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SCHEDULE HEALTH CHECK REPORT
PROJECT NAME

Client Name
Month Year

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Document title:

Project reference:

Purpose of issue:

Issue	Description of amendment	Author	Checked	Approved	Date
1					
2					
3					
4					

1 Executive Summary

A summary of key findings, issues, recommendations, etc. across:

- SCHEDULE INTEGRITY
- SCHEDULE STRUCTURE

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HEALTH SCORE CARD – Integrity

	8 – 10	Recommended planning practices and results **have been achieved**. Generally remedial actions will not be suggested in these instances.
	4 - 7	Recommended planning practices and results have been **partially achieved**. Generally remedial actions may be suggested in these instances.
	0 - 3	Recommended planning practices and results have been **not been achieved**. Generally remedial actions will be suggested in these instances.

3.1 Scope, staging, delivery strategy and constructability	**7**
3.2 Work Breakdown Structure (WBS) and activity codes	**10**
3.3 Activity duration estimates & descriptions	**8**
3.4 Contractual requirements	**Not reviewed**
3.5 Project team review and buy-In	**Not reviewed**
3.6 Contingency	**7**
3.7 Baselines, updating and reporting	**Not reviewed**
3.8 Other planning tools and methods	**Not reviewed**
3.9 Multiple schedules and users (for Primavera P6 only)	**Not reviewed**
TOTAL SCORE	**8**

What do the scores mean?

Schedule aspects had a high score and recommended planning and scheduling practices have been appropriately adopted.

Addressing the ***recommendations*** outlined in the report will help to improve this score.

- The schedule covers the entire scope and all stages of work.
- The work breakdown structure defines the scope completely and the project's deliverables have been subdivided into an appropriate level of manageable components.
- Activity durations for works are based on achievable productivity rates. Some of the activity descriptions could be made clearer by providing more detail about work type and location.

- Risks associated with external approvals and utility relocations need to be planned and managed carefully to ensure any delays do not impact the schedule end date.
- Contingency has been included however we recommend increasing the contingency allowance due to a number of key schedule risks such as wet weather, external approvals, and utility relocations.

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HEALTH SCORE CARD – Structure

	8 – 10	Recommended scheduling practices and results **have been achieved**. Generally remedial actions will not be suggested in these instances.
	4 - 7	Recommended scheduling practices and results have been **partially achieved**. Generally remedial actions may be suggested in these instances.
	0 - 3	Recommended scheduling practices and results have been **not been achieved**. Generally remedial actions will be suggested in these instances.

4.1 Activities and Durations	**8**
4.2 Logic	**9**
4.3 Constraints	**10**
4.4 Dates and percent complete	**Not reviewed**
4.5 Float	**10**
4.6 Critical Path Analysis	**7**
4.7 Calendars	**7**
TOTAL SCORE	**8.5**

What do the scores mean?

Schedule aspects had a high score and recommended scheduling practices have been appropriately adopted.

Addressing the ***recommendations*** outlined in the report will help to improve this score.

- Durations are based on realistic productivity rates
- All activities and milestones are logic linked
- There are minimal constraints
- There is no negative float and no excessive positive float

- There are a high number of critical activities and these will need to be managed carefully
- Recommend using a calendar with no RDO's for offsite activities

2 Scope of review

XXXX has been engaged by XXXXXX to perform a schedule health check of the XXXX Schedule for the XXXX Project.

The Schedule that has been reviewed is titled ***'XXXXXXXXX Data Date @ 23 Jun 2020'***. The Primavera XER soft copy was last updated on the 16 May 2020. An updated PDF version was received on the 26 May 2020.

The aim of the schedule health check is to not only assess the schedule against its contractual obligations but also to provide an independent review of the schedule's strengths and weaknesses and to provide any recommendations for areas that may need to be improved to ensure the project is delivered on, or ahead of the contractual Date for Completion.

All of the criteria reviewed as part of the health check fall under two broad categories:

1. SCHEDULE INTEGRITY

The thinking, planning and information gathering involved to develop the project plan and schedule.

2. SCHEDULE STRUCTURE

These are the characteristics of the schedule itself, how it has been developed and how it is being administered within the software tool, in this case Primavera P6.

Each aspect is reviewed and scored with recommended remedial actions provided for any low scoring items. An executive summary of the outcomes of the review is included on Pages XX to XX above.

3 Review Criteria – Schedule Integrity

3.1 SCOPE, STAGING, DELIVERY METHODOLOGY AND CONSTRUCTABILITY

Health Score AMBER 7

Does the schedule include the project's entire scope and deliverables? What reference documentation has been used to plan and schedule the project's scope (e.g. design drawings, technical specifications, scope of works / works brief, cost estimate)? Are all stages of the project covered (e.g. project management, external interfaces and approvals, design and design reviews/approvals, procurement of sub-contractors and long lead time materials and equipment, off site fabrication, construction, testing, commissioning and handover etc.)? Is the staging and sequencing of work in the schedule realistic and credible for the type of work being performed? How have unusual or unique aspects of the project environment been incorporated into the schedule (e.g. restricted operating environment, working hours and site access?)

Review and Results

The schedule includes both summary and detailed activities for the following stages of work:

- Preliminaries
- Procurement
- Management Plans
- Site Establishment
- Site Investigation
- Construction Packages 1 to 3
- Testing and Commissioning (Connections 1 to 5)
- Abandonment Works

The following Preliminaries are also included:

- Community Liaison
- Stakeholder engagement and management
- Mobilisation
- Pre-construction works
- Service relocations (Telstra and Gas services in Athol Street)

The Procurement includes of pipe work procured by the Client and the contractor's procurement of subcontractors. The schedule consists of 3 construction work packages and 19 stages distributed within these work packages.

