Long International's Schedule and Delay Analysis Methodologies

Richard J. Long, P.E., Andrew Avalon, P.E., P.S.P. and Ronald J. Rider, M.B.A.

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Schedule and Delay Analysis Methodologies

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1. INTRODUCTION

The equitable allocation of responsibility for project delays is essential to the resolution of many construction disputes. Contractors frequently assert that they have been delayed for reasons beyond their control. Owners often remain unconvinced that the Contractor is legitimately entitled to a time extension or delay, acceleration and loss of productivity damages. Large dollar amounts may hinge upon the outcome of a dispute over project delay. Consequently, a thorough retrospective schedule analysis of all project delays is essential for the equitable resolution of delay and impact-related construction disputes.

Most construction contracts allow the Owner to recover either liquidated or actual damages for delay caused by the Contractor. Contractors also may be contractually entitled to recover: 1) extended field and home office overhead costs because of Owner-caused delays, 2) acceleration and disruption costs if the Owner fails to approve valid time extension requests, and 3) loss of productivity costs if delays caused by changes in scope, events beyond the Contractor's control, or the Owner's interference disrupt and negatively impact the Contractor's planned sequence and efficiency of performing its work. However, the Contractor's actions as well as the actions of its subcontractors, vendors, and suppliers may also cause delay, disruption, and impact to the Contractor's planned performance. Therefore, a retrospective schedule analysis must evaluate the contractual obligations and rights of each party.

The retrospective schedule analyses performed by Long International typically focus on comparing as-planned, updated and as-built project schedules to identify and quantify delays to the critical and near critical paths of the project. These delays may include either variances in the duration of an activity or variances in the planned and actual relationship lag durations between predecessor and successor activities. Concurrent delays are also analyzed to properly understand the Owner's and Contractor's liability for delay and impact damages. Once all critical and near critical path activity delays have been quantified, the origins and causes of each delay are determined. This process often involves the organization and analysis of extensive project documentation to establish the cause-effect relationships of each party's actions or inactions and the resulting delays. The responsibility for each delay is then apportioned to either the Contractor, Owner, a third party, if appropriate, and to force majeure or other excusable delays defined by the contract.

Long International frequently performs "Update Impacted" and "As-Built But-For" schedule analyses using a windows approach to evaluate the contemporaneous, cumulative impact of delays caused by each party on the contractual completion dates. These two schedule analysis techniques determine the impact of delays during various schedule windows of time. The project schedule windows are typically based upon the data dates of the Contractor's monthly schedule updates when the critical path may have changed due to key project events. The cumulative results of the analysis of delays to all schedule windows serve as the basis for an equitable apportionment of responsibility for delay and impact damages to the project participants.

In the sections that follow, Long International explains its detailed schedule analysis methodology using a construction delay claim on a hypothetical waste water treatment plant project. The fictitious parties in this example include the Owner, Olympia Chemical Corporation and the Contractor, Milestone Construction.

As shown in Figure 1, the Olympia Waste Water Treatment Plant (WWTP) project was planned to be completed in 502 calendar days. The actual duration, however, was 677 calendar days. Therefore, the net actual delay was 175 days. An update impacted and as-built but-for schedule analysis was performed to allocate responsibility for the 175 days of delay.

The update impacted analysis adds excusable delays into the schedule update to determine the cumulative impact of excusable delays to the project completion date. The update impacted analysis determines the amount of time extension that the Contractor is entitled to claim and the amount of liquidated damages that the owner is entitled to assess. For the Olympia WWTP project, the update impacted analysis determined that Milestone Construction is entitled to receive a time extension of 74 calendar days and Olympia Chemical Corporation is entitled to assess 101 calendar days of liquidated damages.

The as-built but-for analysis subtracts compensable delays from the as-built schedule for each schedule window to determine the earliest date that the Contractor could finish its work absent compensable delays. The cumulative amount of compensable delay calculated for all schedule windows using the as-built but-for analysis represents the total amount of delay for which the Contractor is entitled to recover extended field and home office overhead costs. For the Olympia WWTP project, the as-built but-for analysis determined that Milestone Construction is entitled to receive compensation for 27 calendar days of extended overhead costs.

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2. UPDATE IMPACTED ANALYSIS

Long International's Update Impacted schedule analysis, as illustrated by Figure 2, adds excusable delays to affected activities in the Contractor's schedule update at the start of each schedule window to determine how much time extension the Contractor is entitled to receive as a result of the excusable delays that occurred during the schedule window. Excusable delays may include compensable delays caused by the Owner such as change orders, late delivery of Owner-furnished equipment, or delayed approvals, or noncompensable delays such as strikes, unusually severe weather, or governmental actions for which the Contractor may also be contractually entitled to a time extension, depending on the contractual terms or case law.

For example, during each monthly update or schedule window, the Contractor may have experienced approved scope changes. New activities may have been added to the schedule updates to account for the new work associated with the approved changes, or the Contractor may have increased the duration of existing activities to show the effect of the increased work scope. The delays to each activity affected by the changed work are typically quantified by making estimates of the additional time required to perform the changed work or by including any time extension agreed in the approved change order into the critical path leading to project completion. A comparison of the actual activity durations and relationship lag durations that occurred in the as-built schedule at the end of the schedule window to the forecasted activity durations and relationship lag durations at the beginning of the schedule window may also be used to quantify the delay. However, Contractor-caused delays included in the activity durations or relationship lag durations of the as-built schedule updates are not included in the time extension calculation.

Changes that occurred during a schedule window may also affect existing activities beyond the data date of the schedule window. For example, if a change order is approved during the engineering phase that will add additional work to the construction of a piping system in a later schedule window, the increased duration is added to the affected future construction activity as part of the analysis of the earlier schedule window when the change was approved. By adding the excusable delays to affected schedule activities of the as-planned schedule as they occur, Long International determines the amount of time extension that would be required as a result of the delays. Acceleration paid for by the Owner may reduce activity durations or relationship lag durations and the Contractor's entitlement to a time extension. As a result, the effect of any owner-paid acceleration is also evaluated in Long International's schedule analysis.

The sum of the delay results that are calculated in each schedule window represents the overall time extension for the project. The projected extension in the schedule completion date compared to the contractually required completion date represents the amount of time extension that the Contractor is entitled to receive. For example, the update impacted analysis for the

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Olympia WWTP project determined that Milestone Construction is entitled to 1 calendar day of excusable delay in Window 1, 39 calendar days of excusable delay in Window 2, 27 calendar days of excusable delay in Window 3 and 7 calendar days of excusable delay in Window 4 for a total of 74 calendar days.

A comparison of the update impacted schedule completion dates to the as-built schedule actual completion dates, as shown by Figure 2, determines: 1) the amount of Contractor-caused delay in the as-built schedule that is subject to liquidated damages if the as-built completion date is later than the update impacted completion date, or 2) the amount of acceleration that the Contractor has accomplished if the as-built completion date is earlier than the update impacted completion date.

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3. AS-BUILT BUT-FOR ANALYSIS

Long International's As-Built But-For schedule analysis, as shown by Figure 3, determines the earliest date that the required project completion or Final Acceptance milestone(s) could be achieved if the compensable delays did not occur. Unlike analysis of delays to the critical path of the Contractor's schedule update at the beginning of a schedule window, Long International's As-Built But-For schedule analysis quantifies delay responsibility to activities on the actual critical path of the project that is calculated at the end of each schedule window. Because the actual critical path in each schedule window may be different than the planned critical path at the start of each schedule window, as illustrated by Figure 4, Long International's As-Built But-For schedule analysis focuses on responsibility for delays that affected the dynamic nature of the actual critical path of the project. For example, at the beginning of Window 3 on the Olympia WWTP project, the as-planned critical path ran through piping procurement and installation. By the end of Window 3, however, fabrication and delivery delays caused the anaerobic pump installation to become the as-built critical path.

