Highway. This new connection is assumed to be 400 mm diameter with a similar flow and pressure curve to the existing connection at Portage Avenue and Racetrack Road.

A 300 mm watermain was added to the model connecting Saskatchewan Avenue to Portage Avenue. Interconnections to existing pipes and the future Westport Festival area pipes were added to create a watermain loop and improve flow into these areas.

2.3 MODEL RESULTS

The WaterCAD model was used to examine the existing and future fire flow scenarios previously identified. Model results display the available fire flow at representative locations distributed throughout the Red River Exhibition grounds. Maximum Day Demand flows are not reported as they are assumed to be the baseline water demand during the fire event. Reported available fire flows represent flow in excess of the baseline water demand.

To reiterate, the boundary conditions of a fire flow event prescribed by the City of Winnipeg are:

- Minimum System Pressure of 140 kPa
- Maximum Water Velocity of 3.0 m/s

2.3.1 Existing Distribution System

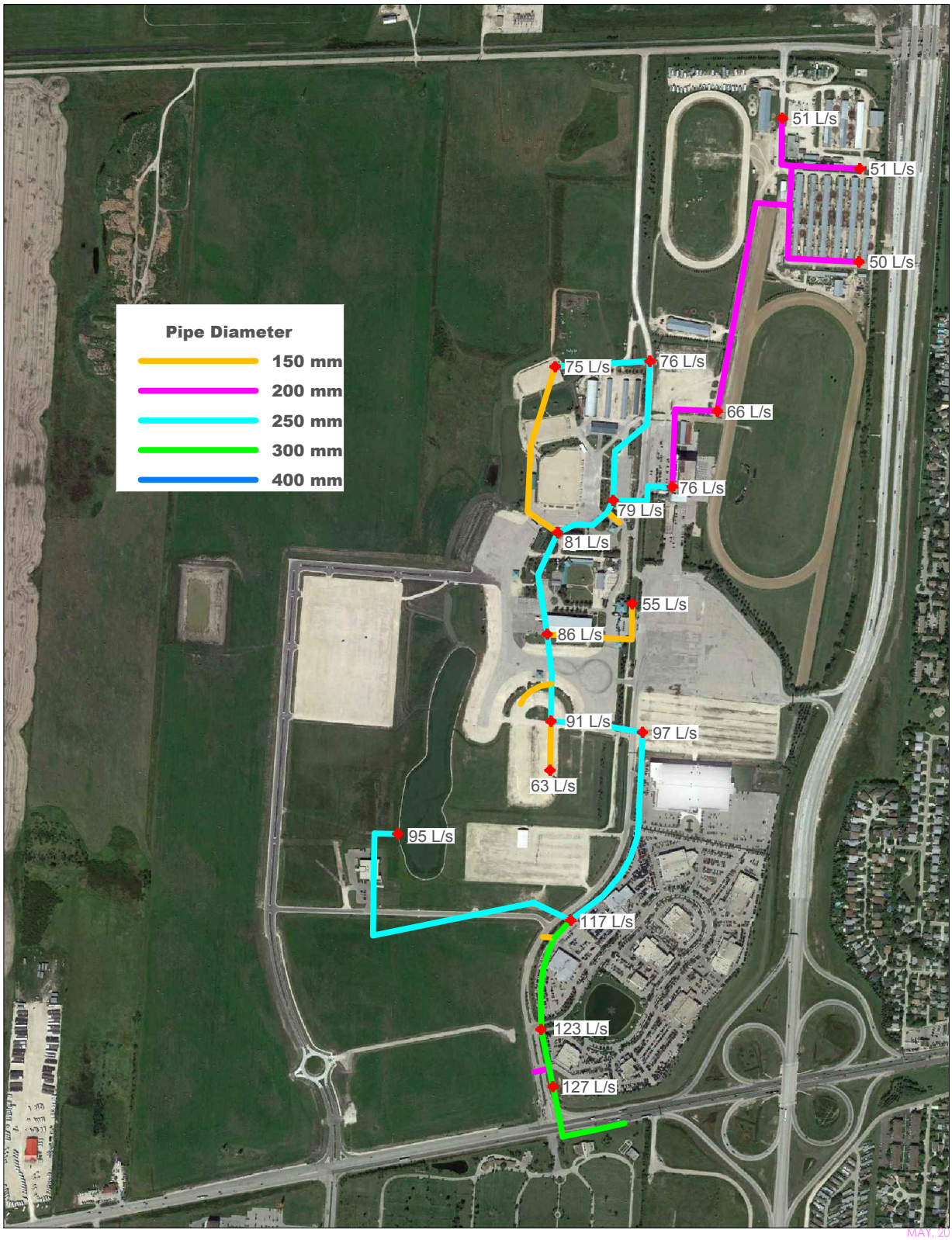
The existing distribution system receives its water supply from Portage Avenue. The highest available flows are logically closest to the water main connection and decrease as the distance from the water supply increases.