Work Package 1:

This work package includes all excavation, installation of bedding, pipeline, backfill and any road and kerb reinstatement work along XXXX Street through XXXX Street. Construction works commence with this package.

- Stage 1 – XXXX Rd Bridge along XXXX Ave
- Stage 2 – XXXX Rd Bridge (Including scaffold and installation of temporary bike path)
- Stage 3 – XXXX Street along XXXX Ave
- Stage 4 – XXXX Street between XXXX Ave and XXXX St
- Stage 5 – XXXX Street intersection
- Stage 6 – XXXX Street between XXXX St and XXXX Rd

- Stage 7 – XXXX Rd Intersection
- Stage 8 – XXXX Street between XXXX Rd and XXXX Rd
- Stage 9 – XXXX Road Crossing
- Stage 10 – XXXX Park
- SEW works at XXXX Rd

Work Package 2:

This work package includes all excavation, installation of bedding, pipeline, backfill and any road and kerb reinstatement work along XXXX Street through XXXX Street. This package is independent of Package 1 and could start immediately after completion of XXXX Street investigation works. Stage 13 starts after the shutdown of Main Connection 4.

- Stage 11 – XXXX Street to XXXX Street
- Stage 12 – XXXX Street to XXXX Rd
- Stage 13 – XXXX Rd between XXXX St and XXXX St
- Stage 14 – XXXX Street to XXXX Rd
- Stage 15 – XXXX Rd Crossing
- Stage 16 – XXXX Street between XXXX Rd and XXXX St
- Stage 17 – XXXX St intersection

Work Package 3:

This work package includes all excavation, installation of bedding, pipeline, backfill and any road and kerb reinstatement work along XXXX Street through XXXX Street. This package is independent of the other packages, however it has been linked to Stage 12 based on discussions with the subcontractors aimed at sequencing work in an achievable manner.

- Stage 18 - XXXX Street
- Stage 19 - XXXX Street

Construction works are followed by Testing and Commissioning of 5 separate Connection packages. The scope of work in the schedule includes all of the scope items within the project cost estimate. The schedule does not include Design activities, however it has been confirmed by the Contractor that the design is completed and they will include some milestones in the next updated schedule to reflect this. The Construction Environmental Management Plan (CEMP) is required for the project and the development of this is in progress. The Client is responsible for approval of the CEMP which needs to happen prior to construction works commencing.

In our opinion the detailed logic, sequencing and staging has been thought through carefully.

Recommendations

- External engagement and approvals with key stakeholders is a key risk item to the commencement of construction works. We recommend that these activities are planned and managed carefully to ensure any delays have minimal impact on the progress of the works packages. The Contractor is aware of this risk and explained that they will provide more detail for this section of the schedule in future revisions to ensure high priority approvals for the initial stages of work are identified and scheduled as separate activities and milestones, linked to their works activities.
- Another key risk is the engagement of key utility providers for the relocation / protection of existing utilities (e.g. internet and gas service). As these works are under the control of external parties we recommend securing agreements and committed timeframes for carrying out these works as early as possible to reduce the risk of delays to works progress. The Contractor have included activities in the schedule for these works and they need to be a key focus of schedule status updates going forward so that any slippage is identified and mitigated before it becomes a problem.

3.2 WORK BREAKDOWN STRUCTURE (WBS) AND ACTIVITY CODES

Health Score GREEN 10

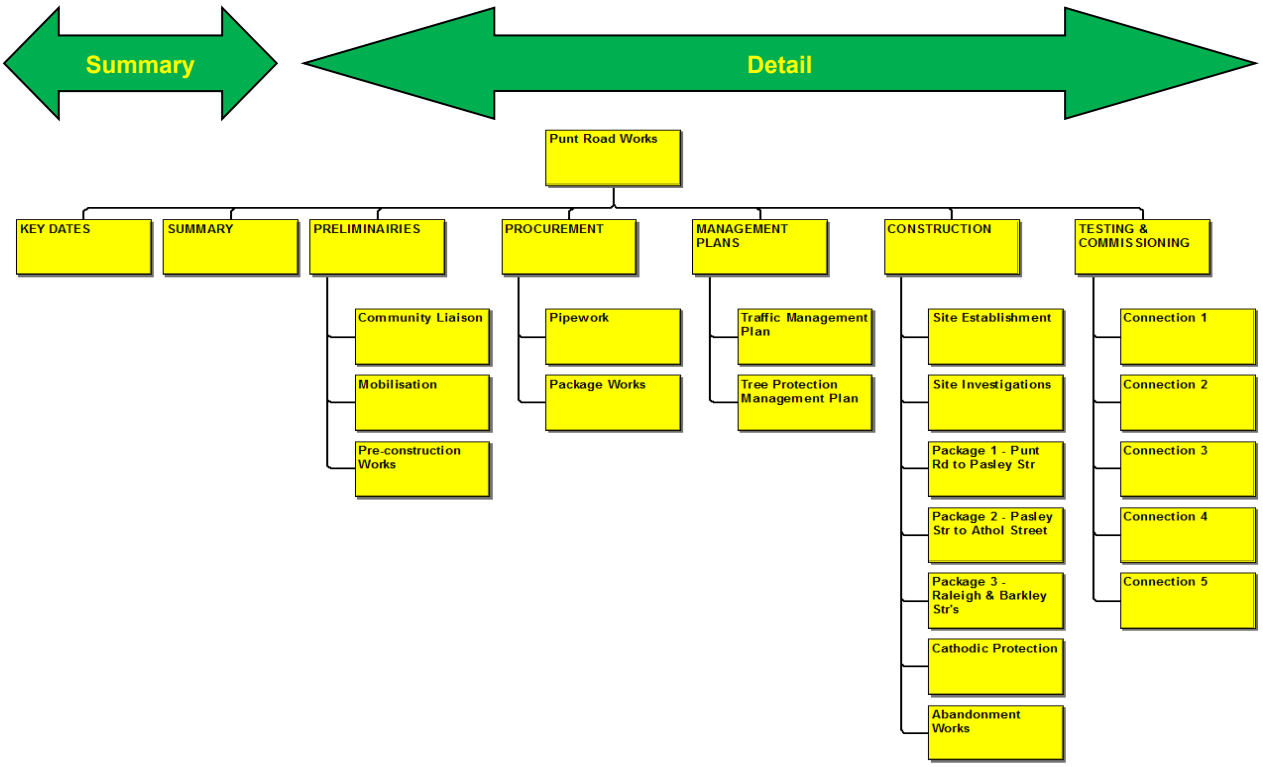
Is the entire project scope and its deliverables captured within an appropriate Work Breakdown Structure (WBS)?