Long International quantifies the cumulative effect of compensable delays on the project completion date by first removing compensable delays caused by the Owner from the activity durations and relationship lag durations in the as-built calculation schedule[1] for each schedule window and then recalculating the calculation schedule absent compensable delays. If the as-built calculation schedule completion date collapses to an earlier completion date after the Owner-caused compensable delays are removed, the net duration of the schedule collapse is the amount of compensable delay days for which the Owner may be liable for the Contractor's extended field overhead and home office overhead costs. If the calculation schedule does not collapse, the Owner-caused delays that were removed were either: 1) not on the critical path, or 2) concurrent with Contractor-caused delays or other excusable but noncompensable delays that were also on the as-built critical path or parallel critical path(s) and prevented the completion date from collapsing to an earlier date. The net overall compensable delay at the end of the project is determined by adding the number of compensable delay days derived from the as-built but-for calculations in each schedule window. For example, the as-built but-for analysis for the Olympia WWTP project determined that Milestone Construction is entitled to 3 calendar days of compensable delay in Window 1, 20 calendar days of compensable delay in Window 2, 4 calendar days of compensable delay in Window 3, and zero calendar days of compensable delay in Window 4 for a total of 27 calendar days of compensable delay.

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[1] An as-built calculation schedule has the identical as-built start and completion dates for all activities as the as-built statused schedule. However, these as-built calculation schedule dates are driven by the as-built activity durations and as-built logic rather than the fixed actual start and finish dates that were entered into the scheduling software. The as-built schedule only shows float on activities that have not yet been completed beyond the schedule window. The as-built calculation schedule, however, also calculates the as-built float on the as-built activities that occurred during the schedule window. In this manner, the delay on the as-built critical path can be determined rather than basing delay on the as-planned critical path.

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4. DETAILED PROCEDURE

Long International's detailed schedule analysis procedure includes the following steps:

- Identification of Schedule Windows
- Correction of the Schedules and Verification of Actual Dates
- Development of a Reasonable As-Planned Schedule for the Start of Each Schedule Window
- Development of As-Built Calculation Schedules for Each Schedule Window
- Preparation of Duration and Lag Variance Tables
- Identification of Delays and Allocation of Delay Responsibility
- Schedule Calculations to Determine Delay Liability

A more-detailed discussion of each of these steps is explained in the following sections.

4.1 IDENTIFICATION OF SCHEDULE WINDOWS

For both the Update Impacted and the As-Built But-For schedule analyses, Long International analyzes delays to the Contractor's work during specific schedule "windows" of time. This windows approach enables Long International to assess the dynamic as-built critical path throughout the project as the Contractor's work was performed and affected by delays. Although performed retrospectively, the analyses evaluate the effect of delays as they occurred and cumulatively over the entire period of the project. Typically, Long International starts with the Contractor's original planned schedule and schedule updates to establish the as-planned and as-built schedules during each schedule window. Using either each monthly schedule update or combining several consecutive updates to define a schedule window, Long International establishes the specific window periods for its analysis based on the data dates of the schedule updates and the timing of key events during the project that may have caused changes to the critical path.

4.2 CORRECTION OF THE SCHEDULES

Based on its review of the Contractor's schedules, Long International identifies any deficiencies or errors that, if not corrected, would substantially affect the accuracy of the delay analysis results. For example, the Contractor's schedule updates may contain inaccurate or inconsistent actual dates. Long International validates the actual dates in the Contractor's schedules against dates recorded in contemporaneous project documentation such as engineering drawing logs, purchase orders, material receiving reports, daily construction reports, test reports, punch lists, meeting minutes and monthly progress reports in order to verify the accuracy of the schedule activity actual dates. This step ensures that the as-built schedules accurately reflect the actual start and finish dates for completed work activities and properly forecast the critical path for the remaining work scope.

Common schedule deficiencies that Long International examines and corrects include the following:

- Incorrect and inconsistent use of as-built dates;
- Activity planned durations that are inconsistent with the Contractor's bid estimate calculations;
- Missing contractual scope of work;
- Lack of contractually required completion activities;
- Over use of constraint dates;
- Missing predecessor or successor logic ties creating open-end activities;
- Inadequate depiction of equipment and materials procurement and delivery activities;
- Inaccurate predecessor logic for Owner approval activities;
- Lack of a contractual Owner approval period for submittal and turnover packages;
- Lack of reasonable project punch list and demobilization periods;
- Inconsistent use of Calendars, Progress Override and Retained Logic schedule calculation options; and
- Unrealistic as-built logic relationships indicating out-of-sequence progress.

After the above schedule deficiencies or errors are corrected, the Contractor's as-planned and/or as-built critical path may be different than the Contractor or Owner thought during the project. Therefore, conclusions regarding the effect of and responsibility for delays may be different if the schedule deficiencies or errors were not corrected.

4.3 DEVELOPMENT OF A REASONABLE SCHEDULE UPDATE FOR THE START OF EACH SCHEDULE WINDOW

To perform the update impacted schedule analysis, Long International first ensures that the schedule updates at the start of each schedule window are reasonable, i.e., the schedule deficiencies identified above have been corrected. Long International then uses the scheduling software to recalculate the corrected schedules to determine: 1) the reasonable baseline schedule at the start of the project prior to any scope changes or delays, and 2) reasonable schedule updates that not only identify consistent and accurate as-built dates for activities that have started and finished prior to the schedule data date but also correctly forecast the planned start and finish dates of remaining schedule activities at the start of each successive schedule window. These schedule updates represent the as-planned schedules for the start of each successive schedule window. Figure 5 graphically depicts the forecast critical path at the start of Window No. 3 of the Olympia WWTP project schedule analysis. In this example, the critical path to achieving Final Acceptance by November 7, 2002 is being driven by the delivery of piping materials.

Liquidated damages may apply to not only the project completion date but also to intermediate milestone activities. Using the reasonable as-planned schedule at the start of the project and the forecast schedule updates for the start of each successive schedule window, Long International sorts and organizes the activity data by float value and/or longest path to identify the driving paths for each contractually required milestone date and the overall critical path leading to the project completion date.

4.4 DEVELOPMENT OF AS-BUILT CALCULATION SCHEDULES FOR EACH SCHEDULE WINDOW

To perform the as-built but-for schedule analysis, Long International prepares an as-built calculation schedule for each schedule window. The as-built schedule window can be defined as the period of time between the data dates of two or more successive schedule updates. The as-planned schedule update with its data date at the beginning of the schedule window contains forecast start and finish dates during the schedule window period. The as-built schedule update with its data date at the end of the schedule window contains actual start and finish dates during the schedule window period.

Forecast start and finish dates and float values in a CPM schedule are driven by the schedule logic and the original or remaining durations of the schedule activities. When actual dates are used to update a schedule for work that has started and/or finished during the as-built schedule window, the actual dates override the schedule logic to fix the as-built dates of the activities. Therefore, there is no float assigned to activities having actual finish dates in a statused schedule. Therefore, the as-built critical path cannot be readily identified with only the statused schedule containing fixed, as-built dates.

The as-built calculation schedule converts the fixed as-built schedule dates into calculated early start and early finish dates based on actual activity durations and as-built logic. The as-built calculation schedule forecast dates are the same as the as-built schedule dates but are calculated by the scheduling software using as-built schedule logic and actual activity durations instead of using the fixed actual dates input to the schedule. For example, as shown in Table 1, the as-built calculation schedule forecast dates are the same as the as-built schedule actual dates for

Window No. 3. This process enables Long to determine the actual float values and actual critical and near critical paths during the as-built period of the schedule. Identification of delays to the as-built critical path is vital to determine the actual causes of the delay to the project.

