

Region of Waterloo  
Stage 1 Light Rail Transit Project

Design and Construction Performance Output Specifications  
Article 19  
Project Schedule

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**ARTICLE 19 PROJECT SCHEDULE****19.1 General Requirements**

- (a) All schedules submitted by Project Co shall be prepared using the latest version of Primavera or other scheduling software as agreed by the Region. If Project Co recommends and the Region approves the use of a scheduling software other than Primavera, Project Co shall provide four (4) licenses and all software updates for the duration of the Project Agreement Term for the use by the Region. In this Article 19, 'Work' means 'Design and Construction Works and Public Infrastructure Works'
- (b) Project Co shall provide, maintain and update a fully detailed cost and resource loaded Works Schedule in CPM Precedence format, as defined herein, which reflects the full scope of Work, including all Variations, in the form of activities, milestones and relationships between activities/milestones, and which clearly identify the Critical Path(s) necessary to meet schedule requirements. The cost loading information shall include all costs except for financing costs. All financing costs and activities involving the financing of the Project shall not be included in the cost loaded CPM Schedule. The resource loading information shall be in line with the standard productivity rates for various trades applicable to the Project location. The CPM Schedules shall show the sequence and interdependence of submittals and approvals, material procurement, equipment manufacture and construction activities, inspection and testing, work plans, and include, at a minimum, the start and completion of all items of the Work, their major components and milestone completion dates, as well as all relationships to the work of others which affect the Work. The Critical Path(s) shall include all efforts under Project Co's control as well as the activities of others which potentially constrain Project Co's ability to meet schedule requirements. If Project Co and/or any subcontractor falls behind on the Critical Path as shown on the Works Schedule (i.e., for any activity its late finish date falls earlier than its early finish date or its late start date falls earlier than its early start date, resulting in negative slack), then Project Co, shall, in accordance with Section 22.3.(iii) of the Project Agreement, shall prepare and submit to the Region for review and approval a "Negative Slack Recovery Plan" demonstrating Project Co's program and proposed plan to regain lost schedule progress and eliminate the negative slack condition. Slack (or Float) shall be measured not only against the Substantial Completion Date, but also against any other completion dates specified in the Project Agreement, and any other intermediate milestone dates as identified by the Region. The approved Works Schedule shall be used, *inter alia*, by the Independent Certifier under Schedule 21 in its determination pertaining to the Construction Period Payments. The 'Cost of Work Form' outlined in RFP Schedule 6 Part 2 shall be generated from the Project Co's Proposal Submission Schedule. The progress update of the Works Schedule shall be used to generate the 'Construction Period Payment Application' outlined in the Project Agreement – Schedule 21, including the detailed cost information for the PIWs.
- (c) During DPM#3, Project Co shall provide a 'Level 2 Example Schedule' for the location along King Street, defined by Location Codes 04.L12, 04.S10 and 04.L13 in accordance with Schedule 15-2 Article 19, including EXHIBIT A. The Level 2 Example Schedule shall include the time frame for local testing of systems installations but excluding system-wide testing and commissioning activities.
- (i) The Level 2 Example Schedule shall focus of the major activities defining the construction sequence and Project Co shall identify all key procurement dates,

construction start dates and their associated work Packages/ Design Unit start dates demonstrating Project Co's approach to this section of the Project. The times frames presented should be representative of the times frames that Project Co will include in their Technical Submission.

- (ii) The Level 2 Example Schedule may use a single location code to represent the three location codes cited above.
  - (iii) The Level 2 Example Schedule shall be cost loaded, using the Cost Accounting Codes to demonstrate that Project Co can generate the Cost of Work Form needed for the Technical Submission as well as the monthly invoices from the schedule. The cost information used in the Level 2 Example Schedule shall be for illustration purposes only and it is not expected to be representative of the actual cost.
  - (iv) Project Co shall also demonstrate its ability to load resources to Level 2 Example Schedule and produce sample resource histograms/graphs from the schedule. The resource information used in the Level 2 Example Schedule shall be for illustration purposes only and it is not expected to be representative of the actual resources loading for this location.
  - (v) Project Co shall provide Level 1 summary of the Level 2 Example Schedule in hard copy and electronic format as per Article 19.2 and 19.5.(c).(iv) and 19.5.(d).
  - (vi) Project Co shall provide Level 1 summary of the Level 2 Example Schedule in hard copy and electronic format as per Article 19.2 and 19.5.(c).(vi) and 19.5.(d).
  - (vii) During DPM#3, Project Co shall provide its understanding of schedule updating requirements as per Article 19.8.
  - (viii) During DPM#3, Project Co shall provide its understanding and approach for preparing and validating updates to the Project Schedule as per Article 19.4.
  - (ix) During DPM#3, Project Co shall provide its approach to schedule adherence and recovery strategies, to illustrate how it will maintain its Project Schedule and holistic and seamless approach to the Work as per Article 19.4.
  - (ix) During DPM#3, Project Co shall provide supplemental drawings or equivalent presentation materials which clearly depict the sequence of construction and staging of work for the section covered under the 'Level 2 Example Schedule'.
- (e) Project Co may propose to use an alternative WBS and/or revise the WBS codes to reflect their specific approach to the location of the Work and description of the Work categories. Project Co's alternative approach may use activity coding in lieu of the WBS to achieve the same level of information cited in this Article. If Project Co elects to use an alternative approach, this approach shall be described in the Technical Submission and is subject to revision by the Region if it is determined by the Region that the alternative approach does not provide a similar level of detail to the requirements cited in this Article.

## **19.2 Project Co's Proposal Submission Schedule and Project Co's Baseline Schedule**

- (a) Project Co's Proposal Submission Schedule: As part of Project Co's Technical Submission requirements of the RFP, Project Co shall develop and submit a schedule for the entire Work in accordance with the requirements stated in this Article 19. The information provided in Project Co's Proposal Submission Schedule shall include, but not be limited to, the interdependencies

between Project Co's activities and all other activities required for the successful completion of the Work, including, those to be performed by Utility Companies, or by other entities. This schedule is termed as Project Co's 'Proposal Submission Schedule'. The level of detail shall comply with the Level 1 and Level 2 requirements set out in Articles 19.5(c) and (d), with some latitude to tailor the level of detail as defined in this Article 19.2(a). The format of the Proposal Submission Schedule shall conform to the overall formats identified in this Article 19. Project Co may elect to use only the first two digits of Code 1 for the Proposal Submission Schedule and defer the detailed development of the schedule using all levels of Code 1 until Financial Close. Project Co may modify the WBS Code for Level 2 as appropriate to reflect the way the Project Co intends to carry out the Work. The cost loading for the entire scope of Work is required to be fully completed to generate the Cost of Work Form, as part of Project Co's Proposal Submission Schedule and the cost information generated for the Financial Submission shall not be altered with the subsequent submission of Project Co's Baseline Schedule, unless it is agreed to by the Region, prior to the Financial Close. At a minimum, Project Co's Proposal Submission Schedule shall include all critical resources needed for the Work. As specified therein, formats shall include bar charts, an activity network diagram, tabular activity listings, resource graphs/tables, cash flow graphs/tables and a Compact Disk (CD) of the Project files in its native format. Level 1 summary bar charts, summarized to Location Code (WBS Code 1) and the actions taking place (WBS Code 3) described for Level 1 under 19.5.(c) and Level 1 summary bar charts, summarized to construction Work Packages/Design Units shall also be included as part of Project Co's Technical Submission.

- (b) Project Co's Baseline Schedule: At the time of the Financial Close, Project Co shall update the Project Co's Proposal Submission Schedule to meet all the requirements for a Level 2 schedule and resubmit the schedule in accordance with the requirements stated in this Article 19. There shall be no change to the amounts provided in the Cost of Work Form as compared to the Project Co's Proposal Submission Schedule, unless it is agreed to by the Region, prior to the Financial Close. The updated schedule is termed as 'Project Co's Baseline Schedule'. As specified therein, formats shall include bar charts, an activity network diagram, tabular activity listings, resource graphs/tables, cash flow graphs/tables and a Compact Disk (CD) of the Project files in its native formats. Level 1 summary bar charts, summarized to Location Code (WBS Code 1) and the actions taking place (WBS Code 3) described for Level 1 under 19.5.(c) of this Article 19 shall also be included with the submittal. Level 1 summary bar charts, summarized to construction Work Packages/Design Units shall also be included as part of Project Co's submission. Project Co's Baseline Schedule and any revision thereto in accordance with the Project Agreement shall always be available on file for comparison purposes in accordance with PA Schedule 26 (Record Provisions).

### **19.3 Process of expanding the Project Schedules**

- (a) 6-Month Works Schedule and Works Schedule

In accordance with Section 22.2(a) of the Project Agreement, Project Co shall:

- (i) within 30 calendar days after the Financial Close, prepare and submit to the Region, the Independent Certifier and the Region Engineer, a detailed 6-Month Works Schedule completed with the resource loading for the entire scope of Work; and
- (ii) within 120 calendar days after Financial Close, prepare and submit to the Region, the Independent Certifier and the Region Engineer, a detailed draft of the Works Schedule.

The 6-Month Works Schedule and the Works Schedule and all revisions thereto shall be prepared in accordance with detail Level 3, as described in Article 19.5(e), subject to Article 19.5(f)(v). Subsequent revisions to the 6-Month Works Schedule and the Works Schedule shall conform with the requirements set out in Article 19, and shall be subject to PA Schedule 10 (Review Procedure). Each time an updated 6-Month Works Schedule or Works Schedule is generated, it is also a revision from the previous 6-Month Works Schedule or Work Schedule, and the revision number shall be increased by one (1), and the old schedule shall be archived, so as to permit an audit trail. The Works Schedule shall always be available on file for comparison purposes in accordance with PA Schedule 26 (Record Provisions).