Have other coding systems (such as Activity Codes) been established so that the Schedule can be filtered and viewed in different ways (e.g. by Area / Trade / Discipline etc.)?

Is the Schedule's WBS aligned with other project coding systems (e.g. cost estimate, payment schedule, financial reporting system, works brief etc.)? This is particularly important if earned value management is a project controls requirement.

Review and Results

The snapshot below shows a summary of the Schedule's WBS.



In our opinion the WBS is well structured, makes sense and captures all of the key stages and deliverables for the project.

There are no activity codes assigned to activities.

Recommendations

- No recommendations.

3.3 ACTIVITY DURATION ESTIMATES & DESCRIPTIONS

Health Score GREEN 8

How have activity durations been calculated (e.g. measured quantities, team/crew sizes and productivity rates, benchmark data, experience and subject matter experts, supplier's quotes, 'plug' estimates)? Have any productivity rates, crew sizes, duration assumptions been documented? Are the activity durations used in the project realistic and achievable? Are the activity durations used in the project realistic and achievable? Do the activity descriptions contain subjects, verbs and area descriptions so that the activity can be easily identified? For example 'Install structural steel level 2 to 3' is easier to understand than 'SS L2/3'. Are there examples of dissimilar or unconnected works in one single activity? For example 'Pour Concrete Level 2 Slab' complies, however 'Pour Concrete Level 2 Slab and Lay Pavers Ground Floor' does not because it contains two unconnected works.

Review and Results

We note the following 'all in' productivity rates have been utilised in the Schedule for the construction works:

Item	Location	Rate
Trench excavation, bedding, pipe laying, backfill	Roads with high amount of expected underground utilities & heavy traffic (e.g. XXXX Rd)	6 m / day
	Intersections and roads with medium amount of expected underground utilities & medium traffic (e.g. XXXX St)	12 m / day
	Intersections and roads with small amount of expected underground utilities & low traffic (e.g. XXXX St Intersection)	18 m / day
	XXXX Park	30 m / day

Typical benchmark productivity rates for these sorts of works would be as follows:

- Trench excavation (in OTR) = 10 m3 / hr = 80 m3 / day / crew = **30 m / day / crew** (based on 1.5m wide x 2.5m deep trench)
- Bedding & pipe laying = **15 m / day / crew** (750 dia.) to **35 m / day / crew** (375 dia.)
- Backfill = 15 m3 / hr = 120 m3 / day / crew = **35 m / day / crew**

When estimating an all in rate generally the bedding and pipe laying rate would govern as this tends to be the slowest however this is highly dependent on the amount of underground services and traffic conditions. Our opinion is that based on these typical benchmarks the productivity rates used in the Schedule are realistic and achievable.

8 weeks has been allowed for engagement and approvals with key stakeholders from mobilisation of management team to commencement of works on site. As discussed in Section 3.1 above this is a key risk and needs to be managed carefully. Subcontractors have been already pre-selected and therefore the duration allowed for procurement of these subcontractors is for assessment and award of the contracts only. These packages have been sequenced based on their construction works order in the Schedule. Most of the activity descriptions contain subjects and verbs and are easy to understand however some descriptions do not provide a clear understanding of the work. For example testing and commission activities descriptions do not include the location of each connection.

There are no examples of dissimilar or unconnected works in one single activity.

Recommendations

- We recommend reviewing and amending some of the activity descriptions so that the type of work and location are clear and easy to understand.

3.4 CONTRACT REQUIREMENTS

Health Score Not Reviewed

How are the Contract requirements met by the Schedule and the processes around it?

These may include:

- Contractual Date/s For Completion
- Interim Contractual Date/s
- Access dates
- Separable Portions
- Specific coding, e.g. activity coding.
- Resource loaded schedule
- Payment milestones
- Time reporting requirements (e.g. Monthly Reports)
- Key Performance Indicators and pain share / gain share criteria (for Alliances)
- Clauses and conditions related to Notices of Delay, Extensions of Time and Liquidated Damages
- Schedule format, structure and software requirements

Review and Results

Not reviewed as a copy of the Contract was not provided.