The as-built start and finish dates often show that the work was performed out-of-sequence compared to the as-planned schedule logic. For example, the Contractor may have planned to install pipe after all pipe spools were prefabricated and delivered. The planned relationship was a finish-to-start tie between the completion of the delivery of all prefabricated pipe and the start of the pipe installation activity. In the as-built schedule, however, the project data may show that the Contractor started to install pipe 5 days after the first shipment of prefabricated pipe was delivered and that pipe continued to be delivered for another 30 days. The actual relationship between the pipe delivery and installation activities, therefore, was a start-to-start relationship. If the actual sequence of work indicates that a different logical relationship between the activities is warranted, Long International adjusts the schedule logic to represent the as-built conditions. The derivation of the as-built logic during the schedule window may reveal that the as-built critical path at the end of the schedule window was different from the as-planned critical path at the start of the schedule window. In all cases, Long International evaluates the reasonableness of the as-built critical path to ensure that minor, non-critical activities are not depicted as as-built critical activities without good reason.

Figure 6 graphically depicts the simulated as-built critical path for Window No. 3 of the Olympia WWTP project schedule analysis. In this example, the critical path to achieving Final Acceptance by December 23, 2002 is being driven by the fabrication of the pump for the anaerobic reactor tank. Absent the 22 calendar day pump fabrication delay caused by a change order, Milestone Construction would have achieved Final Acceptance only four calendar days earlier because near critical piping erection work was also delayed by late piping material deliveries.

4.5 PREPARATION OF DURATION AND LAG VARIANCE TABLES

The as-built calculation schedules are then compared to Long International's corrected as-planned schedule updates to create Duration and Lag Variance tables for each schedule window, as shown by Tables 2 and 3 for Window No. 3 for the Olympia WWTP project schedule analysis. The Lag and Duration Variance Tables enable Long International to quantify the actual delay that occurred for each activity duration and relationship in each schedule window.

4.6 IDENTIFICATION OF DELAYS AND ALLOCATION OF DELAY RESPONSIBILITY

Using contemporaneous project documentation, Long International then identifies delays to the as-planned and as-built critical and near critical paths of each schedule window based on an analysis of changes, impacts and other delaying events that occurred during the schedule window. Typical causes of delays may include but are not limited to the following issues:

- Approved project change orders
- Changes in the Owner's quality assurance requirements
- Changes in the planned means and methods of construction
- Contractor-caused delays and improper management of work (inefficiency)
- Customs clearance delays
- Defective and deficient design
- Defective construction
- Delay in the answer of requests for information or field questions
- Differing site conditions
- Disruption or interference by other contractors under the direction of the Owner
- Government approval delays
- Inadequate or unskilled workers
- Late approval of job tests
- Late delivery of equipment and materials
- Late issuance of Notice to Proceed
- Late Owner approval of the Contractor's Turnover Packages
- Late Owner responses to the Contractor's submittals and drawings
- Poor subcontractor performance
- Site access and limited work space problems
- Strikes
- Variations in estimated quantities
- Weather impacts

In order to quantify the amount of delay that these issues may have caused to the start and finish of the schedule activities, Long International performs detailed reviews of the Project Record to determine: 1) the timing of the delay-causing events and actions or inactions of the Parties, 2) work that may have been affected by the delays, and 3) responsibility for the events or actions/inactions and resulting delays within the terms and conditions of the contract and the risks assumed by the parties. After identifying and quantifying the project delays, Long International can correlate delay issues to the appropriate schedule activities as shown by

Figure 7. For example, a memo from Milestone Construction discussing the late delivery of pumps (Bates no. M30217) can be correlated to the planned and actual pump delivery dates.

Long International then allocates responsibility for delays to critical and near critical activities during each schedule window in the Duration and Lag Variance Tables. This integrated process enables Long International to link not only the causes of delays to specific activities, but also to identify the appropriate timing of each delay. For example, a change in scope may cause delay to a construction activity in Window No. 3. However, if a noncompensable delay to that same activity also occurred in a prior schedule window before the change occurred, the earlier delay may not be related to the later change in scope. This delay and date variance data then enables Long International to assign reasons and responsibility for delays to each schedule activity and quantify the number of days associated with each cause of delay. Long International also evaluates the dependency of activity duration and lag relationship delays. For example, an activity may appear to have incurred a Contractor-caused delay but the extended duration may actually be the result of the Contractor pacing its work because it was aware that the scheduled completion of other work now had float because of an Owner-caused delay. For example, the Contractor may not complete certain equipment foundation concrete pours as planned because it learned that the Owner had incurred equipment procurement delivery delays and the installation of the equipment foundations was no longer critical.

4.7 SCHEDULE CALCULATIONS TO DETERMINE DELAY LIABILITY

To calculate the Contractor's entitlement to a time extension, Long International adds all excusable delays that occur in each schedule window to the as-planned schedule update at the start of the schedule window. These schedules are then recalculated and new projected activity start and finish dates are determined. The update impacted schedule calculation result for Window No. 3 of the Olympia WWTP project is shown by Figure 8. The cumulative result of the update impacted schedule calculations for all schedule windows is shown by Figure 2. The results of this analysis show that Milestone Construction is entitled to 74 calendar days of time extension to the project completion date.

In Figure 2, the overall update impacted schedule completion date is compared to the as-built schedule completion date. Because the as-built completion date was later than the update impacted schedule completion date, this comparison shows that Milestone Construction did not accelerate its work and may not be entitled to recover certain of its acceleration costs. Also, Milestone Construction may be liable for 101 calendar days of liquidated damages because it did not finish its work by the update impacted completion date.

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To calculate the Contractor's entitlement to extended field and home office overhead damages, activity durations and relationship ties in the as-built calculation schedules for each schedule window are reduced by the duration of compensable delays that occurred in each schedule window. The calculation schedules are then recalculated and a new project completion date is determined but-for compensable delays. The as-built but-for schedule calculation result for Window No. 3 of the Olympia WWTP project is shown by Figure 9. The 22-calendar day fabrication delay to activity W2042 in the as-built calculation schedule (see Figure 6) was removed, which caused the as-built but-for critical path to be driven by the WWTP piping delivery activity. The cumulative result of the as-built but-for schedule calculations for all schedule windows is shown by Figure 3. The results of this analysis show that Milestone Construction may be entitled to 27 calendar days of compensable field and home office delay damages.

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5. SUMMARY

The update impacted and as-built schedule analyses performed by Long International provide a supportable analytical basis for credible opinions related to the following:

- The validity and accuracy of the Contractor's contemporaneous schedules used during the project. The use of inaccurate schedules to determine delay responsibility and liability produces unreliable and incorrect results and opinions.
- The reasonable as-planned critical path of the project both at the beginning of the project as well as at the start of each window analysis period.
- The actual critical path of the project schedule and the dynamic nature of the actual critical path for each window analysis period.
- The timing of changes to the planned and actual critical path of the project.
- The responsibility for delays to both activity durations and relationship lags in each window analysis period.
- An assessment of excusable compensable, excusable noncompensable, and inexcusable delays.
- The relationship between the timing of delay events and changes to the planned start and finish dates and durations of the schedule activities. This cause-effect analysis demonstrates that the delays alleged by the project documentation actually affected critical path activities.
- The responsibility for out-of-sequence work performed by the Contractor.
- The potential overstatement of schedule progress in the Contractor's periodic progress reports.
- The effect of concurrent delays on near critical activities.
- The cumulative impact of multiple change orders and delays.
- The Contractor's entitlement to a time extension for excusable delays.
- The Owner's entitlement to liquidated damages.
- The Contractor's entitlement to acceleration costs and the timing of when the acceleration occurred.
- The Contractor's entitlement to extended field and home office overhead damages.
- The Contractor's entitlement to disruption and loss of productivity costs associated with craft labor disciplines.

6. ALTERNATIVE SCHEDULE ANALYSIS METHODOLOGIES

When appropriate, Long International may employ other schedule analysis methodologies than the update impacted and as-built but-for analyses. The selection of the most appropriate schedule analysis methodology depends on the relevant contract conditions, the governing case law, the quality of the available project records, the accuracy and completeness of the project schedules, the nature of the impacting events, the time available to perform the analysis, the amount of the claim value in dispute, and other factors.