- (b) The Proposal Submission Schedule, Project Co's Baseline Schedule, 6-Month Works Schedule and Works Schedule (collectively the "Project Schedules") shall be comprised of measurable and deliverable activities and milestones for planning the Work, for reporting, verifying, and controlling progress. These activities and milestones shall include all Specific Location/individual Work Category elements of the Work Breakdown Structure and all submittal items not included in the WBS. In this regard, the CPM activities shall be coded so that the detailed costs and resources can be automatically rolled-up in Primavera or other approved scheduling software, to the key milestones specified in this Article and the Project Agreement. In order to encourage "fast-tracking", the Project Schedules shall denote all fast tracked Work.
- (c) Comparisons of the current update of the 6-Month Works Schedule and the Works Schedule to the latest 6-Month Works Schedule and Works Schedule shall be made each month so that any schedule slippage can be readily observed and tracked. In addition to the requirements set out in Article 19.1(b) and Section 22.3(iii) of the Project Agreement, Project Co shall be required to prepare, on a monthly basis, an Analysis Report explaining how it intends to make up any slippage in schedule, unrelated to, slippage that affects the Critical Path.
- (d) The 6-Month Works Schedule and the Works Schedule shall always be available as it originally existed. In the event of extreme changes or unforeseeable circumstances, a formal revision of the Works Schedule may be permitted, but only after changes have been approved by the Region. However, the scope changes that do not impact the schedule shall be incorporated as part of the monthly schedule updates, after the precise nature of the change has been approved by the Region.
- (e) The 6-Month Works Schedule and the Works Schedule shall be prepared and submitted monthly during the first six month period of the Project Term and following the first six month period until Substantial Completion respectively. As specified in this Article 19, report formats shall include bar charts, a network logic diagram, tabular activity listings, cash flow graphs/tables and a Compact Disk (CD) of the Project files. One or more Level 1 summary bar charts, showing the level of detail described under Level 1, shall also be included with each submittal.
- (f) Any work carried out by others that require Project Co's coordination shall be included in the 6-Month Works Schedule and the Works Schedule.
- (g) The 6-Month Work Schedule and the Works Schedule shall include activities for, among other things: obtaining permits when required; preparing shop drawings, designs, and other submittals; and obtaining approvals, as required from the Region or agency having jurisdiction. Project Co shall allow the durations for design reviews for the Region's review of submittals where approvals and/or acceptances are required. Activities shall be sufficiently detailed to assure adequate planning, execution and progress evaluation of the Work within the significant dates provided for in the Project Agreement. Activities at Level 3 schedule detail shall generally range

in duration from three (3) calendar days to ninety (90) calendar days or as deemed reasonable based upon complexity and criticality of the tasks involved. Long lead time procurement items may have durations exceeding ninety (90) calendar days. However, the activity durations in the schedule shall be applied in working days to have the desired effect of equivalent calendar days.

#### **19.4 Schedule Updates**

- (a) Project Co shall prepare, maintain and update the 6-Month Works Schedule and the Works Schedule, as the case may be, in accordance with this Article 19 and such updates (the “Project Schedule Updates”) shall be prepared in such a manner as to permit the orderly planning, organization, and execution of the Work, be sufficiently detailed and cost and resource loaded to accurately depict all the progress of the Work. The methods for distributing the resource and costs assigned to the CPM network activities over time (accrual types e.g. linear, front loaded, back loaded, etc.), shall be approved by the Region. Project Schedule Updates shall include the depiction and reporting of the actual performance and progress of the Work, as described in this Article 19. Each update to the 6-Month Works Schedule and the Works Schedule, as applicable, shall be completed in accordance with PA Schedule 10 (Review Procedure) and shall bear the signature of Project Co's Project Manager.
- (b) All Project Schedule Updates submitted by Project Co shall be managed in accordance with PA Schedule 10 (Review Procedure) and shall be prepared using the latest version of Primavera and submitted on one or more CDs, as required, and containing the Primavera file format.
- (c) The Project Schedule Updates shall graphically represent the Network Logic Diagrams, and showing the logical sequence of the activities necessary to complete the Work in accordance with the requirements of the Project Agreement. Project Schedules shall include activities involving the procurement, manufacture and delivery of construction materials and equipment, whether such materials and equipment are furnished by the Region, Project Co or by others. The information provided in Project Schedules shall include, but not limited to, the interdependencies between Project Co's activities and all other activities required for the successful completion of the Project, e.g., those to be performed by utility companies, or by other entities. In order to encourage "fast-tracking", the Project Schedule shall denote construction Work Packages/Design Units in accordance with this Article 19.

#### **19.5 Levels of Detail for Project Schedules**

- (a) The Proposal Submission Schedule and Project Co's Baseline Schedule will include levels of detail 1 and 2 only. All three levels of detail are required for 6-Month Works Schedule and the Works Schedule, subject to this Article 19.5(f)(v).
- (b) The activity durations shall be applied in work days for arriving at the desired effect of equivalent calendar days. Various Work Calendars and Resource Calendars that are assigned, shall be defined with distinct names and hard copies submitted along with the schedule submission.
- (c) Level 1 Schedules
  - (i) These are summary schedules and can have varying levels of detail and content, depending upon the intended use and recipient of the schedule. A typical application would be to provide a one page overview of the entire Project for review by upper management.

- (ii) A Level 1 summary schedule shall include major Milestones, Engineering and Construction activities, and at least one activity for the remaining Summary Work Categories.
  - (iii) A Level 1 summary schedule, shall be "Location of Work" oriented.
  - (iv) The Proposal Submission Schedule, shall include a Level 1 summary schedule, which in addition to the requirements set out above, identifies the Location Code (WBS code 1) and action taking place (WBS code 3), thereby distinguishing between design, procurement, manufacturing, construction, testing, commissioning, etc.
  - (v) Project Co shall prepare a cost and resource loaded summary schedule that contains activities and milestones as specified in the Articles herein and the Project Agreement. An Activity Code field shall be established in Primavera to contain the Milestone numbers, so that a Milestone Summary Schedule can be readily produced. Cost Codes shall be assigned and cost loaded to activities and milestones.
  - (vi) The Proposal Submission Schedule shall include a Level 1 summary schedule of the construction Work Packages/Design Units, established in the Technical Submission, as a means of identifying work that will be "fast-tracked". The Activity Code field shall be established in Primavera, to contain the construction Work Package number, to permit the readily production of summary of construction Work Packages/Design Units.
  - (vii) Summary level schedules shall typically consist of either: one (1) Hammock activity (the latest version of Primavera terms it as 'Level of Effort' activity), or two (2) Summary activities based upon Activity Code Values for the detail activities contained within the lower level schedules, defined below. Pertinent Milestones shall be included with either method of summarization.
- (d) Level 2 Schedules
- (i) Modified Level 2 detail is the minimum acceptable level of schedule detail for the Proposal Submission Schedule and the Project Co's Baseline Schedule should be a fully compliant Level 2 Schedule. These schedules shall directly relate to the Cost of Work Form as included in the Technical Submission and shall be cost and resource loaded in order to generate the preliminary Cash Flows and resource charts/histograms for the Project.
  - (ii) Level 2 detail shall include activities for each individual Work Category identified in this Article 19 and the Project Agreement, and shall directly relate to the Cost of Work Form. The activities and milestones shall include all submittal items: one (1) as an individual submittal; two (2) contained within a specific Work Category, such as "Program Control"; or three (3) grouped under "Remaining Submittals "for each applicable Summary Work Category. This schedule shall be cost and resource loaded for Cash Flow and resource indication purposes..
  - (iii) In general, Level 2 schedule detail translates into detail down to the fifth position of WBS Code 1 (Location of Work - Specific Location/Segment) together with the first position of WBS Code 2 (Summary Work Category), except as noted below however, to include the PIW:



- (iv) For Summary Work Category G (Trackway Structures) within specific Trackway Line Segments, additional CPM activities shall be identified and scheduled, at a minimum, for the following individual Work Categories:
  - A. Demolitions (G.01)
  - B. Waterproofing (if applicable) (G.02)
  - C. Trackway Foundation (G.03)
  - D. Remainder of Trackway Construction, Trackway Piers and Pier Caps, Other Trackway Structure (with specific descriptions as applicable), walkways, etc. (G.04 - G.10)
  
- (v) For Summary Work Category T (Trackwork and other Trackway Equipment) within specific Trackway Line Segments (i.e. each Track Line (eg.: 01.L.01)), additional CPM activities shall be identified and scheduled, at a minimum, for the following individual Work Categories:
  - A. Running Rail – Ballasted and/or Running Rail - Embedded (T.01 and/or T.02 as applicable)
  - B. Special Trackwork (Gauntlet, Turnouts, Switches) (T.03)
  - C. Remainder of Trackwork and other Trackway Equipment as applicable, to the point of beginning Systems installation (T.04 - T.10)
  
- (vi) For Summary Work Category S (LRT Stop Facilities) within specific Trackway Line Segments (i.e. each LRT Stop), additional CPM activities shall be identified and scheduled, at a minimum, for the following individual Work Categories:
  - A. Slabs and Foundations (S.01)
  - B. Other Structures (if applicable) (S.02)
  - C. LRT Shelters (S.03)
  - D. LRT Wind Screens (S.04)
  - E. Remainder of LRT Stop Facility to the point of beginning Systems installation (S.05 - S.12)
  
- (vii) For Systems-related Summary Work Categories, such as those listed below, shall have separate CPM activities identified and scheduled, at a minimum: In addition, separate CPM activities shall be established for each individual building, as applicable, under "Projectwide" - WBS Code 1 = 20.P.01 to 20.P.09 for these Systems-related Summary Work Categories:
  - A. Power Supply and Distribution System (P)
  - B. Train Control/ ATP
  - C. Communications, ITS, SCADA and Security (C)
  
- (viii) Other Summary Work Categories, such as those listed below, shall have separate CPM activities identified and scheduled, at a minimum: In addition, separate CPM activities shall be established for each individual building, as applicable, under "Projectwide" - WBS Code 1 = 20.P.01 to 20.P.09 for the following Summary Work Categories:

- A. Infrastructure and Sitework (Z)
- B. Utilities (U)
- C. Right-of-Way and Other Environmental Cleanup (R)
- (ix) Level-of-Effort (LOE) Summary Work Categories, such as Project Management (M), may be represented in the Level 2 detail with a single Projectwide network activity for the entire duration, as long as one activity can provide a reasonably accurate Cash Flow for each such LOE Summary Work Category. Design (D) Work Categories that are LOE, such as D.01 (Facilities Design Management and Administration), D.08 (Civil/Structural Design Management and Administration), D.13 (Systems Design Management and Administration) may also be treated in this fashion. Location-related Design Work Categories, such as D.03 (Facilities Drawings and Specifications), D.10 (Civil/Structural Drawings and Specifications), D.15 (Systems Drawings and Specifications), shall have separate CPM activities identified and scheduled, at a minimum, for each major Line Section. Cost loading to these activities shall be as per the Cost Codes 80.01 through to 80.11 and including PIW costs and to enable the submission and reporting as per the Cost of Work Form.
- (x) Key activities shall be scheduled even if they are included within a Summary Work Category or an individual Work Category.
- (xi) Beyond identifying what is being worked on in accordance with the WBS, schedule activities must define the action taking place. A list of actions is provided as WBS Code 3 "Scheduling Actions" in Exhibit A. At schedule Level 2, such actions shall include, but are not limited to:
  - A. Final Design for individual trackway segments, LRT Stops and Buildings
  - B. Final Design for Systems and other Summary Work Categories according to major Line Section or Projectwide, as applicable.
  - C. Permitting, as required
  - D. Procurement
  - E. Manufacturing
  - F. Construction - at a minimum, shall correspond to the WBS detail described above for Level 2
  - G. Testing
  - H. Specific Submittals, as required
- (xii) The Activity ID for Level 2 schedules shall contain the WBS Number relevant to the level of detail for Level 2. That is, the first six positions of the Activity ID shall contain WBS Code 1 (all five positions) and the first position of WBS Code 2 (Summary Work Category). The remaining positions of the Activity ID (up to twelve alphanumeric characters in total) may then be used to indicate the action taking place, along with any additional detail relating to the Work Category.
- (xiii) 'Cost Account' number/code shall be applied to Level 2 schedule activities, in order to segregate and group the cost loaded activities into various cost categories. The numbering and description shall be as indicated in Exhibit A or as approved by the Region. The cost

breakdown included within the Proposal Submission Schedule shall be as per the Cost of Work Form provided in the RFP and shall have the ability for segregation to identify the cost of PIW.

- (xiv) When assigning resources, the Resource ID and Resource Name, Resource Type and the role shall be applied as required.
- (e) Level 3 Schedules
  - (i) This level of schedule detail shall define measurable and deliverable activities and milestones for planning the Work, for reporting and controlling progress in order to verify the progress of the Work. Monthly Cash Flow reports and graphics shall be developed from the cost and resource loaded CPM activities using this level of detail. Activities and milestones that make up the construction Work Packages shall be coded and scheduled at Level 3, or if necessary, at Level 4 detail.
  - (ii) The network activities in the schedule shall be cost and resource loaded and directly related to the Cost of Work Form included in the Financial Submission and resource requirements which shall be further broken down to correspond to the level of detail in the level 3 project schedule.
  - (iii) Cost and resource allocations shall be made, at the level of schedule detail described below, initially allowing for the allocation of costs and resources for multiple Work Categories to a single CPM activity. Further detailing of the Level 4 to one or more Level 3 CPM activities shall occur over time, at least one hundred twenty (120) calendar days in advance of the actual performance of the work for any WBS Work Category. As the Work progresses, the resulting Earned Value for the work accomplished, as agreed by the Region and calculated by Primavera, shall be used to verify the progress of the Work and any Construction Period Payment in accordance with Schedule 21 of the Project Agreement.
  - (iv) The level of schedule detail shall evolve over time down to all five positions of WBS Code 1 (Location of Work - Specific Location/Segment) together with all three positions of WBS Code 2 (Work Categories). Up until one hundred twenty (120) calendar days prior to starting work on a particular Work Category, a reasonable combining of Work Categories within each Summary Work Category shall be permitted, as long as the schedule and the cost allocation among activities are not compromised, i.e., the Work Categories being combined logically belong together and occur in the same time frame. The 'Notebook' field / tab available for Primavera activities shall be used to identify which specific Work Categories have been combined into a single activity. Final approval of the degree of detail rests with the Region.
  - (v) Combining of Work Categories to a single CPM activity in the schedule will be permitted as follows:
    - A. For Summary Work Category G (Trackway Structures) all Work Categories for each specific Trackway Line Segment shall, at a minimum, have separate activities identified and scheduled.
    - B. For Summary Work Category S (LRT Stop Facilities) within specific LRT Stop, separate CPM activities shall be identified and scheduled, at a minimum, for the following Work Categories:

1. Slabs and Foundations (Trackway and foundations within Stop limits) (S.01)
  2. Other Structures (as applicable) (S.02)
  3. LRT Shelters (S.03)
  4. LRT Wind Screens (S.04)
  5. Fire Protection Systems (S.05)
  6. Plumbing Elements (S.06)
  7. Electrical Elements (S.07)
  8. Signage - Static (S.08)
  9. Other LRT Stop Furnishing (S.09)
- C. The Systems Work Categories, i.e. those within Summary Work Categories P, A and C as well as the Work Categories within Summary Work Categories Z, U, T and R, may initially be combined within a Specific Location in accordance within the general requirement that the Work Categories being combined logically belong together and occur in the same time frame. However, the Summary Work Categories themselves shall not be combined.
- D. Level-of-Effort (LOE) Work Categories, such as those contained within Project Management, (M), may be represented in the Level 3 Project Schedules with a single network activity for each year of the duration, as long as one activity per year can provide a reasonably accurate cash flow for each such LOE Work Category. Design (D) Work Categories that are LOE, such as D.01 (Facilities Design Management and Administration), D.08 (Civil/Structural Design Management and Administration), D.13 (Systems Design Management and Administration) shall also be treated in this fashion. Location-related Design Work Categories, such as D.03 (Facilities Drawings and Specifications), D.10 (Civil/Structural Drawings and Specifications), D.15 (Systems Drawings and Specifications), shall have separate CPM activities identified and scheduled, at a minimum, for each major Line Section.
- E. Key activities shall be scheduled even if they are included within an individual Work Category.
- (xi) The Level 3 schedule shall evolve in a “rolling-wave” fashion, with more detailed activities being defined as final design progresses, the exact construction methodologies known to be used, and after the effects of external influences are understood. In any event, not less than one hundred twenty (120) calendar days or more prior to starting the work on any individual Work Category, at least one CPM activity shall exist in the Project Schedule for that Work Category for each Specific Location to which it applies.
- (xii) As with schedule Level 2, beyond identifying what is being worked on in accordance with the WBS, Level 3 schedule activities must define the action taking place. A list of actions is provided as WBS Code 3 "Scheduling Actions" in Exhibit A. At schedule Level 3, such actions shall include, but are not limited to:
- A. Preliminary Engineering

- B. Intermediate Design
- C. Ready of Construction Design
- (xiii) Note: These Design submittals shall be scheduled for each individual trackway segment, LRT Stop and Building. However, for Systems and other Summary Work Categories, Design activity detail may be according to WBS Code 1, position 1 and 2, i.e. major Line Section or Projectwide, as applicable. If Projectwide, LOE treatment may be suitable.
  - A. Design Activities
  - B. Design Review and Comments
  - C. Incorporation of Comments
  - D. Approvals and Acceptance
  - E. Permitting, as required
  - F. Inspections/Surveys
  - G. Procurement
  - H. Manufacturing
  - I. Delivery of Equipment
  - J. Construction - at a minimum, shall correspond to the WBS detail described above for Level 3
  - K. Installation/Erection
  - L. Coordination
  - M. Construction Interface
  - N. As-Built Documentation
  - O. Integration and Checkout
  - P. Factory Acceptance Testing
  - Q. Qualification Testing
  - R. Acceptance Testing
  - S. Completion of Punch List Items
  - T. Specific Submittal as required
  - U. Warranties/ Guarantees
- (xiv) The Activity ID for Level 3 schedules shall contain the WBS Number relevant to the level of detail for Level 3. That is, the first eight positions of the Activity ID shall contain all five positions of WBS Code 1 (Specific Location) and all three positions of WBS Code 2 (individual Work Category). The remaining positions of the Activity ID (up to twelve alphanumeric characters in total) may then be used to indicate the action taking place.
- (xv) The Level 3 schedule shall be updated and submitted, at least, on a monthly basis, each and every month of the Project duration. Monthly submittals shall coincide with Project

Co's submittal of the Monthly Progress Reports. The update shall consist of changes in scope, logic changes and progress input in terms of actual start dates, actual finish dates, remaining durations, etc., and identify the exact cause of changes to the Critical Path and the resolution of negative slack/float situations. Changes in scope and logic, including any modifications to relationship lag and lead times, shall be marked-up on the latest prior logic diagram(s), so these types of changes can be easily seen. In no event shall changes in logic and cost allocation be made without prior notification and discussion with the Region.

- (xvi) 'Cost Account' number/code shall be applied to Level 3 schedule activities, in order to segregate and group the cost loaded activities into various cost categories. The numbering and description shall be as indicated in Exhibit A or as approved by the Region. Cost summation shall be as per the Cost Form template provided and shall have cost segregation to identify the cost of PIW.
  - (xvii) When assigning resources, the Resource ID and Resource Name, Resource Type and the role shall be applied as required.
- (f) Level 4 Schedules
- (i) These are detailed construction schedules which shall be developed, as necessary, in order to define the day-to-day activities of each construction effort, including the construction Work Packages. Typical construction efforts shall include each trackway line segment, each LRT Stop, each Building and, as appropriate, subsegments of the trackway, etc. As the various testing phases approach, such as integration testing and demonstration testing, they shall be scheduled at Level 4 detail.
  - (ii) Level 4 detail shall be a further detailing of activities within the Level 3 Project Schedule itself, or it may reside in a separate stand-alone schedule, as long as the calculated schedule dates, estimates to completion, etc., are accurately reflected in the Level 3 Project Schedule. Activity definition shall show all required interfaces (or "hand-off" of information) between disciplines, crafts, subcontractors, or other third parties, highlighting any problem areas. Specific problem areas that need to be resolved shall be isolated as "Fragnets".
  - (iii) Activities that define the action taking place shall include, but not be limited to, any of the actions identified for Level 3, above, or any of the WBS Code 3 "Scheduling Actions".
  - (iv) This level of schedule detail shall be developed three months or more prior to performing the actual work. Situations requiring earlier activity definition to Level 4 detail might include manufacturing work so that the critical aspects of the project can be concentrated upon in time to take any corrective action.
  - (v) It is anticipated that Level 4 detail will be requested for submittal on an exception basis, but this is dependent upon the schedule progress of the Project. In any event, this level of detail shall be maintained and updated by Project Co.
  - (vi) 'Cost Account' number/code shall be applied to Level 4 schedule activities, in order to segregate and group the cost loaded activities into various cost categories. The numbering and description shall be as indicated in Exhibit A or as approved by the Region. . Cost

summation shall be as per the Cost Form template provided and shall have the ability for segregation to identify the cost of PIW.