The following is a summary of the model results for the existing distribution system.

Table 1: Existing Fire Flow Statistics

	Available Fire Flow
Maximum	127 L/s
Mean	81 L/s
Minimum	50 L/s

The following figure show the detailed modeling results for the existing distribution system.



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WATERMAIN CAPACITY STUDY
AVAILABLE FIRE FLOW

Figure No.
1

Title
EXISTING DISTRIBUTION SYSTEM

2.3.2 Future Distribution System

The future water distribution system will receive its water supply from Portage Avenue to the South and Saskatchewan Avenue to the North. A 300 mm diameter water main will connect Portage Avenue to Saskatchewan Avenue and provide a water main loop which will improve flow to all areas within the Red River Exhibition grounds by effectively shortening the distance of each hydrant to its water main supply.

The following is a summary of the model results for the future distribution system.

Table 2: Future Fire Flow Statistics

	Available Fire Flow
Maximum	214 L/s
Mean	158 L/s
Minimum	62 L/s

The following figure show the detailed modeling results for the future distribution system.

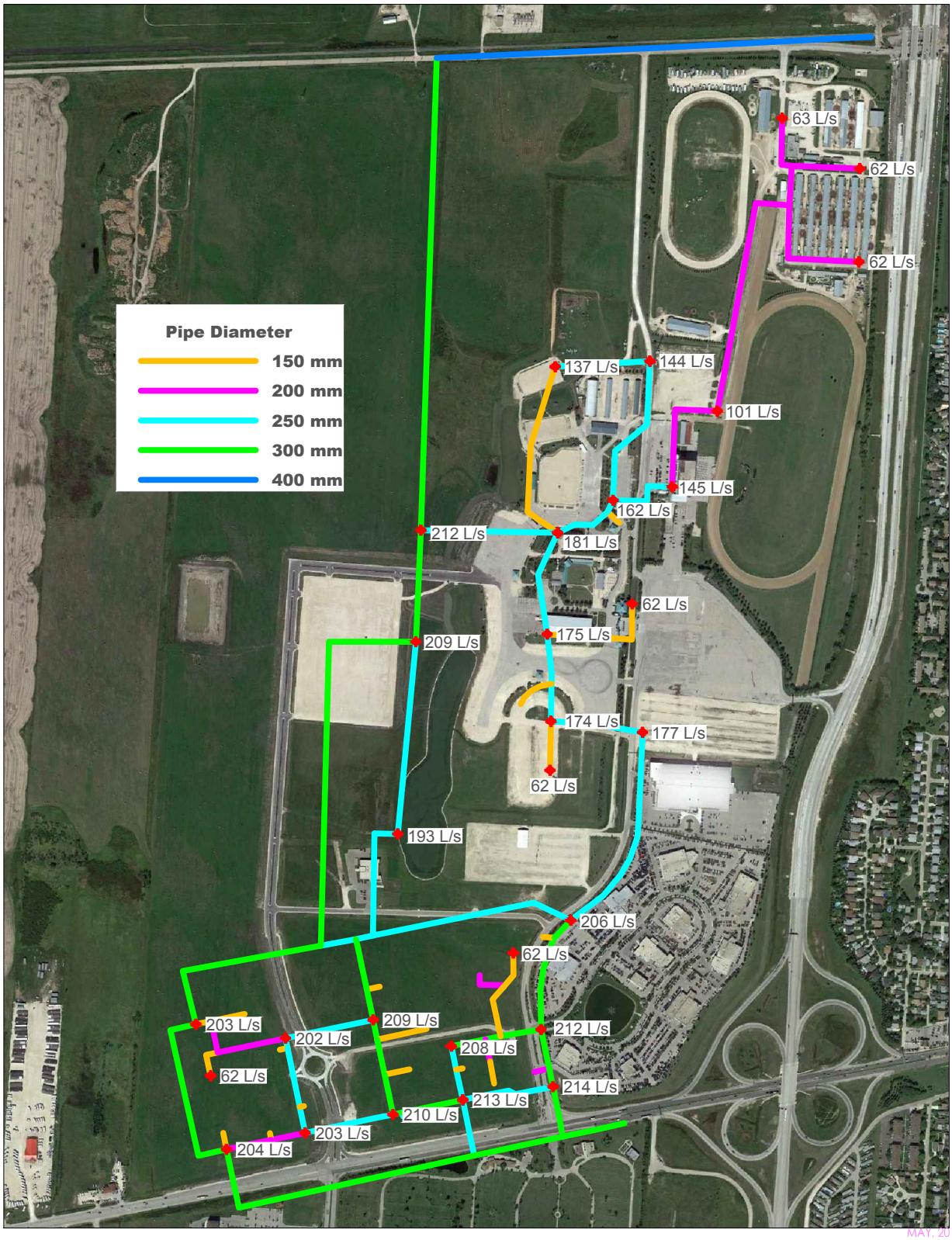

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Figure No.
2

Title
FUTURE DISTRIBUTION SYSTEM
300 mm MAIN LOOP

2.3.3 Upsize Main Loop to 400 mm Diameter

The first parameter to be modified when attempting to increase available fire flow is the pipeline diameter of the main loop. There is a balance that must be maintained between lowering hydraulic resistance and increasing water age in the system. If the pipeline is too large it will cause problems with chlorine decay. For comparison, the model calculated available fire flow with a 400 mm diameter main loop connecting Portage Avenue to Saskatchewan Avenue.

The following is a summary of the model results for the 400 mm watermain loop.

Table 3: 400 mm Watermain Loop Fire Flow Statistics

	Available Fire Flow
Maximum	227 L/s
Mean	166 L/s
Minimum	62 L/s

The following figure show the detailed modeling results for the 400 mm watermain loop.