For example, it may be appropriate to perform a "time impact analysis" in each schedule window where Contractor and Owner-caused delays, as well as excusable noncompensable delays, are added one at a time as they occur. Responsibility for projected delay is then assessed and accumulated throughout the life of the project. This procedure may be particularly relevant in situations where the Contractor owns the float. In such cases, a delay caused by the Owner may create float that absorbs a subsequent Contractor-caused delay. A determination may then be made that the Contractor's concurrent delay was not dominant and the Contractor is entitled to compensation for the Owner-caused delay. Conversely, in certain jurisdictions, the Contractor may not be entitled to a time extension or compensation for concurrent Owner delays if a determination is made that the Contractor's delays were dominant and the Owner's concurrent delays were dependent upon the Contractor's delay.

Another methodology may add, as a separate set of calculations, only Contractor-caused delays and Contractor-initiated acceleration to the updated schedule in each schedule window to calculate the projected delay caused by the Contractor. The result of this analysis may then be compared to the result of the update impacted analysis with Owner-caused and excusable delays and owner-paid acceleration to apportion acceleration costs.

When time and budget permit, the combined use of multiple schedule analysis methodologies may strengthen the accuracy and reliability of the analysis.

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Long International, Inc. (www.long-intl.com) is a Colorado-based construction claims and project management consulting company which provides expert analysis and testimony for all forums of construction disputes, including mediation, arbitration and litigation, both in the U.S. and internationally. Long International focuses its practice on owners, engineering and construction firms, and contractors in the petroleum refining, petrochemical, power/cogeneration, mining and mineral processing, industrial and other process industries worldwide.

***Richard J. Long, P.E.**, is Founder and CEO of Long International, Inc. Mr. Long has over 40 years of U.S. and international engineering, construction, and management consulting experience involving construction contract disputes analysis and resolution, arbitration and litigation support and expert testimony, project management, engineering and construction management, cost and schedule control, and process engineering. As an internationally recognized expert in the analysis and resolution of complex construction disputes for nearly 30 years, Mr. Long has served as the lead expert on over 300 projects having claims ranging in size from US $100,000 to over US $2 billion. He has presented and published numerous articles on the subjects of claims analysis, entitlement issues, CPM schedule and damages analyses, and claims prevention. Mr. Long earned a B.S. in Chemical Engineering from the University of Pittsburgh in 1970 and an M.S. in Chemical and Petroleum Refining Engineering from the Colorado School of Mines in 1974. Mr. Long is based in Littleton, Colorado and can be contacted at rlong@long-intl.com and (303) 972-2443.*

***Andrew Avalon, P.E., P.S.P.**, is President of Long International, Inc. and has nearly 30 years of engineering, construction management and claims consulting experience. He is an expert in the preparation and evaluation of construction claims, insurance claims, schedule delay analysis, arbitration/ litigation support, and dispute resolution. He has prepared more than thirty CPM schedule delay analyses, written expert witness reports, and supported attorneys in depositions, cross-examinations, mediations, and settlement negotiations. In addition, Mr. Avalon has published numerous articles on the subjects of CPM schedule delay analysis and entitlement issues affecting construction claims. Mr. Avalon is a registered Professional Engineer with U.S. and international experience in petrochemical, oil refining, tar sands, gas-to-liquids, LNG, commercial, educational, medical, correctional facility, transportation, dam, wharf, wastewater treatment, and coal and nuclear power projects. Mr. Avalon earned both a B.S., Mechanical Engineering, and a B.A., English, from Stanford University in 1984. Mr. Avalon is based in Orlando, Florida and can be contacted at aavalon@long-intl.com and (407) 445-0825.*

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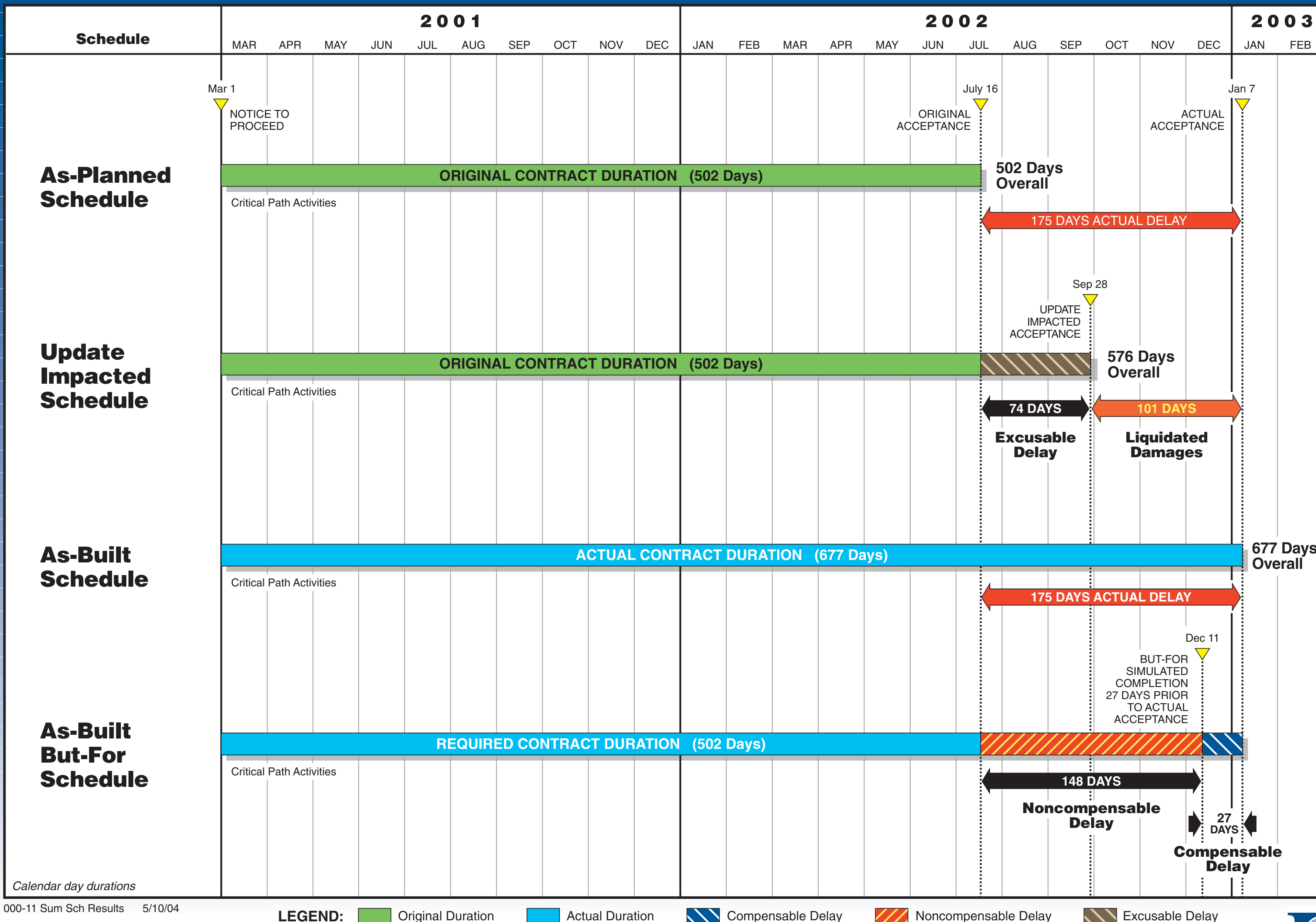
Ronald J. Rider, MBA *is a Principal with Long International and has over 25 years experience in construction project management and contract dispute resolution. Mr. Rider has performed CPM schedule development, project cost control, cost and labor hour variance modeling, impact identification and causation, change order pricing and resolution, retrospective schedule delay, time extension and acceleration analyses, concurrent delay assessments and damages quantification. Mr. Rider's work experience includes petrochemical, oil refinery, power, commercial, industrial, road/highway, transit, hospital/medical, airport and casino projects. He holds a B.S. degree in construction management from Colorado State University and an M.B.A. degree from the University of Colorado. Mr. Rider is based in Littleton, Colorado and can be contacted at rrider@long-intl.com and (303) 346-5836.*