- (vii) When assigning resources, the Resource ID and Resource Name, Resource Type and the role shall be applied as required.

**19.6 Project Schedule Terminology**

- (a) The following terms apply to each Project Schedule. Supplementary definitions and information can be obtained from Primavera reference manuals. Other scheduling software may have a slight difference in terminology and definition. However, the meaning remains the same.

- (i) Activity

A discrete item of Work with a Duration, Start Date and End Date which can be clearly defined; a synonym for a task. Unless otherwise permitted in writing by the Region Activity's Duration shall not be more than ninety (90) calendar days and not less than one day, except for Milestone Activities with duration of zero by definition. Appropriate work calendar shall be applied to activities as applicable.

- (ii) Activity Codes

Values assigned to CPM network activities to organize them into manageable groups for updating, analyzing, reporting, plotting and summarizing. Activity codes are assigned to specific activities as needed. The following activity Codes shall be defined as well: (1) Progress Milestone, containing the Progress Milestone number; (2) Construction Work Packages, containing the Work Package number; and any other activity code as appropriate and as required.

- (iii) Activity Description

A textural explanation of an Activity. The Activity Description shall be limited to the software's limitations and clearly described to avoid any ambiguity.

- (iv) Activity Number or ID

An alphanumeric code which uniquely identifies an Activity. The Activity Number (or ID) shall consist of twelve alphanumeric characters and shall be comprised only of numbers and letters (no special characters). It shall be structured, as provided by Primavera's Activity Classifications, according to the WBS. The first eight characters of the WBS code constitutes the predefined portions of the activity ID itself. For purposes of this Project Agreement, the following activity ID numbering shall be defined: (1) WBS Code 1, containing the Location of Work; and (2) WBS Code 2, containing the Work Category number.

- (v) Actual Finish Date

Actual Finish Date is the date upon which an Activity is actually finished.

- (vi) Actual Start Date

Actual Start Date is the date upon which an Activity actually begins.

- (vii) Alternative Solutions

Alternative Analysis is an analysis of various options for dealing with encountered or anticipated schedule problems. It is developed to assist in determining the best

method(s) of preventing or correcting any impediments to the progress of the Work. Alternative Solutions shall indicate impacts on scheduling and resources.

(viii) Analysis Report

Analysis Report is a report which displays the impacts of all variances relating to the Current Project Schedule. The Analysis Report shall focus attention on the impacts of variances between planned and actual performance, so as to support an assessment of such impacts. The Analysis Report shall include Alternative Solutions.

(ix) 'Autocompute Actuals' Rules

This refers to the "Automatic Cost/Resource Calculation Rules" within Primavera. These rules may be customized to determine how Primavera calculates actual quantities and costs, estimates to complete and at completion, and variances.

(x) Bar Chart

A Schedule display designed to complement the Network Logic Diagram. A basic Bar Chart is a traditional Gantt chart for the Current Schedule, to which, typically, the Original Duration, Remaining Duration, Early Start Dates, Early Finish Dates and the Total Float have been added. Late Start Dates, Late Finish Dates, Percent Complete, Free Float, Budget Cost, Cost At Completion, etc., may replace some of these activity data fields or they may be added to the Bar Chart display. Comparison Bar Charts compare one or more schedules to the Current Schedule. To show any actual or potential lateness, both Early Date and Late Date bars are displayed. To show slippage from the Baseline schedule, both Current Schedule and Target (Baseline) schedule bars are displayed. To view lateness and slippage on the same output display, Current Early Dates, Current Late Dates and Target Early Dates are all displayed together. Bar Charts are required to be part of each schedule submittal. The content, format and activity data fields displayed shall be at the request of the Region.

(xi) Budget

Project Co's proposed Schedule of Value for all Work, excluding the costs for financing or financial related activities, which will be required to perform an Activity or all Work in its entirety under the Project Agreement. The budget, once approved by the Region, is the contractual obligation on the part of Project Co to perform all of the Work encompassed by the Activity as per the Project Agreement.

(xii) Budgeted Value for Work Accomplished

The value of the Work, in year of expenditure dollars, accomplished up to a particular point in time, in terms of the budget for that item of Work. This may be generated from a breakdown of the costs included in the Cost of Work Form generated by the time incurred in the cost loaded activity. The particular point in time is generally "time now", "today's date", the "status date", the "data date" or some similar reference to the point in time at which the measurement of the Work accomplished is made.

(xiii) Calendar (Work Calendar and Resource Calendar)

An integral part of the data base for developing the Project Schedule, the Calendar incorporates into the data base each of the days during which Work is to be performed by defining the standard number of working days per week, any non-working periods



such as holidays or planned Work restrictions, as well as exceptions to days off such as specific Saturdays or Sundays. The base time unit used in the Calendar shall be one day. One work day generally means 8 (eight) hours of work within a day. There can be more than one Calendar defined and assigned.

(xiv) Cash Flow

The year of expenditure cash flow requirements for the Work over time excluding any financial related costs or charges is termed as the Cash Flow. The time periods are generally years or months. An initial cash flow for the entire Project would show the "Total Fixed Cost" for each time period in accordance with Project Co's Baseline Schedule. Thereafter, Primavera will spread actual costs from the start of the Project up to the "Data Date", and cost to complete from the "Data Date" to the scheduled completion of the Project in accordance with the latest Project Schedule. The cash flow may be viewed in graphical format that shows incremental values as bars and cumulative values as a line graph, or in tabular format at various levels of detail.

(xv) Constraint

A restriction imposed upon the start or finish of an activity, such as to "Start On or After" a specific date or "Finish On or Before" a specific date.

(xvi) Critical Path

The longest path through the network in estimated total elapsed time from the start of the first activity through the completion of the last Activity is the Critical Path. The Critical Path consists of a series of Activities which shall be completed on their scheduled completion dates in order for the Project to be completed on schedule. There may be more than one Critical Path in the schedule. Interim Project Milestones shall dictate Critical Path of activities leading up to an Interim Project Milestone. This Critical Path(s) which drives the activities to an interim milestone completion may or may not be part of the overall Critical Path of the Project.

(xvii) Critical Path Method Precedence format (CPM Precedence format)

The Critical Path Method used most widely in the construction industry is the precedence method. This scheduling method allows for four (4) different types of Relationships between Activities, as opposed to the Arrow Diagramming Method (ADM), which only allows Finish-to-Start relationships.

(xviii) Critical Path Method Schedule (CPM Schedule)

For some time now, the construction industry has embraced the practice and use of critical path method (CPM) scheduling as a project management tool to plan, coordinate and schedule the execution of construction-related projects. Through the identification of discrete work activities required to complete the project or any interim Milestone(s) and the relationship of those activities to one another, CPM scheduling allows for the determination of what activities are critical to completing the project or any interim Milestone(s), those that must be performed on their early start and finish dates to avoid any delay to the project's or any interim Milestone(s) completion. Therefore, non-critical activities have the ability to be delayed in their

start and/or finish by some defined amount of time, commonly referred to as "float," without the risk of delaying the project or any interim Milestone(s).

(xix) Critical Path Symbol

A symbol, pattern and/or color used in Bar Charts and Network Logic Diagrams to indicate which Activities are on the Critical Path.

(xx) Current Project Schedule

The most recent Project Schedule which has been approved by the Region.

(xxi) Duration

The estimated and/or actual length of time required to fully perform a specific Activity. The Duration is expressed in work days or as appropriate. The Original Duration is the original estimate of the total amount of time needed to perform an activity. The Remaining Duration is the latest estimate of the remaining amount of time it will take to complete the activity from the Data Date. Other common terms for "Data Date" are "Status Date" or "Time Now". Remaining Durations shall be used for progressing activities. If at some point in time during the progressing of the Project Schedule the Remaining Duration shall exceed the total Original Duration, the Original Duration shall be updated to be at least equal to the Remaining Duration, upon approval by the Region.

(xxii) Early Finish Date

The earliest date upon which an Activity can be completed in consistent with network logic relationships, constraints and activity durations, is the Early Finish Date.

(xxiii) Early Start Date

The earliest date upon which an Activity can logically begin, is the Early Start Date.

(xxiv) Earned Value (EV)

The portion of the budget allocated to the Work that was actually accomplished. Within Primavera, it is calculated as the percent complete of a CPM network activity times its budget. If the budget is allocated among multiple resources, then the resource percent complete times the resource budget is used. Other terminology for Earned Value includes: Budgeted Value for Work Accomplished, Value of Work Performed and Budgeted Value for Work Performed (BCWP). The calculated Earned Value will be used to verify Progress of the Work.

(xxv) Estimate to Complete (ETC)

An estimate of the remaining number of days, person hours, physical asset units or dollars which will be required to complete an Activity or all Work under the Project Agreement. This estimate is made while such Activity or Work is in progress.

(xxvi) Estimate at Completion (EAC)

An estimate of the total number of days, person hours, physical asset units or dollars which will have been expended at the completion of an Activity or group of Activities or of all Work under the Project Agreement. During performance of the Project, the

Estimate at Completion is equal to the total number of days, person hours, physical asset units or dollars actually expended on such Activity, or group of Activities to date, plus the Estimate to Complete, i.e.,  $EAC = Actuals + ETC$ .

(xxvii) Free Float

The amount of time by which an Activity may be delayed without affecting the start of succeeding Activities is termed as Free Float.

(xxviii) Hammock (currently Primavera terms it as ‘Level of Effort’ activity)

A special activity that spans at least two Activities in a network in order to summarize the total elapsed time encompassed by such activities is known as Hammock (or ‘Level of Effort’ activity as termed by the current version of Primavera).

(xxix) Lag

The offset or delay from an activity to its successor. The lag associated with a Finish-to-Finish Relationship is the interval between the completion of a Predecessor Activity and the completion of a Successor Activity. For example, ten (10) days of positive Lag will cause the Successor Activity to finish ten days after the Predecessor Activity has been completed. Negative Lag (called Lead) will cause the Activities to overlap.