Recommendations

- Not Reviewed.

3.5 PROJECT TEAM REVIEW & BUY-IN

Health Score Not Reviewed

- Was the schedule reviewed by the relevant members of the project team as it was being developed?
- Does the schedule have buy in and shared ownership from the people responsible for delivering the project?
- Is the schedule reviewed by the project team regularly for changes and updates as the project is progressing?
- Schedule change control process, including review and approval

Review and Results

Not reviewed.

Recommendations

- Not Reviewed.

3.6 CONTINGENCY

Health Score AMBER 7

Has contingency been included for delays such as inclement weather, industrial action, contractor underperformance and other delays?

How has contingency been included? Contingency can be built into the Schedule's calendars, built into the durations of a number of activities, or included as a discrete activity at the end of the Schedule, or portion of the Schedule.

Has a more considered estimate of contingency been developed using a quantitative risk assessment to estimate a range of likely Schedule duration and completion dates? Are the inherent and contingent risks used in this assessment aligned with the project's risk register?

Review and Results

A total of four weeks contingency has been included in the Schedule to allow for wet weather and other delay allowances.

The duration of construction activities in the Schedule is 231 days; therefore the 20 day contingency is equal to 9% of overall construction duration.

We normally recommend the percentages below for a high level estimate of contingency:

- Approx. 16% - 20% of net schedule duration for external works when the project is exposed to wet weather delays
- Approx. 8% - 12% of net schedule duration for all other works (e.g. design, procurement, internal works)

Recommendations

- As well as wet weather there are a few other key schedule risks which have been discussed in previous sections such as external approvals with key stakeholders, relocation and protection of existing utilities, and potential limitations on staging of works and work hours due to local traffic and residential constraints. Based on these risks we recommend increasing the overall contingency allowance to approx. 16% of net schedule duration (i.e. 35 to 40 days).
- A regular schedule risk analysis, no later than quarterly, is recommended to assess and monitor the remaining schedule contingency allowance against its desired confidence level.
- Additional scenario analysis is recommended to assess the required contingency allowance for different delivery strategies.

Health Score Not Reviewed

- Has a Baseline Schedule been agreed and approved with the relevant members of the project team?
- Is periodic progress being measured against the agreed baseline?
- Are periodic baselines being recorded and measured against to provide performance measurements from one period to the next?
- Has a documented process for updating and reporting Schedule progress been established? How are the project team members involved in the updating process?
- How is key information from Schedule updates communicated back to the project team and other Stakeholders? Is there a summary document used to extract and present the key dates and information from the Schedule in a way that is clear and easy to understand for the rest of the project team?

Review and Results

Not reviewed as this is a Tender Schedule which has not yet been baselined.

Recommendations

- Not Reviewed.

4 Review Criteria – Schedule Structure

4.1 ACTIVITIES AND DURATIONS

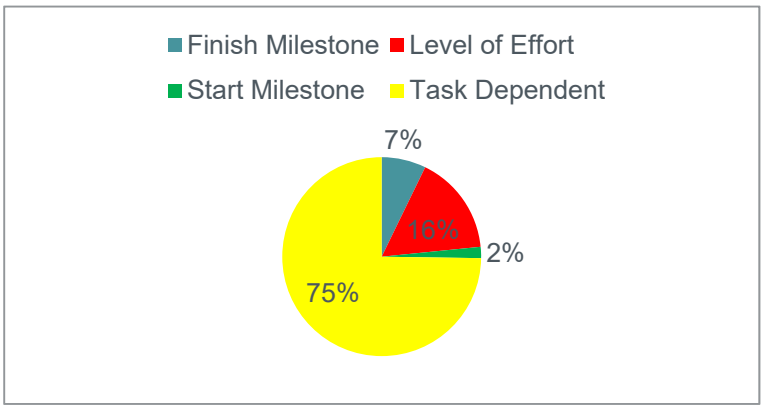
Health Score GREEN 8

4.1.1 Number of activities

Are there an adequate number of activities to describe the type of project? Are there too many activities? Schedules with too many activities can become difficult to manage, update and report against. Are there too few activities? Schedules with too few activities might not be detailed enough to estimate the project's deliverables accurately and will make it difficult to define credible critical paths and accurate values of float.

Review and Results

Item	No.	% of Total
Total Number of Activities & Milestones	111	
Number of Start Milestones	2	2%
Number of Finish Milestones	8	7%
Number of Level of Effort Activities	18	16%
Number of Task Dependant Activities	83	75%



In our opinion the tender stage schedule contains an appropriate number of activities and is at an appropriate level of detail.

Recommendations

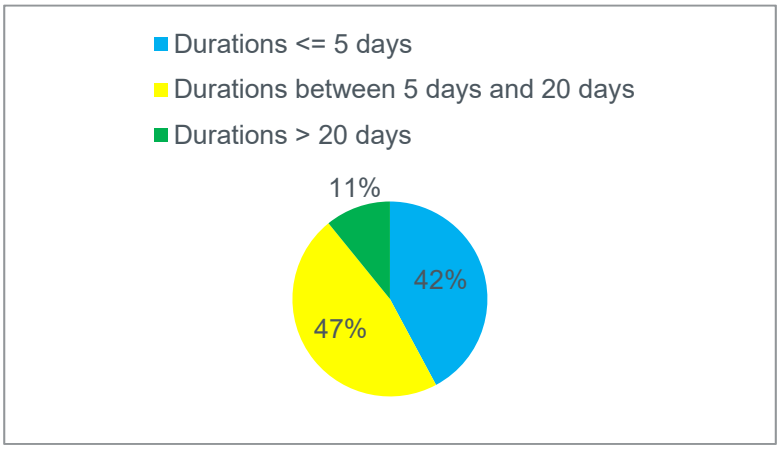
- No recommendations.