Summary of Schedule Analysis and Simulation Results

Figure 1



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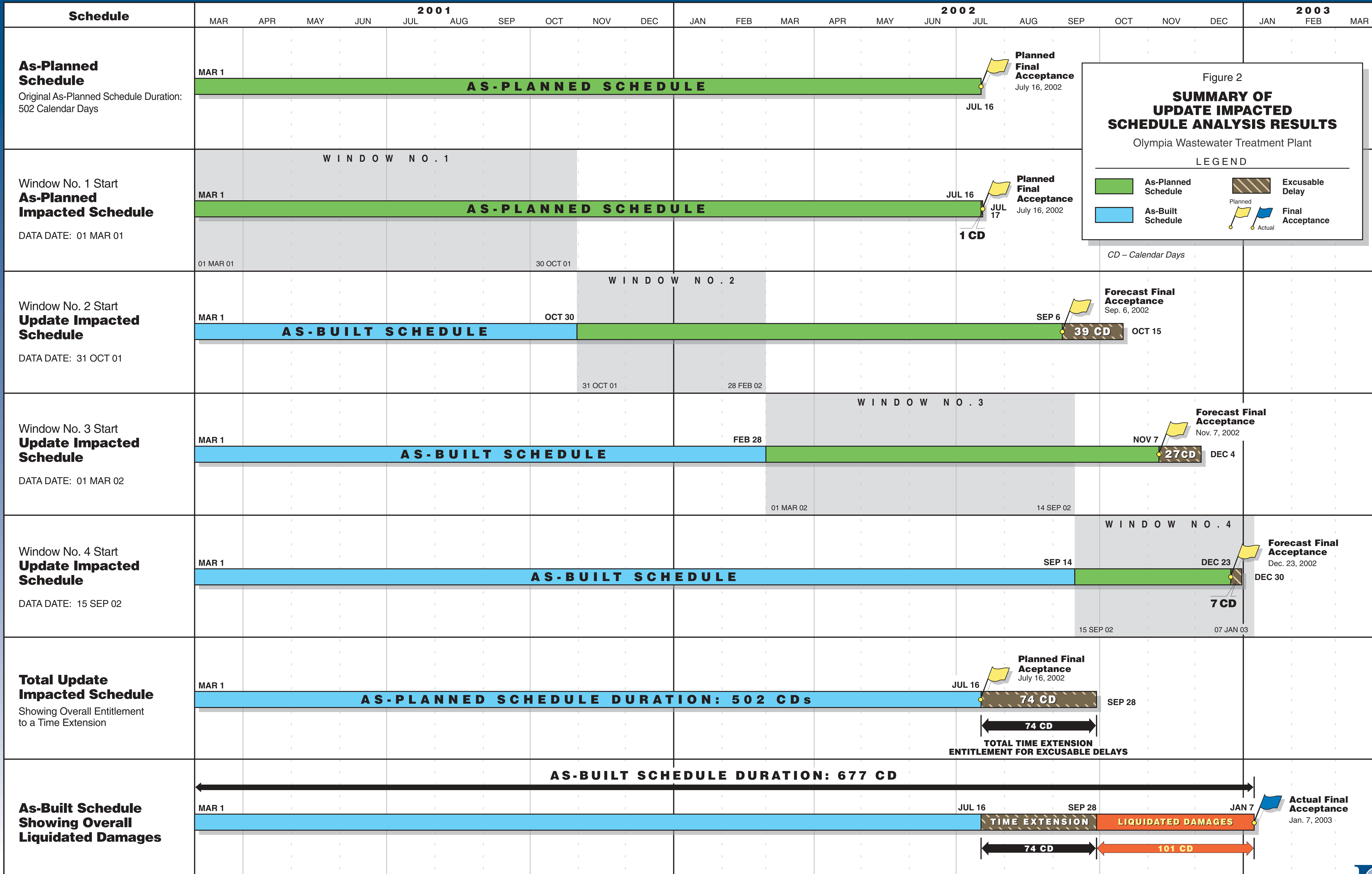


Schedule
2001
2002
2003
MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB MAR
As-Planned Schedule
Original As-Planned Schedule Duration: 502 Calendar Days
MAR 1
AS-PLANNED SCHEDULE
JUL 16
Planned Final Acceptance July 16, 2002
Figure 2
SUMMARY OF UPDATE IMPACTED SCHEDULE ANALYSIS RESULTS
Olympia Wastewater Treatment Plant
LEGEND
As-Planned Schedule
Excusable Delay
As-Built Schedule
Planned
Actual
Final Acceptance
CD – Calendar Days
Window No. 1 Start
As-Planned Impacted Schedule
DATA DATE: 01 MAR 01
WINDOW NO. 1
MAR 1
AS-PLANNED SCHEDULE
JUL 16
JUL 17
1 CD
Planned Final Acceptance July 16, 2002
01 MAR 01
30 OCT 01
Window No. 2 Start
Update Impacted Schedule
DATA DATE: 31 OCT 01
WINDOW NO. 2
MAR 1
OCT 30
AS-BUILT SCHEDULE
SEP 6
39 CD
OCT 15
Forecast Final Acceptance Sep. 6, 2002
31 OCT 01
28 FEB 02
Window No. 3 Start
Update Impacted Schedule
DATA DATE: 01 MAR 02
WINDOW NO. 3
MAR 1
FEB 28
AS-BUILT SCHEDULE
NOV 7
27CD
DEC 4
Forecast Final Acceptance Nov. 7, 2002
01 MAR 02
14 SEP 02
Window No. 4 Start
Update Impacted Schedule
DATA DATE: 15 SEP 02
WINDOW NO. 4
MAR 1
AS-BUILT SCHEDULE
SEP 14
DEC 23
DEC 30
7 CD
Forecast Final Acceptance Dec. 23, 2002
15 SEP 02
07 JAN 03
Total Update Impacted Schedule
Showing Overall Entitlement to a Time Extension
MAR 1
AS-PLANNED SCHEDULE DURATION: 502 CDs
JUL 16
74 CD
SEP 28
Planned Final Acceptance July 16, 2002
74 CD
TOTAL TIME EXTENSION ENTITLEMENT FOR EXCUSABLE DELAYS
As-Built Schedule Showing Overall Liquidated Damages
AS-BUILT SCHEDULE DURATION: 677 CD
MAR 1
JUL 16
SEP 28
JAN 7
TIME EXTENSION
LIQUIDATED DAMAGES
Actual Final Acceptance Jan. 7, 2003
74 CD
101 CD