(xxx) Late Finish Date

This is the latest date by which an Activity shall be completed in order not to delay the end date of the Project or an intermediate late date constraint, such as "Finish Not Later Than" constraint date on itself or on one or more succeeding activities.

(xxxi) Late Start Date

Late Start Date is the latest date by which an Activity must begin to allow completion by the Late Finish Date of its successor(s).

(xxxii) Manpower/Resource Loading Chart

Manpower/Resource Loading Chart is typically a histogram that shows manpower requirements, or any other resource requirements, over time. Each time period, e.g., a month, displays the amount of manpower or other resources required in that period for the activities included in the histogram.

(xxxiii) Milestone

A significant point in the performance of the Work is a Milestone. A Milestone has no duration, and can represent either the start or the completion of a portion of the Work. A Milestone may also represent either the beginning or the completion of a task or action being performed by entities others than Project Co. A cost may be assigned to a milestone and used for payment purposes in lieu of assigning a cost to an activity. These milestones are referred to as payment milestones and are most applicable for items such as design submissions, testing activities, and construction work with a short duration or any activity for which it is easier or more efficient to assess progress by its completion rather than as a percent of completion.

(xxxiv) Negative Float or Negative Slack

A negative amount of time between the Early Finish Date and Late Finish Date of an Activity or between the Early Start Date and Late Start Date of the Activity is known as Negative Float or Negative Slack. An Activity with Negative Float or Slack shall be completed ahead of its currently calculated Early Finish Date (or started a head of its currently calculated Early Start Date, as the case may be) if the Work is to be completed on time. Negative Float or Slack conditions indicate the need for corrective and/or preventive action in order to complete the Work on schedule and shall immediately be reported, together with proposed solutions, to the Region in a "Negative Slack Recovery Plan".

(xxxv) Negative Slack or Negative Float Recovery Plan

A plan of action Project Co shall prepare whenever the slack (or float) for any activity in the CPM schedule becomes negative. Negative Slack indicates the Project Schedule cannot be met. The Negative Slack Recovery Plan shall describe the cause of the lateness and the immediate course of action Project Co intends to take in order to meet the required late dates. A Negative Slack Recovery Plan shall be prepared not only when it appears that one of the revenue service dates cannot be achieved, but for any intermediate milestone designated for inclusion by the Region that cannot be met as well.

(xxxvi) Network Diagram (Activity Network Diagram)

A logic diagram which displays each Activity required for the performance of the Project Agreement in the sequence in which it is to be performed, showing all Predecessor and Successor Relationships between Activities and Milestones, and which identifies the Critical Path(s). For purposes of the Project Agreement, an Activity Network Diagram is required with each schedule submittal, and the Activities shall be grouped or "zoned" for ease of viewing. The format may be "Pure Logic", which clearly displays the relationships between all Activities, expressly stating the amount of lag and the relationship type if lag exists, but does not portray time. Alternately, "Time-Scaled Logic" diagrams, which display Activities along a time scale, clearly showing their start and finish dates as in a bar chart, and which display all relationships between Activities, but not necessarily the amount of lag, may be submitted.

(xxxvii) Precedence Diagramming Method (PDM)

PDM is a scheduling method which allows for four (4) different types of Relationships between Activities, as opposed to the Arrow Diagramming Method (ADM), which only allows Finish-to-Start relationships. In PDM, Activities are represented by nodes and the Relationships are represented by lines between nodes.

(xxxviii) Predecessor Activity

Activity which is prerequisite to the start or completion of another Activity, depending upon the type of relationship defined.

(xxxix) Predecessor/Successor Relationship

A relationship between two Activities representing restrictions on the start or completion of subsequent Activity, is known as Predecessor/Successor Relationship.

Relationships do not represent Work and may possess either positive or negative Lag. There are four basic types of Relationships:

- A. Finish to Start
- B. Start to Start
- C. Finish to Finish
- D. Start to Finish.

(xl) Project Schedules

The Proposal Submission Schedule, the Project Co's Baseline Schedule, the 6-Month Works Schedule and the Works Schedule, as applicable.

(xli) Proposal Submission Schedule

The schedule included as part of the Technical Submission to the RFP.

(xlii) Project Co's Baseline Schedule

The Proposal Submission Schedule advanced to meet all the requirements for the Financial Close.

(xliii) Resource ID

Resource ID is a code within the Primavera database which uniquely identifies a resource.

(xliv) Resource Name

The name assigned to each unique Resource ID within the Primavera database.

(xlv) Resource Type

This option within the Primavera database allows to choose the type of resource to one of: 'labour', 'non-labour' or 'material'.

(xlvi) Schedule Calculation Logic

Logic alternatives permitted by the Precedence Diagramming Method (PDM) in performing forward and backward calculations to compute early and late schedule dates, is termed as Schedule Calculation Logic. Key options permitted within the Primavera Project Planner software include: (1) Retained Logic versus Progress Override; (2) Actual Start versus Early Start for Start-to-Start lags; (3) Contiguous Duration versus Interruptible Activity Duration; and, (4) Total Float calculated as Start Float, Finish Float or Most Critical Float. For the purposes of this Project Agreement, the options to be used are: (a) Retained Logic; (b) Early Start for Start-to-Start Lags; (c) Contiguous Durations; and, (d) Most Critical Float.

(xlvii) Schedule Slippage

Slippage is a measure of schedule delay when comparing the current schedule to a Baseline schedule. Slippage is typically measured as a difference in days between the current schedule Early Finish Date and the Baseline schedule Early Finish date. An Activity may "slip" in schedule and still not be "late". Lateness is directly associated with Float or Slack. An Activity is "late" if its calculated Early Dates are later in time

than its calculated Late Dates, thus resulting in Negative Slack. A Tabular Report showing Schedule Slippage shall be included with each schedule submittal, and for any slippage exceeding thirty 30 calendar days, an analysis shall be made and a recovery plan shall be prepared in the Analysis Report.

(xlvi) Successor Activity

Successor Activity is an Activity which cannot be started or completed without the prior completion or partial completion of a Predecessor Activity.

(xlix) Tabular Activity Reports

These reports display Activity data in a tabular format. Their content may include a variety of Activity-related information and they may be sorted by any one or combination of Activity data fields. The following Tabular Activity Reports shall be included with each schedule submittal:

- A. A listing of all Activities in Activity ID sequence, displaying each Activity's ID, Original Duration, Remaining Duration, Percent Complete, Description, Early Dates, Late Dates and Total Float.
- B. All activities on the Critical Path with Float up to thirty (30) days positive, sorted by Float, Early Start Date and Activity ID. The same data fields as in "A.", above, shall be displayed. For any Activities that are "late", i.e. their Total Float is negative, a recovery plan shall be submitted to the Region within seven (7) calendar days after the report submittal.
- C. A Baseline (Target)/Current Project Schedule and Progress Comparison Report, showing all Activities which have slipped from the latest approved Baseline (Target) schedule by more than thirty (30) calendar days. All such Activities or Milestones shall be addressed in an Analysis Report that identifies the cause and the corrective action to be taken. The Comparison Report shall contain the same Activity data fields as noted above, except for the field replacements that Primavera automatically performs. At the request of the Region, the latest approved Baseline Project Schedule shall be replaced by the prior month's Project Schedule for comparison reporting purposes and to indicate trends.
- D. For new Activities or those which have undergone a change in logic, including any change in the lag or lead time of a relationship, a Tabular Activity Listing shall be produced. This listing shall display the "Detailed Predecessor/Successor" information (ID, Relationship type, Lag, Description, schedule dates, etc.). The "Constrained Date" information (date constraints, Float constraints, Milestone designation, etc.) shall also be displayed. This listing shall display a 'remarks/comments' column as to why the change has been effected.

(xli) Total Float

The amount of time by which an Activity or series of Activities may be delayed without affecting the completion date of the Project or an intermediate Late Date constraint.

### 19.7 Schedule Formats, Submittals, Review and Approvals

- (a) Formats of Schedule Submittals: Unless explicitly stated otherwise, all schedule submittals shall be in Bar Chart format, supported by Activity Network Diagram, Tabular Activity Reports, Cash Flows and back-up diskettes. The Activity Network Diagram shall be in either "Time-Scaled Logic" or "Pure Logic" format, as either graphical reports or Primavera "layouts", and be readable so that all logic ties can be distinguished. Graphics enhancement software shall be permitted to increase the readability of the logic diagrams and other graphic output. All copies of the network logic diagrams shall be submitted on sheets 30 inches by 40 inches, unless they adequately fit on smaller size sheets. Where multiple sheets are required for a Activity Network Diagram, each sheet shall have "match lines" via the repetition of "Group Titles" or otherwise, indicating the interfaces between sheets. All bar charts, network logic diagrams and tabular activity reports shall have formats in accordance with those described in this Article 19. Subject to readability of contents and logical links, the minimum acceptable size for the Bar Charts, Tabular Activity Reports, Cash Flows and Resource Graphs shall be 11 inches by 17 inches
- (b) The schedules shall be in sufficient detail to indicate Project Co's ability and plan for accomplishing the Work in the specified period of time and to establish the accomplishment of Work for the purpose of verifying progress of the Work and directly related to the Cost of Work Form. Six (6) copies of the bar charts, one (1) copy of the network logic diagrams, one (1) copy of the tabular activity reports and one (1) copy of Cash Flow, one (1) copy of Resource Graphs shall be included with each schedule submittal. In addition, one or more CD's, as required, containing the Primavera files and layouts in "Backup/ Xer" compressed format shall be submitted with each update of the Project Schedule.
- (c) The 6-Month Works Schedule and the Works Schedule, as the case may be, shall be updated on a monthly basis and submitted with the Works Report. Of particular importance during the Phase 1 Preliminary Engineering program will be findings or otherwise that indicate potential Phase 1 or Phase 2 schedule impacts. Such impacts will be discussed at the bi-weekly Progress Meetings and, based on the direction provided by the Region the 6-Months Works Schedule and the Works Schedule, as the case may be, shall be revised accordingly and submitted with the Works Report.
- (d) The Proposal Submission Schedule, 6-Month Works Schedule and the Works Schedule, as the case may be, shall contain Project Co's proposed plan and schedule to complete all Work as required by the Project Agreement. A Proposal Submission Schedule indicating time(s) for completion other than those required by the Project Agreement will not be deemed to be compliant with the Technical Submission requirements of the RFP.
- (e) The Region and the Project Co will manage the submission and approval of the 6-Month Works Schedule and the Works Schedule in accordance with PA Schedule 10 (Review Procedure).
- (f) Updates of the 6-Month Works Schedule and the Works Schedule, as the case may be, shall be submitted to the Region for approval, and reviewed in accordance with PA Schedule 10 (Review Procedure).