4.1.2 Activity Durations

The recommendation is for the majority of activity durations to be less than 3 to 4 weeks (or one reporting period) as a general rule of thumb. This enables greater control over activities, and helps to ensure that any slippages and delays are identified early.

Review and Results

Item	No.	% of Total
Number of Incomplete Activities (Milestone and Summary activities exclusive)	83	
Number of Incomplete Activities with Durations <= 5 days	35	42%
Number of Incomplete Activities with Durations between 5 days and 20 days	39	47%
Number of Incomplete Activities with Durations > 20 days	9	11%



The majority of activities are less than or equal to four weeks duration which indicates that the Schedule has been developed at appropriate level of detail.

11% of activities have durations greater than 4 weeks. Most of these activities are for tender periods and procurement of long lead time items and equipment which is appropriate.

Recommendations

- No recommendations.

4.1.3 Number of Milestones and Activity Type

How many milestones are in the Schedule? The recommendation is for there to be a sufficient number of milestones over the life of the project to capture the key project deliverables and to allow for progress to be measured against these milestones. Approximate ratio of milestones to normal activities should be 1:20.

Does the Schedule contain summary activities and key milestones for reporting to Management?

How many activities are Task Dependent? The recommendation is for activity types to be predominantly Task Dependent (for Primavera P6 only).

Review and Results

Activity Type	No.	% of Total
Number of Incomplete Activities & Milestones	111	
Finish Milestone	8	7%

Start Milestone	2	2%
Level of Effort	18	16%
Task Dependent	83	75%
Resource Dependent	0	-
WBS Summary	0	-

The ratio of milestones to activities is 1:10 (9%) and other than summary activities all other activities are 'Task Dependant' which is consistent with best practice. The Schedule contains level of efforts bars and key milestones at the top of the Schedule to track variances and report to management which is also recommended practice.

Recommendations

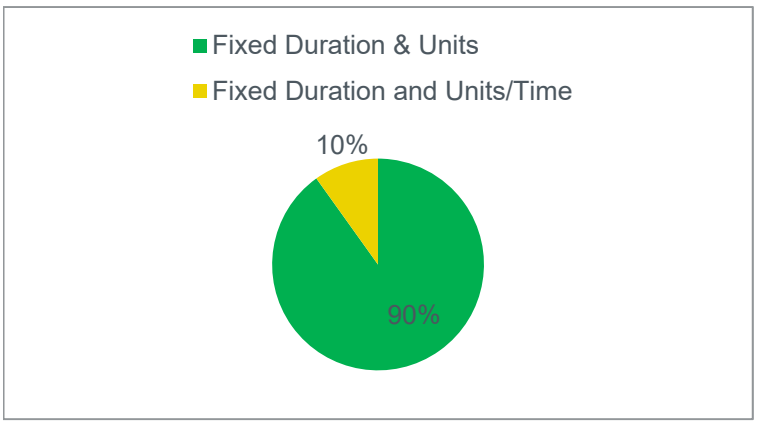
- No recommendations.

4.1.4 Duration Type (for Primavera P6 only)

The recommendation is for duration types to be predominantly Fixed Duration & Units or Fixed Duration & Units/Time unless driven by resources. If activity durations are driven by resources this needs to be understood and managed carefully.

Review and Results

Duration Type	No.	% of Total
Number of Incomplete Activities & Milestones	111	
Fixed Duration & Units	100	90
Fixed Duration & Units/Time	11	10
Fixed Units	0	-
Fixed Units/Time	0	-



All of activities are Fixed Duration type which is consistent with best practice.

Recommendations

- No recommendations.

4.1.5 % Complete Types

Are the % complete types consistent with the type of work being done? The recommendation is to use Physical % Complete for works that can be physically measured as they progress (such as construction works) and Duration % Complete for works that are harder to measure in terms of physical progress (such as reviews and approvals).

Review and Results

Item	No.
Number of Activities with Duration % Complete	111
Number of Activities with Physical % Complete	0

Recommendations

- We recommend changing the % complete to Physical % Complete for all construction and installation activities in the Schedule. When updating Schedule progress both Remaining Duration and Physical % Complete should be estimated and recorded as both sets of data have their own merit and purpose and are not necessarily directly related. For example a 10 day activity may be 50% complete in terms of physical progress and still have more than 5 days remaining duration if it has taken longer than planned to complete.

Health Score GREEN 9

4.2.1 Missing predecessors and successors

If an activity is missing a predecessor then the start of the activity will default to the data date unless it is held by a constraint. The recommendation is for the only activity without predecessors to be the Schedule's first activity or milestone.

If an activity is missing a successor then the late finish of the activity will default to the latest date of the project and the activity will exhibit a large total float. The recommendation is for the only activity without successors to be the Schedule's last activity or milestone.

Review and Results

Item	No.	% of Total
Number of Incomplete Activities & Milestones	111	
Number of Incomplete Activities with no Predecessors	1	<1%
Number of Incomplete Activities with no Successors	3	2%
Number of Critical Activities with no Predecessors	0	
Number of Critical Activities with no Successors	1 This is project completion milestone	

The schedule contains activities missing predecessors. Two of the activities missing successors are Level of Effort activities with Finish to Finish relationships added as Predecessors rather than Successors which is OK.