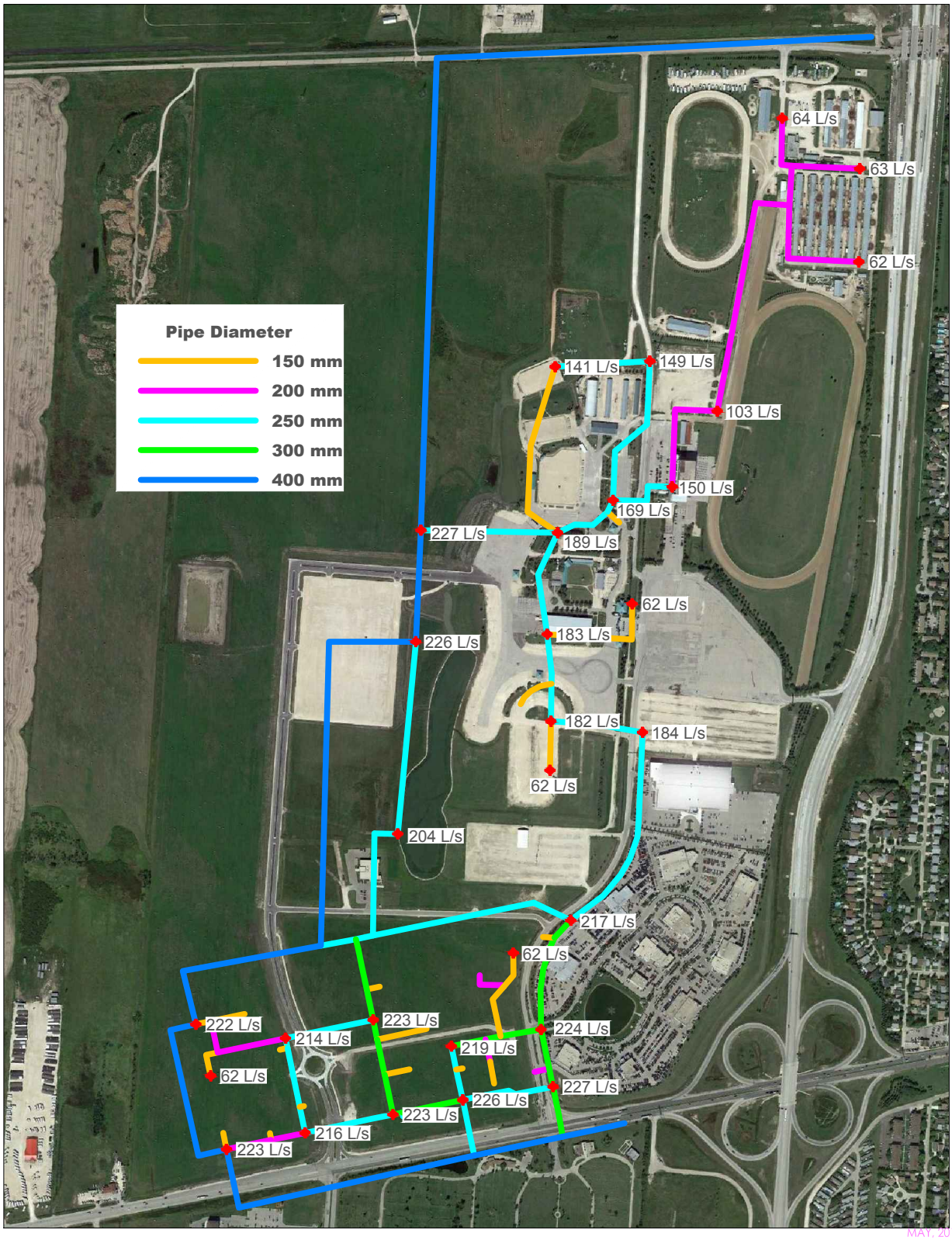

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Figure No.
3

Title
FUTURE DISTRIBUTION SYSTEM
400 mm MAIN LOOP

2.4 CONCLUSIONS

The future water supply connection from Portage Avenue to Saskatchewan Avenue will improve the available fire flow for all areas within the Red River Exhibition Grounds except for the area North of Assiniboine Downs. An additional connection to Saskatchewan Avenue is required to improve fire flow to that area.

Increasing the size of the future watermain loop from 300 mm to 400 mm diameter will increase the mean available fire flow from 158 L/s to 166 L/s respectively. This correlates to an overall increase of 5% for the available fire flow. Larger pipe sizes will provide significantly diminishing value for the additional cost.

The City of Winnipeg has determined this site to have a fire flow target of 250 L/s. The distribution system within the Red River Exhibition Grounds is unable to meet this requirement for any current or future scenario presented in this report. Both the Client and the City are aware of this shortfall through previous fire flow reports. Further discussion on this topic is required to determine appropriate solutions for meeting fire flow targets.