### 19.8 Schedule Updating Requirements

- (a) In accordance with Section 22.5 of the Project Agreement, once each month, or as frequently as deemed necessary by the Region, Project Co shall participate with the Region in reviewing the progress update of the current 6-Month Works Schedule or the Works Schedule, as applicable. The progress meetings shall include Project Co's Representative along with the supporting staff as required, and the Region's Representative along with the supporting staff as required. At least

- five (5) calendar days in advance of such meeting, Project Co shall provide for review by the Region.
- (i) A current schedule Bar Chart at Level 3 detail suitable for updating purposes, showing thirty (30) calendar days of history, three week look ahead, and sixty (60) calendar days of future work. The Bar Chart shall include, at a minimum, the following activity data fields: Activity ID, Original Duration, Remaining Duration, Early/Actual Dates, Late Dates, Free Float. The Activity Title shall be displayed above each bar.
  - (ii) A Network Logic Diagram encompassing the activities/milestones appearing in the above Bar Chart, plus any other activities involved in planned or actual logic revisions. In this regard, logic revisions include, but are not limited to: (1) adding or deleting activities/milestones; (2) adding, modifying or deleting activity relationships; (3) modifying the lag/lead duration on a relationship; (4) changes to the total duration of in-progress or future activities. Any revisions in scope or logic shall be supported by a mark-up by hand of the previous Project Schedule for the affected scope of work
  - (iii) A narrative report which shall include, at a minimum, the following: (1) progress during the period; (2) progress scheduled during the next period, as currently forecasted and as planned in the Baseline schedule; (3) anticipated problems and proposed solutions, particularly those involving lateness or slippage in schedule; (4) discussion of each one of the logic revisions identified above, covering the impact on the schedule; (5) analysis and discussion of alternative methods to mitigate accumulated delays.
  - (iv) Once the progress and logic changes have been reviewed and agreed to by the Region, Project Co shall computerize and formalize the 6-Month Works Schedule or the Works Schedule, as applicable and update report and submit these to the Region for approval in accordance with PA Schedule 10 (Review Procedure). Any revisions to the logic shall be accompanied by a written explanation of these revisions in detail. At the discretion of the Region, Project Co may also be requested to prepare and submit marked-up drawings such as cross-sections, profiles and plan views of the area under analysis.
- (b) The update to the current Project Schedule as described above shall be made in accordance with the Primavera Schedule Calculation Logic, Cost updating and Autocompute Rules approved by the Region. The Project Schedule shall be updated to include completed activities, activities in progress, revised durations of activities, new activities to represent changes in scope, revised logical sequence of activities, the revised Critical Path, extensions of time, if any, etc. The output to be submitted to the Region shall be in the form of schedules and Analysis Reports as identified and described in this Article 19 and shall include at least the following:
- (i) Bar charts at different levels of detail and covering varying periods of time, such as:
    - A. Level 1 summary schedule for the entire project duration.
    - B. Level 1 schedule of construction Work Packages.
    - C. Level 3 detail schedule showing two months of history and six months of future Work.
    - D. Level 3 Comparison Bar Chart showing Current Early Dates, Current Late Dates and Target Early Dates so that lateness and slippage may be viewed on the same output display for two months of history and six months of future Work.



- (ii) Network Logic Diagrams at Level 3 detail encompassing the activities/milestones appearing in the above Level 3 detail schedule Bar Chart. In addition, Network Logic Diagrams for the entire Project or other selected portions of the Project may be specified for inclusion by the Region.
  - (iii) Tabular Activity Reports, as specified in this Article 19, together with appropriate Analysis Reports, such as: (1) recovery plans for negative slack in the critical path and (2) causes and corrective actions for schedule slippage exceeding thirty (30) calendar days from the latest approved Baseline Schedule, based upon the "Baseline (Target) / Current Schedule Comparison Report".
  - (iv) Cash Flows in both graphical and tabular format for: (1) the entire Project; and (2) Each major Line Section, including Projectwide, according to WBS Code 1, position 1.
  - (v) One or more CDs, as required, containing the Primavera files and layouts in "Backup" compressed format.
- (c) Within seven (7) calendar days after receipt by the Region of an updated Project Schedule, Project Co shall meet with the Region for the purpose of reviewing and obtaining its approval.
- (d) The Region may require Project Co to furnish a revised update which shall include any other information needed in evaluating Project Co's progress and future needs, including, but not limited to, the following: manpower loading charts, equipment schedules, multiple shifts or overtime requirements to maintain approved schedules, Estimates to Complete, Estimates at Completion. In the event the Region requests Project Co to revise the updated Project Schedule submittal, and/or to submit such additional information, Project Co shall make the requested revisions and/or submit the updated Project Schedule to the Region for approval along with the additional information requested within seven (7) calendar days of the request.
- (e) Project Co acknowledges and agrees that if an Activity with Free Float, the Project Co owns the first 10 working days and the Region owns the rest of the free float.

## EXHIBIT A

### Preliminary Work Breakdown Structure (WBS) and Cost Accounts Guidelines

### PRELIMINARY WORK BREAKDOWN STRUCTURE (WBS)

The WBS shall be applied to the Pricing Structure and shall be the basis for organizing cost information in the Pricing Forms, with the help of the Cost Accounting codes. It shall also be the basis for the level of detail of network activity definition in the Project Schedules. The following WBS codes (or fields) shall be applied.

#### CODE 1

□□□□□□

#### CODE 2

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#### CODE 3

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### CODE 1 - LOCATION OF WORK

First and Second Character ( \_\_.x.xx) = Line Section or Projectwide

Third Character (xx. \_ .xx) = LRT Stop (S), Line Segment (L) or Projectwide (P)

Fourth and Fifth Character (xx.x. \_ \_ ) = Specific Location/Segment (see listing)

Note: Project Co may modify the Line Segment Location Code to include the linear work such as roadway and track that would occur at the LRT Stop location. However, the location code for each Stop needs to be retained to capture all Stop specific work.

- 01 = Section 1 – Common 1 + A1 (Conestoga Mall to Erb St.)
  - 01.S01 = Conestoga Mall LRT Stop
  - 01.L01 = Double Track Line between Conestoga Mall LRT Stop and Northfield Dr. LRT Stop
  - 01.S02 = Northfield Dr. LRT Stop
  - 01.L02 = Double Track Line between Northfield Dr. LRT Stop and R&T Park LRT Stop
  - 01.S03 = R&T Park LRT Stop
  - 01.L03 = Double Track Line between R&T Park LRT Stop and University of Waterloo LRT Stop
  - 01.S04 = University of Waterloo LRT Stop

- 01.L04 = Double Track Line between University of Waterloo LRT Stop and Waterloo Park LRT Stop
- 01.S05 = Waterloo Park LRT Stop
- 01.L05 = Double Track Line between Waterloo Park LRT Stop and the intersection @ Erb St./Caroline St.
- 02 = Section 2 - Route B1 (Southern Single Track between Erb St. and Allen St.)
  - 02.L06 = Single Track Line between the intersection @ Erb St./Caroline St. and LRT Stop @ Caroline St./Willis Way
  - 02.S06 = LRT Stop @ Caroline St./Willis Way
  - 02.L07 = Single Track Line between the LRT Stop @ Caroline St./Willis Way and the intersection @ King St./Allen St.
- 03 = Section 3 - Route B2 (Northern Single Track between Erb St. and Allen St.)
  - 03.L08 = Single Track Line between the intersection @ Erb St./Caroline St. and Waterloo Spur LRT Stop near King Street N.
  - 03.S07 = Waterloo Spur LRT Stop near King Street N.
  - 03.L09 = Single Track Line between Waterloo Spur LRT Stop near King Street N. and the intersection @ King Street S./Allen St.
- 04 = Section 4 - Route 'Common 2' (King St. between Allen St. and Victoria St.)
  - 04.L10 = Double Track Line between the intersection @ King Street S./Allen St. and LRT Stop near King Street/Allen St.
  - 04.S08 = LRT Stop near King Street/Allen St.
  - 04.L11 = Double Track Line between LRT Stop near King Street/Allen St. and LRT Stop near King Street / Pine St.
  - 04.S09 = Grand River Hospital LRT Stop
  - 04.L12 = Double Track Line between Grand River Hospital LRT Stop and the LRT Stop near King St. W. / Victoria St. South
  - 04.S10 = LRT Stop near King St. W. / Victoria St. South
  - 04.L13 = Double Track Line between LRT Stop near King St. W. / Victoria St. South and the intersection @ King St. W./Victoria St. S
- 05 = Section 5 - Route 'C1' (Northern Single Track from Victoria St. @ King St. to Duke St. to Charles St. @ Benton St.)
  - 05.L14 = Single Track Line between the intersection @ Victoria St./King St and LRT Stop near Duke St. W. /Young St.
  - 05.S11 = LRT Stop near Duke St. W. /Young St.