Recommendations

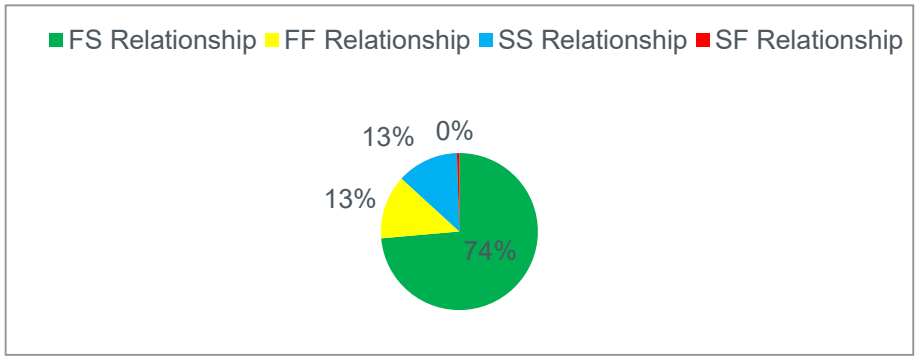
- No recommendations.

4.2.2 Relationship types

The recommendation is for the majority of relationship types to be Finish to Start. Finish to Finish and Start to Start relationships between task dependent activities (not milestones) should be used sparingly and in most Schedules the expectation would be for more than 80% to 90% of relationships between task dependent activities to be Finish to Start. The recommendation is for Start to finish relationships to not be used at all.

Review and Results

Item	No.	% of Total
Number of Relationships for Incomplete Activities & Milestones	197	
Finish to Start Relationship	145	74%
Finish to Finish Relationship	26	13%
Start to Start Relationship	25	13%
Start to Finish Relationship	1	<1%



The majority of relationship types are Finish to Start which is consistent with best practice. Most Start to Start and Finish to Finish relationships are for summary activities (Level of Effort) which is OK. There is one SF relationship in the Schedule to link project duration summary activity to the start of the project.

Recommendations

- We recommend changing the project kick-off milestone (contract award) to a Start Milestone.

4.2.3 Number of relationships

An excessive number of relationships can make a Schedule overly complex and difficult to manage and interpret. As a general rule of thumb the number of relationships should be between 2 and 2.5 times the total number of activities. Less than two indicates some logic will be missing, and greater than four indicates the Schedule is too complex.

Review and Results

Item	No.
Number of Incomplete Activities & Milestones	111
Number of Relationships for Incomplete Activities & Milestones	197
Proportion of Relationships to Activities & Milestones	1.7

The number of relationships for incomplete activities and milestones is 1.7 times the total number of activities which is consistent with best practice.

Recommendations

- No recommendations.

4.2.4 Activities with lots of relationships (High Risk)

Activities with a high number of predecessors and successors can turn into Schedule bottlenecks which cause delays in the Schedule.

Review and Results

Item	No.	% of Total
Number of Incomplete Activities & Milestones with less than 10 days float (critical	86	

and near critical)		
Number of Incomplete Activities & Milestones with 3 or more Predecessors **or** 3 or more Successors and less than 10 days float (critical and near critical)	29	
Number of Incomplete Activities & Milestones with 3 or more Predecessors and 3 or more Successors and less than 10 days float (critical and near critical)	4	5%

Less than 5% of critical and near critical activities have a high number of predecessors and successors.

Recommendations

- No recommendations.

4.2.5 Relationships to other schedules

The recommendation is to have no relationships with other Schedules as this introduces complexity and may result in scheduling errors if not managed carefully.

Review and Results

Item	No.
Number of relationships to other Schedules	0

Recommendations

- No recommendations.

4.2.6 Lags and Leads

The recommendation is for lags to be used sparingly as they introduce complexity and 'hidden' logic to the Schedule that can be easily overlooked. They can also lead to scheduling errors when multiple calendars are used. The recommendation is to replace lags with activities where possible.

Review and Results

Item	No.	% of Total
Number of Relationships for Incomplete Activities & Milestones	197	
Number of Relationships with Negative Lag (Leads)	0	-
Maximum Negative Lag	-	-
Number of Relationships with Positive Lag	1	0.5 %
Maximum Positive Lag	5 days	
Number of Relationships with Negative & Positive Lag	0	-

The schedule contains a minor number of lags which is consistent with best practice.

Recommendations

- No recommendations.

4.3 CONSTRAINTS

Health Score GREEN 10

Excessive constraints can introduce complexity and may result in unexpected scheduling results (such as negative float) and an incorrect critical path.

The recommendation is for constraints to be used sparingly and kept to a minimum with constraints assigned to no more than 5% of activities as a rule of thumb.

Hard constraints (such as Mandatory constraints) should not be used in most cases. These will hold constrained activities in place, regardless of any logic, and this can result in incorrect float and date calculations.

Review and Results

Item	No.	% of Total	Notes
Number of Incomplete Activities & Milestones	111		
Mandatory Finish Constraints	1		
Mandatory Start Constraints	0		
Project - Must Finish By Date	0		
As Late as Possible Constraints	0		
Finish On Constraints	0		
Finish On or After Constraints	0		
Finish On or Before Constraints	1	<1%	Project start Milestone
Start On Constraints	0		
Start On or After Constraints	1		
Start On or Before Constraints	0		
Project – Anticipated Start Date	-		
Project – Anticipated Finish Date	-		
TOTAL CONSTRAINTS	**3**	**2.7%**	

The Schedule contains a low number of constraints, and only one hard constraint which is consistent with best practice. The Mandatory Finish constraint has been assigned to the 'Contract Award' Milestone which drives the project commencement date.