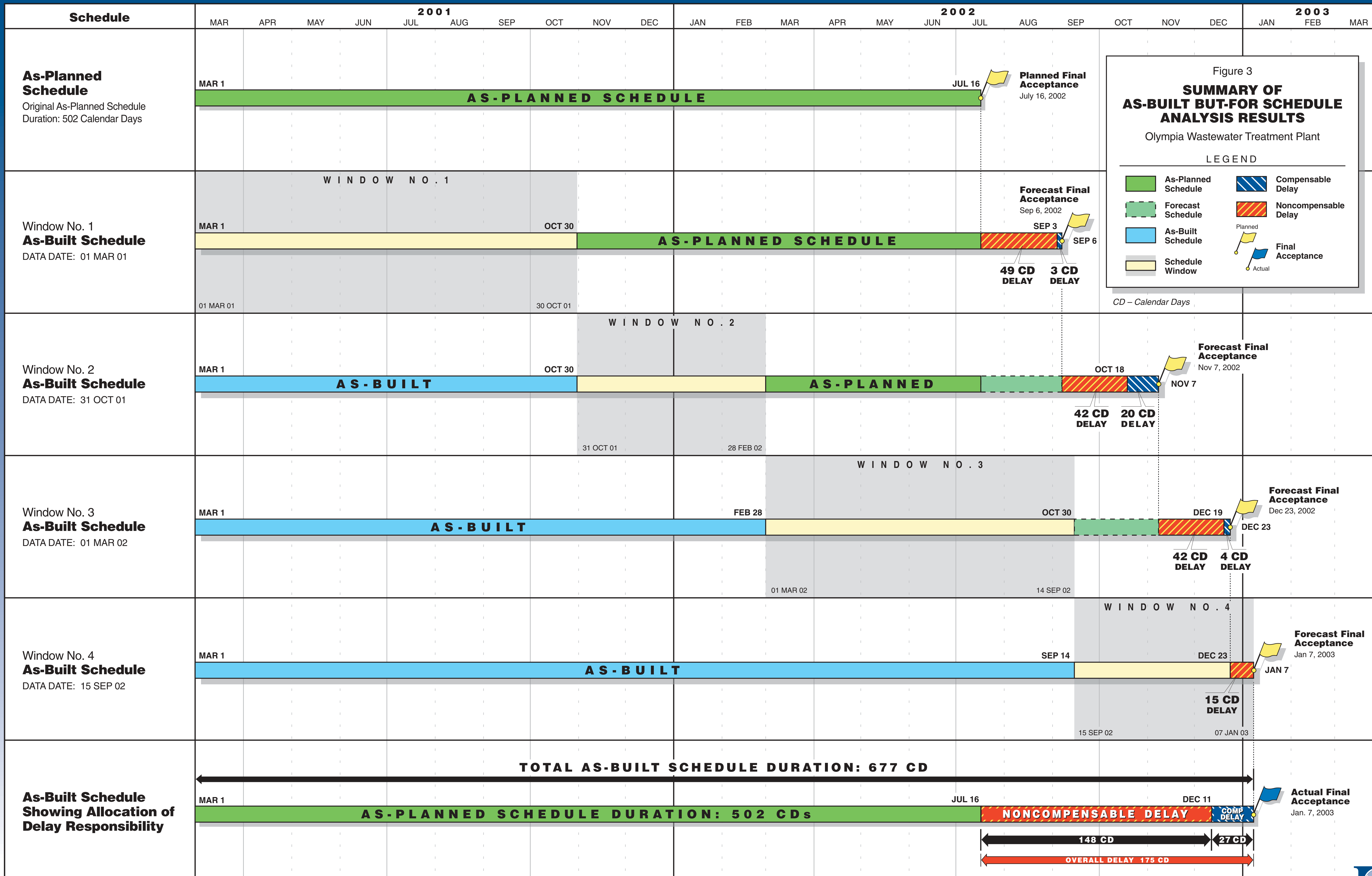
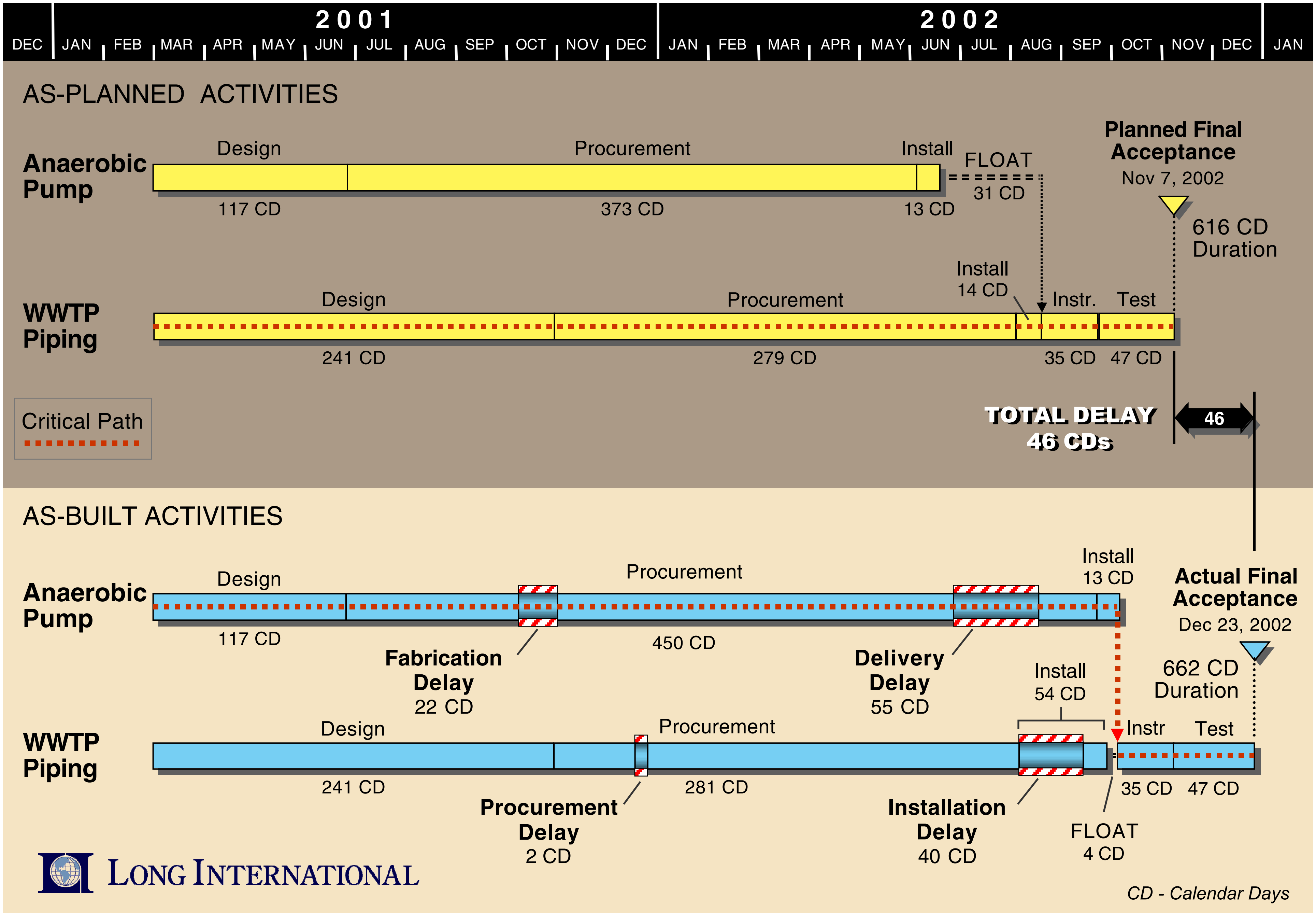


Figure 3
SUMMARY OF AS-BUILT BUT-FOR SCHEDULE ANALYSIS RESULTS
Olympia Wastewater Treatment Plant
LEGEND
As-Planned Schedule
Forecast Schedule
As-Built Schedule
Schedule Window
Compensable Delay
Noncompensable Delay
Planned
Actual
Final Acceptance
CD – Calendar Days
Schedule
2001
MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
2002
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
2003
JAN FEB MAR
As-Planned Schedule
Original As-Planned Schedule
Duration: 502 Calendar Days
MAR 1
AS-PLANNED SCHEDULE
JUL 16
Planned Final Acceptance
July 16, 2002
Window No. 1
As-Built Schedule
DATA DATE: 01 MAR 01
WINDOW NO. 1
MAR 1
OCT 30
AS-PLANNED SCHEDULE
Forecast Final Acceptance
Sep 6, 2002
SEP 3
SEP 6
49 CD DELAY
3 CD DELAY
01 MAR 01
30 OCT 01
Window No. 2
As-Built Schedule
DATA DATE: 31 OCT 01
WINDOW NO. 2
MAR 1
OCT 30
AS-BUILT
AS-PLANNED
OCT 18
Forecast Final Acceptance
Nov 7, 2002
NOV 7
42 CD DELAY
20 CD DELAY
31 OCT 01
28 FEB 02
Window No. 3
As-Built Schedule
DATA DATE: 01 MAR 02
WINDOW NO. 3
MAR 1
FEB 28
OCT 30
AS-BUILT
DEC 19
Forecast Final Acceptance
Dec 23, 2002
DEC 23
42 CD DELAY
4 CD DELAY
01 MAR 02
14 SEP 02
Window No. 4
As-Built Schedule
DATA DATE: 15 SEP 02
WINDOW NO. 4
MAR 1
SEP 14
DEC 23
AS-BUILT
Forecast Final Acceptance
Jan 7, 2003
JAN 7
15 CD DELAY
15 SEP 02
07 JAN 03
As-Built Schedule Showing Allocation of Delay Responsibility
TOTAL AS-BUILT SCHEDULE DURATION: 677 CD
MAR 1
JUL 16
DEC 11
AS-PLANNED SCHEDULE DURATION: 502 CDs
NONCOMPENSABLE DELAY
COMP DELAY
Actual Final Acceptance
Jan. 7, 2003
148 CD
27 CD
OVERALL DELAY 175 CD