- 05.L15 = Single Track Line between LRT Stop near Duke St. W. /Young St. and LRT Stop at Frederick St. near King St. E/ Duke St. W
- 05.S12 = LRT Stop at Frederick St. near King St. E/ Duke St. W
- 05.L16 = Single Track Line between LRT Stop at Frederick St. near King St. E/ Duke St. W and the intersection @ Frederick St./Charles St.
- 06 = Section 6 - Route 'C2' (Southern Single Track from Victoria St. @ Charles St. to Benton St.)
  - 06.L17 = Single Track Line between the intersection @ Victoria St./King St. and LRT Stop near Gaukel St.
  - 06.S13 = LRT Stop near Gaukel St.
  - 06.L18 = Single Track Line between LRT Stop near Gaukel St. and LRT Stop near Benton St. /Charles St.
  - 06.S14 = LRT Stop near Benton St. /Charles St.
- 07 = Section 7 - Route 'Common 3' (Charles St. @ Benton St. to Charles St. @ Borden Ave. S.)
  - 07.L19 = Double Track Line between the intersection @ Benton St./Charles St. and Kitchener Market LRT Stop
  - 07.S15 = Kitchener Market LRT Stop
  - 07.L20 = Double Track Line between Kitchener Market LRT Stop and LRT Stop on Charles St/ Borden St.
  - 07.S16 = LRT Stop on Charles St/ Borden St.
  - 07.L21 = Double Track Line between LRT Stop on Charles St/ Borden St. and the intersection @ Charles St./Borden St.
- 08 = Section 8 - Route 'D1' (Southern Single Track from Charles St. to Borden Ave. S. to Huron Park Spur @ Ottawa St.)
  - 08.L22 = Southern Single Track Line between the intersection @ Border Ave./Charles St. and Huron Spur at Ottawa St. crossing
- 09 = Section 9 - Route 'D2' (Northern Single Track from Charles St. @ Borden Ave. S. to Ottawa St. to Huron Park Spur)
  - 09.L23 = Northern Single Track Line between the intersection @ Borden Ave./ Charles St. and Huron Spur at Ottawa St. crossing
- 10 = Section 10 - Route 'D1-2 (Common)' (Huron Park Spur to Fairview Park Mall - End)
  - 10.S17 = Mill St. LRT Stop near Ottawa St.
  - 10.L24 = Double Track Line between Mill St. LRT Stop near Ottawa St. and Courtland Ave. LRT Stop near Community Center (Block Line)
  - 10.S18 = Courtland Ave. LRT Stop near Community Center (Block Line)

- 10.L25 = Double Track Line between Courtland Ave. LRT Stop near Community Center (Block Line) and Fairview Park Mall LRT Stop on Hydro One corridor
- 10.S19 = Fairview Park Mall LRT Stop on Hydro One corridor
- 20 = Projectwide
- 20.P01 = Projectwide (non-site specific, e.g., Vehicles, Overall Project Management)
- 20.P02 = Maintenance Shop Building
- 20.P03 = Maintenance of Way Building
- 20.P04 = Yard Tower Building (if stand-alone)
- 20.P05 = Car Wash Building
- 20.P06 = Central Control Room
- 20.P07 = Storage Yard
- 20.P08 = Transportation Building
- 20.P09 = As required to locate specific work areas  
(shall be expanded as required)

## CODE 2 - WORK CATEGORY

Three characters as follows:

First Character (\_xx) = Summary Work Category

- G = Trackway Structures
- S = LRT Stop Facilities
- B = Other Facilities (OMSF, Car Wash, etc.). (This code shall be applied in conjunction with the Location Codes 20.P02, 20.P03, 20.P04, 20.P05, 20.P06, 20.P07 and 20.P08).
- Z = Infrastructure and Sitework
- U = Utilities
- T = Trackwork and other Trackway Equipment
- P = Power Supply and Distribution
- A = Train Control/ATP
- C = Communications, ITS, SCADA and Security
- V = Vehicles
- M = Project Management by DBFOM
- D = Design

R = Right-of-Way and Other Environmental Cleanup

Second and Third Character (x.\_\_) = Work Category

G = Trackway Structures

G.01 = Demolition

G.02 = Waterproofing

G.03 = Trackway Foundations

G.04 = Trackway Piers and Pier Caps

G.05 = Trackway Superstructures

G.06 = Trackway Structure - Noise Walls

(eg. Noise Walls @ Mill St/ Ottawa St.)

G.07 = Trackway Structure – Walls/ Retaining Structures

(eg.: Retaining Structure @ Grand River Hospital, @ Blockline Rd., @ Fairview Park Mall, Walls @ Kitchener Waterloo Collegiate and Vocational School)

G.08 = Other Trackway Structures (see list below)

G.09 = Trackway Walkways

G.10 = Miscellaneous Trackway Installations

Other Trackway Structures

- Bridge: (eg.: Bridge @ HW85, @ Weber St)
- Flyover: (eg.: Flyover @ Laurel Creek, @ HW7/8,  
@ Schneider Creek, @Montgomery Creek)
- Culvert: (eg.: Culvert @ King St, @ Caroline)
- Grade Separation: (eg.: King St. Grade Separation)
- Vibration Slabs on Alignment

S = LRT Stop Facilities

S.01 = Slabs and Foundations (Trackway and foundations within Stop limits)

S.02 = Other Structures

S.03 = LRT Shelters

S.04 = LRT Wind Screens

S.05 = Fire Protection Systems

S.06 = Plumbing Elements

S.07 = Electrical Elements

S.08 = Signage – Static

- S.09 = Dynamic Signage/VMS
  - S.10 = TVM Validator Work
  - S.11 = Other LRT Stop Furnishings
  - S.12 = LRT Stop Landscape
- B = Other Facilities (OMSF, Car Wash, Driver Relief Bldg. @ Conestoga Mall and @ Fairview mall etc.)
- B.01 = Foundations, Slabs and Aprons (within limits of facility)
  - B.02 = Structures (within limits of facility)
  - B.03 = Exterior Wall Systems
  - B.04 = Interior Wall Systems
  - B.05 = Interior Finishes
  - B.06 = Fire Protection Systems
  - B.07 = Plumbing Elements
  - B.08 = HVAC Elements
  - B.09 = Electrical Elements
  - B.10 = Telephone/Data Elements
  - B.11 = Utility Services – Water
  - B.12 = Utility Services – Sanitary
  - B.13 = Utility Services – Storm
  - B.14 = Utility Services – Comms.
  - B.15 = Utility Services – Waste Recycled Water
  - B.16 = Utility Services – Refuse/Recycled
  - B.17 = Signage – Static and Dynamic
  - B.18 = Standard Shop Equipment
  - B.19 = Special Shop Equipment
  - B.20 = Facility Furnishings and Equipment
  - B.21 = Lockers
  - B.22 = Bathroom Fixtures and Equipment
  - B.23 = UPS Room and Equipment



- B.24 = Fire Protection Alarm Room Equipment
- B.25 = Fuel Supply System (Natural Gas/ Propane, Diesel @ OMSF)
- Z = Infrastructure and Sitework
  - Z.01 = Street and Highway Construction, Relocation or Modifications
  - Z.02 = Parking Lot Facilities
  - Z.03 = Protection or Modification of Existing Facilities and Monitoring
  - Z.04 = Clearing, Demolition, and Miscellaneous Sitework
  - Z.05 = Temporary Facilities for Construction
  - Z.06 = Special Environmental Mitigation
  - Z.07 = Maintenance and Protection of Traffic During Construction
- U = Utilities
  - U.01 = Potable Water Supply Systems
  - U.02 = Storm Water Sewer Systems
  - U.03 = Sanitary Sewer Systems
  - U.04 = Electric Power Supply Systems
  - U.05 = Communications Systems
  - U.06 = Street Lighting Systems
  - U.07 = Traffic Control Systems
  - U.08 = Cable Television Systems
  - U.09 = Communication System
  - U.11 = Gas Supply Systems – Natural Gas
  - U.12 = Gas Supply Systems – Propane
  - U.13 = Fuel Supply Systems
  - U.14 = Fuel Supply System (Natural Gas/ Propane/ Diesel)
  - U.15 = Data/Telephone Systems – Copper
  - U.16 = Data/Telephone Systems – Fiber
  - U.17 = Data/Telephone Systems – Coaxial
  - U.18 = CCTV System (Fiber cabling and CCTV @ Signalized Intersection)
- T = Trackwork and Other Trackway Equipment

- T.01 = Running Rail - Ballasted
- T.02 = Running Rail - Embedded
- T.03 = Special Trackwork (Gauntlet, Turnouts, Switches)
- T.04 = Fixed Buffers
- T.05 = Sliding Bumpers (@ Conestoga Mall, @ Fairview Mall)
- T.06 = Trackwork Appurtenances
- T.07 = Track Heating and Lubrication
- T.08 = Miscellaneous Track Materials
- T.09 = Restraining Rail
- T.10 = De-railers
- P = Power Supply and Distribution System (PDS)
  - P.01 = OCS Poles & Foundations
  - P.02 = Overhead Catenary System
  - P.03 = Traction Power Substations
  - P.04 = Auxiliary Power Supply
  - P.05 = Wayside Traction Power Equipment
  - P.06 = Signal Power Distribution Equipment
  - P.07 = Uninterruptible Power Supplies
  - P.08 = Grounding and Cathodic Protection
  - P.09 = Power Distribution Monitoring and Control Systems(CCF)
  - P.10 = Power Distribution Infrastructure (Duct Banks, Manholes, etc.)
- A = Train Control/ATP
  - A.01 = Vehicle Borne ATP Equipment
  - A.02 = Wayside ATP Equipment
  - A.03 = ATP Monitoring and Control Systems (CCF)
  - A.04 = Other ATP Equipment
  - A.04 = Crossing Warning System
- C = Communications and SCADA
  - C.01 = Communications, ITS and SCADA Systems (CCF)

- C.02 = Public Address Systems
  - C.03 = Intercom Systems
  - C.03 = Telephone Systems
  - C.04 = Radio Communications Systems
  - C.05 = Closed Circuit Television Systems
  - C.06 = Communications Recording Systems
  - C.07 = Communications Transmission Infrastructure (Duct Banks, Manholes, etc.)
  - C.08 = Safety and Security Systems
  - C.09 = Other Monitored Systems
  - C.10 = Data Collection, Analysis and Archiving Systems
  - C.11 = Variable Message Signs – PID (Passenger Information Display)
  - C.12 = Fare Collection Provisions
  - C.13 = Intelligent Transportation System
  - C.14 = Vehicle Onboard Comms. & ITS System
- V = Vehicles
- V.01 = LRT Vehicles - Non-recurring activities (Region Responsibility)
  - V.02 = LRT Vehicles - Recurring activities on a per-vehicle basis (Region Responsibility)
  - V.03 = Non-revenue vehicles (e.g., trucks, cars)
  - V.04 = Maintenance and Way Vehicles
- M = Project Management by DBFOM
- M.01 = Project Management and Administration
  - M.02 = Program Control
  - M.03 = Mobilization/Demobilization of Management and Administration Resources
  - M.04 = Mobilization/Demobilization of Construction Resources(e.g., construction equipment)
  - M.04 = Bonds
  - M.05 = Quality Assurance and Control
  - M.06 = Safety and Security – Construction/ Operation/ Maintenance
  - M.07 = Permits
  - M.08 = Guaranties and Warranties