Recommendations

- No recommendations.

4.4 DATES AND PERCENT COMPLETE

Health Score Not Reviewed

4.4.1 Forecast Dates same as Data Date

How many activities have a forecast start date that is the same as the project data date (status date)? A large proportion of these indicate that these activities might be getting delayed.

Review and Results

Item	No.
Number of Activities with Forecast Start Dates = Data Date	

Not reviewed as Schedule has not been agreed or updated yet.

Recommendations

- Not reviewed as Schedule has not been agreed or updated yet.

4.4.2 Actual Dates ahead of Data Date

How many activities have actual (completed) start or finish dates ahead of the project data date (status date)? This is a result of improper scheduling and can result in inaccurate schedules with incorrect end dates.

Review and Results

Item	No.
Data Date = 23 Jan 2014	
Number of Activities with Actual Start Dates > Data Date	
Number of Activities with Actual Finish Dates > Data Date	

Not reviewed as Schedule has not been agreed or updated yet.

Recommendations

- Not reviewed as Schedule has not been agreed or updated yet.

4.4.3 Forecast Dates behind Data Date

How many activities have forecast start or finish dates behind the project data date (status date)? This is a result of improper scheduling and can result in inaccurate schedules with incorrect end dates.

Review and Results

Item	No.
Number of Activities with Forecast Start Dates < Data Date	
Number of Activities with Forecast Finish Dates < Data Date	

Not reviewed as Schedule has not been agreed or updated yet.

Recommendations

- Not reviewed as Schedule has not been agreed or updated yet.

4.4.4 Out of Sequence Activities

Out of sequence activities arise when work is performed on an activity before it is logically scheduled to occur; e.g. before its predecessor(s) is completed. The recommendation is to have no out of sequence activities.

Review and Results

Item	No.
Number of Out of Sequence Activities	

Not reviewed as Schedule has not been agreed or updated yet.

Recommendations

- Not reviewed as Schedule has not been agreed or updated yet.

4.4.5 % Complete Types

Are the % complete types consistent with the type of work being done? The recommendation is to use Physical % Complete for works that can be physically measured as they progress (such as construction works) and Duration % Complete for works that are harder to measure in terms of physical progress (such as reviews and approvals).

Review and Results

Not reviewed as Schedule has not been agreed or updated yet.

Recommendations

- Not reviewed as Schedule has not been agreed or updated yet.

4.4.6 Baseline Comparison

How many activities are forecast to start before the baseline start date? This indicates the amount of schedule acceleration that has occurred.

How many activities are forecast to start after the baseline start date? This indicates the amount of schedule slippage / delay that has occurred.

Review and Results

Item	No.
Number of Activities with Forecast Start Dates < Baseline Start Dates	
Number of Activities with Forecast Start Dates > Baseline Start Dates	
Number of Activities with Forecast Start Dates = Baseline Start Dates	

Not reviewed as Schedule has not been agreed or updated yet.

Recommendations

- Not reviewed as Schedule has not been agreed or updated yet.

4.4.7 Baseline Execution Index (BEI)

The BEI measures the number of activities completed as a ratio to those activities that should have been completed according to the baseline Schedule. It indicates the pace of execution for the Schedule and provides an early warning on increased risk to completing the project on time.

Review and Results

BEI Value	Indicates
> 1.00	the Schedule on average is being accomplished faster that the Baseline rate
= 1.00	the Schedule on average is performing to the Baseline rate
< 1.00	the Schedule on average is being accomplished slower that the Baseline

Item	No.
Number of Activities Actually Completed	
Number of Activities Planned to be Completed (according to Baseline Schedule)	
BEI	

Not reviewed as Schedule has not been agreed or updated yet.

Recommendations

- Not reviewed as Schedule has not been agreed or updated yet.

4.5 FLOAT

Health Score GREEN 10

4.5.1 Negative Total Float

Negative total float in a Schedule can place risk on achieving the completion date(s) as the critical path can be difficult to determine in this situation, especially if the negative float is a result of scheduling errors in the software. The recommendation is to remove any negative total float that exists in the Schedule as a result of scheduling errors (i.e. when it is unintended).

Review and Results

Item	No.	% of Total
Number of Incomplete Activities & Milestones	111	
Number of Activities with negative Total Float	0	0%

Recommendations

- No recommendations

4.5.2 Excessive Positive Total Float

Are there activities with excessive positive total float? Excessive positive total float may indicate a need to review the activity's successors or an opportunity to optimize the Schedule by moving additional work into a path that has high positive float.

Review and Results

Item	No.	% of Total
Number of Incomplete Activities & Milestones	111	
Number of Activities with Total Float > 30 days and < 60 days	7	6%
Number of Activities with Total Float > 60 days	2	<2%

A low number of activities have a large amount of positive float. All the activities are logically linked which indicates the high float is due to the early nature of the work.

Recommendations

- No recommendations

4.6 CRITICAL PATH

Health Score AMBER 7

4.6.1 Critical Path is clearly defined, makes sense and is understood

The critical path can be defined as:

'The sequence of activities that determine the earliest possible completion date for the project, or a phase of the project' - ISO 21500 Guide to Project Management.

Is there a clearly defined critical path from the start of the project to the project end date?

Are there parallel critical paths?

Does the critical path make sense?

Is the critical path well understood by the project team?