Olympia Wastewater Treatment Plant

Critical Path Comparison – As -Planned vs. As-Built (Window 3)

Figure 4



Activity ID	Activity Description	Total Float	Orig Dur	WBS	Early Start	Early Finish
As-Planned Critical Path						
W2435	WWTP PIPING DELIVERY	-114	280	P	28OCT01A	03AUG02
W4555	HOMOGENIZATION TANK PIPING ERECTION	-114	6	C	04AUG02	09AUG02
W4556	HOMOGENIZATION CONDITIONING TANK PIPING ERECTION	-114	8	C	10AUG02	17AUG02
W4461	WWTP INSTRUMENT INSTALLATION	-114	35	C	18AUG02	21SEP02
W5928	WWTP NOTICE TO BEGIN TURNOVER	-114	1	T	22SEP02	22SEP02
W5930	WWTP JOINT PRE-HYDRO TEST INSPECTION	-114	1	T	23SEP02	23SEP02
W5932	WWTP HYDRO TEST	-114	3	T	24SEP02	26SEP02
W5933	WWTP RECONECT & FINISH INSTRUMENT INSTALLATION	-114	7	T	27SEP02	03OCT02
W5934	WWTP POST-HYDRO TEST JOINT PUNCHLIST WALKDOWN	-114	1	T	04OCT02	04OCT02
W5936	WWTP COMPLETE PUNCHLIST WORK	-114	7	T	05OCT02	11OCT02
W5938	WWTP PUNCHLIST VERIFICATION WALKDOWN	-114	1	T	12OCT02	12OCT02
W5940	WWTP ELECTRICAL & INSTRUMENT TESTING	-114	3	T	13OCT02	15OCT02
W5941	WWTP SUBMIT FOR ACCEPTANCE	-114	1	T	16OCT02	16OCT02
W5942	WASTE WATER TREATMENT PLANT OWNER ACCEPTANCE	-114	1	T	23OCT02	23OCT02
W9000	MECHANICAL COMPLETION	-114	0	T	—	23OCT02
W9999	FINAL ACCEPTANCE	-114	0	T	—	07NOV02

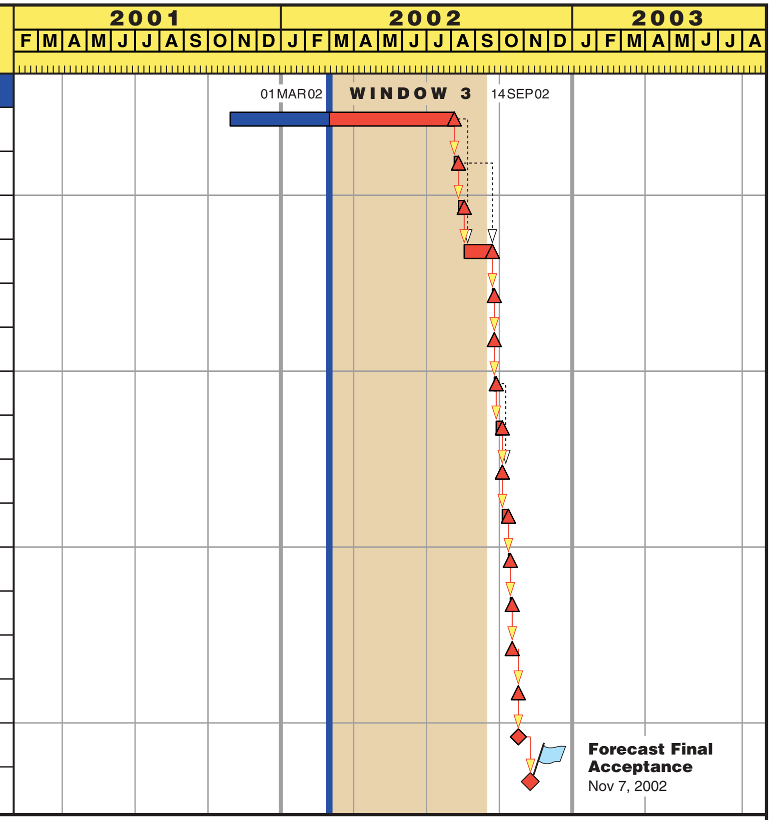


Figure 5

Start Date	01JAN01
Finish Date	07NOV02
Data Date	01MAR02
Run Date	02JUN03

Early Bar
Progress Bar
Critical Activity
Driving Logic Tie
Non-Driving Logic Tie
Window Designation

W3AP

OLYMPIA WASTEWATER TREATMENT PLANT
UPDATE SCHEDULE - WINDOW 3
CRITICAL PATH ACTIVITIES

Work Breakdown (WBS) Activity Codes

E	ENGINEERING
P	PROCUREMENT
C	CONSTRUCTION
T	TESTING & TURNOVER

LONG INTERNATIONAL

Activity ID	Activity Description	Total Float	Actual Dur	WBS	Early Start	Early Finish
As-Built Critical Path						
W2042	ANAEROBIC PUMP FABRICATION	-160	374	P	26JUN01A	19JUL02
W2043	ANAEROBIC PUMP DELIVERY	-160	62	P	20JUL02	19SEP02
W4382	ANAEROBIC TANK PUMP ERECTION	-160	5	C	20SEP02	24SEP02
W4570	ANAEROBIC REACTOR TANK PIPING ERECTION	-160	4	C	25SEP02	28SEP02
W4571	ANAEROBIC PUMP PIPING ERECTION	-160	4	C	29SEP02	02OCT02
W4461	WWTP INSTRUMENT INSTALLATION	-160	35	C	03OCT02	06NOV02
W5928	WWTP NOTICE TO BEGIN TURNOVER	-160	1	T	07NOV02	07NOV02
W5930	WWTP JOINT PRE-HYDRO TEST INSPECTION	-160	1	T	08NOV02	08NOV02
W5932	WWTP HYDRO TEST	-160	3	T	09NOV02	11NOV02
W5933	WWTP RECONECT & FINISH INSTRUMENT INSTALLATION	-160	7	T	12NOV02	18NOV02
W5934	WWTP POST-HYDRO TEST JOINT PUNCHLIST WALKDOWN	-160	1	T	19NOV02	19NOV02
W5936	WWTP COMPLETE PUNCHLIST WORK	-160	7	T	20NOV02	26NOV02
W5938	WWTP PUNCHLIST VERIFICATION WALKDOWN	-160	1	T	27NOV02	27NOV02
W5940	WWTP ELECTRICAL & INSTRUMENT TESTING	-160	3	T	28NOV02	30NOV02
W5941	WWTP SUBMIT FOR ACCEPTANCE	-160	1	T	01DEC02	01DEC02
W5942	WASTE WATER TREATMENT PLANT OWNER ACCEPTANCE	-160	1	T	08DEC02	08DEC02
W9000	MECHANICAL COMPLETION	-160	0	T	—	08DEC02
W9999	FINAL ACCEPTANCE	-160	0	T	—	23DEC02
As-Built Near Critical Path						
W2435	WWTP PIPING DELIVERY	-156	282	P	28OCT01A	05AUG02
W4555	HOMOGENIZATION TANK PIPING ERECTION	-156	6	C	15SEP02	20SEP02
W4556	HOMOGENIZATION CONDITIONING TANK PIPING ERECTION	-156	8	C	21SEP02	28SEP02