- M.09 = Insurance
- M.10 = System Integration Testing
- M.11 = System Demonstration and Maintainability Testing
- M.12 = Pre-Revenue Activities
- D = Design
  - D.01 = Facilities Design Management and Administration
  - D.02 = Mobilization of Facilities Design Resources
  - D.03 = Facilities Drawings and Specifications
  - D.04 = Survey and Mapping Updates
  - D.05 = Geotechnical Field Explorations
  - D.06 = Facilities Design Submittals
  - D.07 = Facilities Design Services During Construction
  - D.08 = Civil/Structural Design Management and Administration
  - D.09 = Mobilization of Civil/Structural Design Resources
  - D.10 = Civil/Structural Drawings and Specifications
  - D.11 = Civil/Structural Design Submittals
  - D.12 = Civil/Structural Design Services During Construction
  - D.13 = Systems Design Management and Administration
  - D.14 = Mobilization of Systems Design Resources
  - D.15 = Systems Drawings and Specifications
  - D.16 = Systems Design Submittals
  - D.17 = Systems Design Services During Construction
  - D.18 = Operations and Maintenance Planning
  - D.19 = Operations and Maintenance Management
  - D.20 = Environmental Investigations
  - D.21 = Utility Investigation
  - D.22 = Architectural Investigation
- R = Right-of-Way and Environmental Clean-up Activities
  - R.01 = Construction Staging Areas (site rental or easement)

- R.02 = Property Acquisition Support
- R.03 = Environmental Clean-up Activities

### **CODE 3 - SCHEDULING ACTIONS**

These Scheduling Actions shall be developed by Project Co, as needed, to further define the Project Schedule. The following list is illustrative of the actions that take place during the course of the Contract and for which activities must be included in the Project Schedules.

- o Design Activities
- o Design Review, Comments and Disposition
- o Incorporation of Comments
- o Approvals and Acceptance
- o Permitting
- o Inspections/Surveys/ Monitoring
- o Procurement
- o Manufacturing
- o Delivery of Equipment
- o Construction
- o Installation/Erection
- o Coordination
- o Construction Interface
- o As-built Documentation
- o Integration and Checkout
- o Factory Acceptance Testing
- o Qualification Testing
- o Acceptance Testing
- o Completion of Punch List Items
- o Specific Phase submittal items, as required
- o Warranties/ Guarantees

### **COST ACCOUNTS**

Cost Accounting code shall be applied to the Pricing Structure and shall be the basis for organizing cost information in the Pricing Forms. By applying these codes to the activities of the schedule, this coding structure shall also enable the roll up of the cost to appropriate Cost Accounts for creating tabular reports within the Project Schedules. The following Cost Account codes (or fields) shall be applied. This Cost

Accounts structure shall be further expanded by Project Co by adding more main and/or sub categories and/or by subdividing the existing into sub-sub categories as needed, to further refine the Project Schedule.

The following structure is the basic requirement to be incorporated into the Schedules.

Five characters as follows:

First two characters ( \_ \_ .xx.x) = Main Cost Category

10 = Civil/Trackways

15 = Trackwork

20 = LRT Stops, Terminals, Intermodal

30 = Support Facilities: Yards, Shops, Admin Bldgs.

40 = Utilities

45 = Special Conditions (Structures)

50 = Systems

60 = ROW, Land, Existing Improvements

70 = Vehicles

80 = Management, Construction Management, Administration, Design and Engineering by DBFOM

Third and Fourth Character (xx. \_ \_ .x) = Sub Cost Category

10: Civil/Trackways

10.02 = Trackway: At -grade Semi-exclusive (allows cross-traffic)

10.03 = Trackway: At-grade in Mixed Traffic

10.04 = Trackway: Aerial Structure

10.05 = Trackway: Built up Fill

10.08 = Trackway: Retained Cut or Fill

15: Trackwork

15.51 = Trackwork: Embedded

15.52 = Trackwork: Ballasted

15.53 = Trackwork: Special (switches, turnouts)

15.54 = Trackwork: Vibration and Noise Dampening

20: LRT Stops, Terminals, Intermodal

- 20.01 = At-grade LRT Stop, Shelter, or Terminal Platform
- 20.04 = aBRT Interface
- 20.05 = LRT Stop Area Improvements or Joint Development
- 20.06 = Automobile Parking Multi-story Structure

30: Support Facilities: Yards, Shops, Admin Bldgs.

- 30.01 = OMSF- Operations, Maintenance, and Storage Facility
- 30.03 = Storage or Maintenance of Way Facility
- 30.04 = Car Wash Building
- 30.05 = Traction Power Building if stand alone building
- 30.06 = Miscellaneous Buildings

40: Utilities

- 40.01 = Private Utilities
- 40.02 = Public Utilities

45: Special Conditions (Structures)

- 45.01 = Alignment Environmental Mitigation, Ground Water Treatment
- 45.02 = Environmental Mitigation (eg Wetlands Historical/Archeological, Parks)
- 45.03 = Site Structures including Retaining Walls, Sound Walls
- 45.04 = Third Party Construction (CN Relocation)
- 45.05 = Roads and Parking Lots
- 45.06 = Temporary Facilities
- 45.07 = Alignment Landscaping

50: Systems

- 50.50 = Train Control and Signals
- 50.51 = Traffic Control Signals
- 50.52 = Road and Pedestrian Warning System
- 50.53 = Traction Power Supply: Substations
- 50.54 = Traction Power Distribution: OCS
- 50.55 = Communications
- 50.56 = Fare Collection Systems and Equipment

60: ROW, Land, Existing Improvements

- 60.01 = Purchase or Lease of Real Estate
- 60.02 = Relocation of Existing Households and Businesses

70: Vehicles

- 70.02 = LRT Rail Cars (Region Responsibility)
- 70.08 = Free Issue Equipment Cost
- 70.09 = LRT Maintenance Vehicles
- 70.11 = aBRT Buses and Articulates (Region Responsibility)
- 70.12 = aBRT Maintenance Vehicles (Region Responsibility)
- 70.13 = Non Recurring Cost (Region Responsibility)

80: Project Management, Construction Management, Administration, Design and Engineering by DBFOM

- 80.01 = DBFOM Planning/Preliminary Engineering/Environmental
- 80.02 = DBFOM Data Gathering
- 80.03 = DBFOM Engineering Design for Fixed Facilities
- 80.04 = DBFOM Systems Engineering/Design
- 80.05 = DBFOM Vehicles Design
- 80.06 = DBFOM Project Management including scheduling and administration
- 80.07 = DBFOM Construction Supervision and QC
- 80.08 = DBFOM Design Services During Construction -Fixed Facilities
- 80.09 = DBFOM System's Oversight, Testing and Commissioning
- 80.10 = DBFOM Vehicle Oversight, Testing and Commissioning
- 80.11 = DBFOM Training/Start-up/ Testing

Note: Cost Code 80.11 is reserved for Operations & Maintenance costs including O&M management, staffing up and training for revenue service and all non construction activities prior to commencing Revenue Service.

- 80.12 = Support LRV Acceptance Testing

Note: Cost code 80.12 is reserved for all Project Co costs related to supporting the Region's acceptance testing of the LRVs as per Project Agreement Schedule 35 - Vehicles.

- 80.13 = Other Direct Costs not including the above (excluding financing cost)



- 80.14 = Independent Certifier Cost  
(Cost related to the Independent Certifier)
- 80.15 = Legal Cost including DRB Cost  
(Cost related to Legal including the cost of Dispute Resolution Board)
- 80.16 = Accounting, Tax and Audit Cost  
(Cost related to Accounting, Tax and Audit)

Fifth Character (xx.xx.\_) = Maintenance Category (after acceptance)

The Fifth character has been introduced in order to differentiate between:

- 1: Public Infrastructure Work (PIW): Work elements that Project Co has design, construction, testing and acceptance responsibilities but has no responsibility for ongoing maintenance after PIW is accepted for use by the Authority Having Jurisdiction.
- 2: Work Maintained by Project Co: Work elements that Project Co has full responsibilities, including responsibility for control of all maintenance and up keep.

The value of the ‘fifth’ position can be assigned as either ‘1’ for ‘Public Infrastructure Work (PIW)’ or ‘2’ for ‘Work Maintained by Project Co’, depending on what ‘Maintenance Category’ under which the subject element falls. These Maintenance Category codes shall be used to generate the Sheets 1A and 1B of the ‘COST OF WORK FORM’ required in ‘WLRT RFP Schedule 6 Part 1’.

## ACTIVITY CODES

Activity Codes shall be applied to the schedule for organizing and filtering the schedule activities and information as necessary for managing the schedule. By applying these codes to the activities of the schedule, this coding structure shall also enable the roll up of the appropriate fragments or groups of activities within the Project Schedules. The following Activity codes (or fields) shall be applied. This coding structure shall be further expanded by Project Co, as needed, to further refine the Project Schedule. The basic requirements of Activity Codes are as follows:

Project Co shall create and apply the activity codes for the Line Sections, LRT Stops, Line Segment, Project-wide, Specific Location/Segment, Work Category, etc., the same way as set for the WBS Codes, described above. In addition to these activity codes, Activity Codes shall be expanded further but not limited to incorporate the below noted.

Responsibility: The main party responsible for the activity

Phases: Phase 1, Phase 2 and Phase 3

Milestone Numbers

Construction Work Package Number

.....Other additional codes as appropriate

**GENERAL RULE**

No activity within the schedule shall have empty/blank codes. No codes shall be left blank without the code values/description.

**TOOLS AND TECHNIQUES FOR PROGRESS DATA GATHERING**

Project Co shall develop tools and techniques in the forms of check sheets, tables, weighted tables, etc., for detailed progress data gathering (between disciplines, crafts, subcontractors, or other third parties ) and transform into simplified data/percentages for updating the schedule. These tools and techniques enable the status updates of the schedule less laborious, more accurate and least controversial. These tools and techniques shall, as well keep schedule to an optimum level of detailing. Project Co shall obtain approval from the Region, prior to implementing these tools and techniques.