Review and Results

The Schedule contains a clear an identifiable critical path as summarised below:

- Contract Award - 27 Jun 2014
- Develop Community Management Plan
- External Stakeholder Engagement
- Procurement of MSCLDN750 Pipe (MW)
- Package 1 Construction – pipe works stage 1 to stage 10
- Testing and commissioning of connection 1 to connection 3
- Shutdown main connection 4 (Abandon XXXX Rd Section)
- Stage 13 pipe work (Construction Package 2)
- Testing and commissioning of connection 4
- Abandonment works
- Grouting
- Project completion

Based on our understanding of the project scope and stages of work involved the Schedule's critical path makes sense and following discussions with The Contractor the critical path activities are well understood by the Project Team.

4.6.2 Number of Critical and Near Critical Activities

How many activities are on the critical and near critical path with the potential to become critical? A higher percentage of critical path activities can place greater risk on achieving the end date(s).

Review and Results

Item	No.	% of Total
Number of Incomplete Activities & Milestones	151	
Number of Critical Activities	72	48%
Number of near Critical Activities (less than 10 days float)	19	13%

A high number of activities are critical (approx 48%) and near critical (approx 61%).

In our discussions with The Contractor they explained that they are aware of the high number of critical activities which they are using as a tool to focus the Project Team's efforts on progressing these critical activities as a high priority.

Recommendations

- We recommend reviewing some of the critical path activities and introducing some float to these where feasible.
- We also recommend managing and monitoring the critical and near critical activities carefully as the project progresses to ensure any slippage is identified and the underlying causes mitigated as early as possible. Regularly measuring physical progress to update schedule status is recommended. It is also helpful to use simple and clear visual progress monitoring tools which can be easily understood by all who are responsible for the delivery of the works.
- We recommend summarising key information from Schedule in an easy to understand table that captures variances between forecast and baseline dates, reasons for variance, mitigation actions for dates that have or might be delayed, as well as a summary of key schedule risks, opportunities and issues.

4.6.3 Critical Path Test

The integrity of the critical path is tested by introducing a delay to a number of random activities on the critical path. If the project completion date is not delayed by the same amount then this indicates that there is broken logic somewhere in the network.

Review and Results

Item	Delay	Original Date	Impacted Project Completion Date
Forecast Project completion date - 16 Oct 2025			
"Contract Award" Milestone	2 weeks	27 Jul 2019	29 Oct 2025
The Client Procurement of MSCLDN750 Pipe	20 days	11 Sep 2019	18 Nov 2025
Hydro-test, Clean and Disinfection Section To XXXX Road	10 days	27 Mar 2020	20 Dec 2025

The above analysis illustrates that any delay introduced to randomly selected activities on the critical path is consistently delaying the project completion date.

Recommendations

- No recommendations

4.6.4 Schedule Options (for Primavera P6 only)

Primavera's Schedule Options will determine how the Schedule is scheduled and will affect how Schedule logic behaves and how the critical path is calculated. If more than one user is accessing the same project it is very important that both users choose the same Schedule Options.

Review and Results

The Schedule schedule options adopted by the Schedule are as shown below:

Setting Description	Setting	Comment
Ignore relationships to and from other projects	**No**	Should be **'No'** in most cases
Make open-ended activities critical	**No**	Should be **'No'** in most cases
Use Expected Finish Dates	**No**	Should be **'No'** in most cases
Schedule automatically when a change affects dates	**No**	Can be either **'Yes'** or **'No'**
Level resources during scheduling	**No**	Should be **'No'** in most cases
Recalculate assignment costs after scheduling	**No**	Should be **'No'** in most cases
When scheduling progressed activities use:	**Retained Logic**	Should be **'Retained Logic'**
Calculate start-to-start lag from	**Early Start**	Should be **'Early Start'**
Define critical activities as:	**0h**	Should be **Total Float less than or equal to '0 h'** in most cases
Calculate float based on finish date of	**Each Project**	Should be **'Each Project'** in most cases
Compute Total Float As	**Finish Float**	Should be **'Finish Float'** in most cases
Calendar for scheduling Relationship Lag	**Predecessor**	Can be either **'Predecessor Activity Calendar'** or **'Successor Activity Calendar'** The choice will affect Total Float calculations so lags should be assigned with care
(Advanced) Calculate multiple float paths	**No**	Should be **'No'** in most cases

Recommendations

- No recommendations

4.7 CALENDARS

Health Score AMBER 7

Multiple calendars with different hours of work are often not handled well by scheduling software and can produce unexpected scheduling results (such as negative float). They also add complexity to a Schedule and make updating and reporting progress time consuming and prone to error. The recommendation is to use a single schedule calendar whenever possible.

What are the details of each calendar used in the Schedule (e.g. working days per week, working hours per day, non-work periods)?

If more than one calendar is used, do the different calendars use different working hours per day (e.g. 8 hour day & 10 hour day)?

Review and Results

The Schedule contains one calendar as shown in the snapshots on the following pages.

The calendar is based on a 5 day week (Mon-Fri) 8 hours per day, and has been assigned to all activities including Procurement, Management and Construction.

There are nonworking days in the calendar in addition to weekends and Victorian public holidays for rostered day offs (RDOs). Generally RDOs are not applicable to non construction activities.

Recommendations

- We recommend assigning a standard 5 day week calendar with no RDOs to all non-construction activities (i.e. Management plans and Procurement.)
- We also recommend expanding the construction calendar beyond the project completion date, to ensure any additions to the planned or actual project duration are calculated accurately.