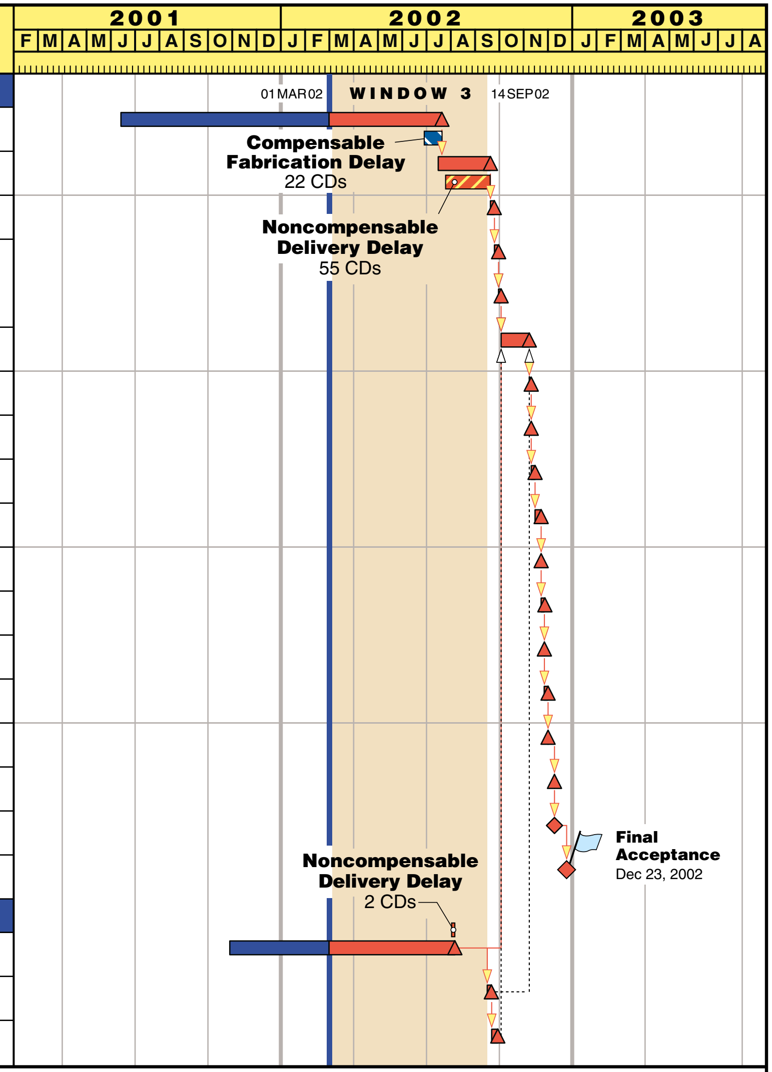


Figure 6

Start Date	01JAN01
Finish Date	23DEC02
Data Date	01MAR02
Run Date	28JUL03

Early Bar — Progress Bar — Critical Activity — Driving Logic Tie — Non-Driving Logic Tie — Window Designation

W3AB

OLYMPIA WASTEWATER TREATMENT PLANT
AS-BUILT SIMULATION SCHEDULE - WINDOW 3
CRITICAL PATH ACTIVITIES

Work Breakdown (WBS) Activity Codes

- E ENGINEERING
- P PROCUREMENT
- C CONSTRUCTION
- T TESTING & TURNOVER

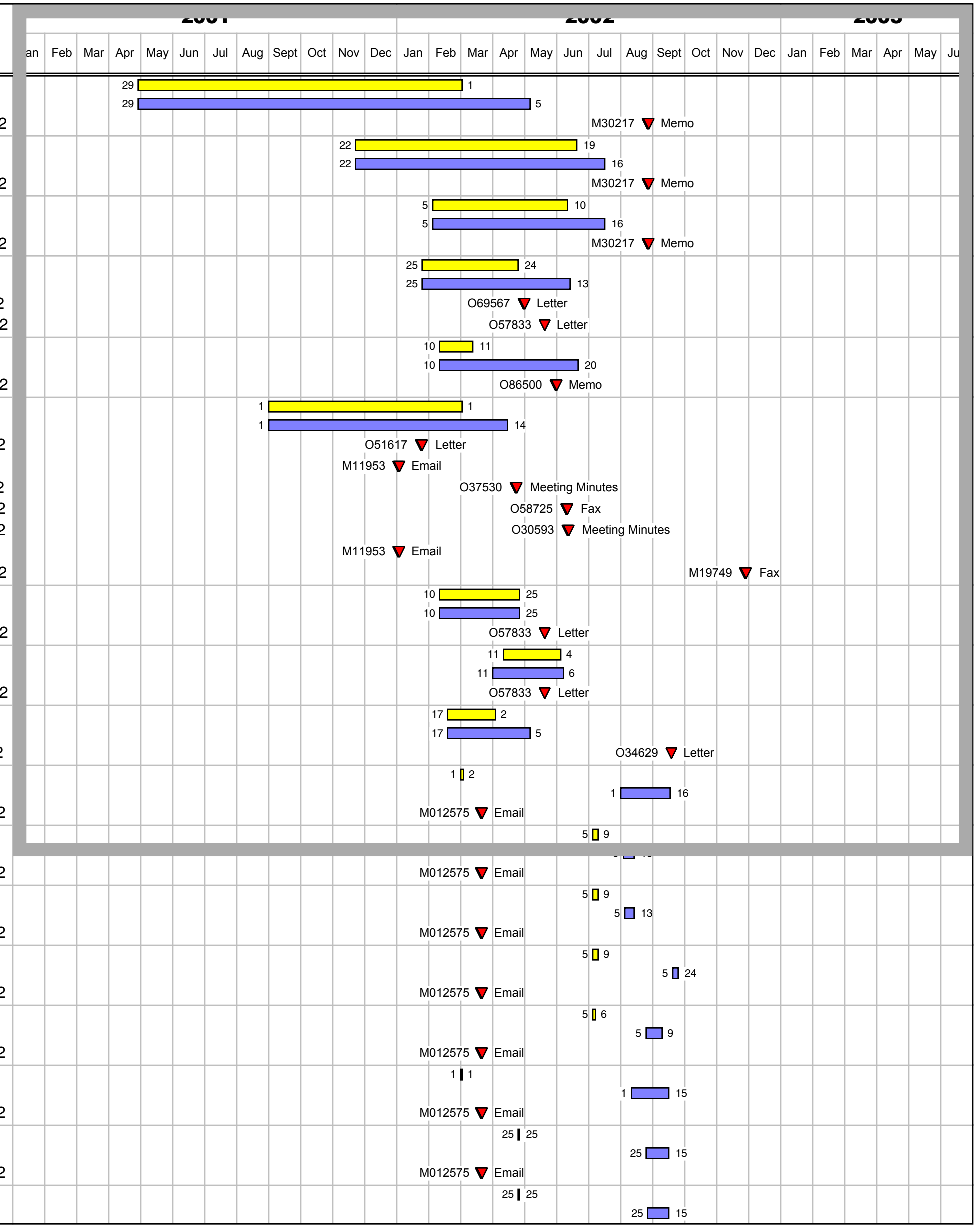
LONG INTERNATIONAL

Olympia Wastewater Treatment Plant

As-Planned vs As-Built Schedule Showing Impacts to Activities

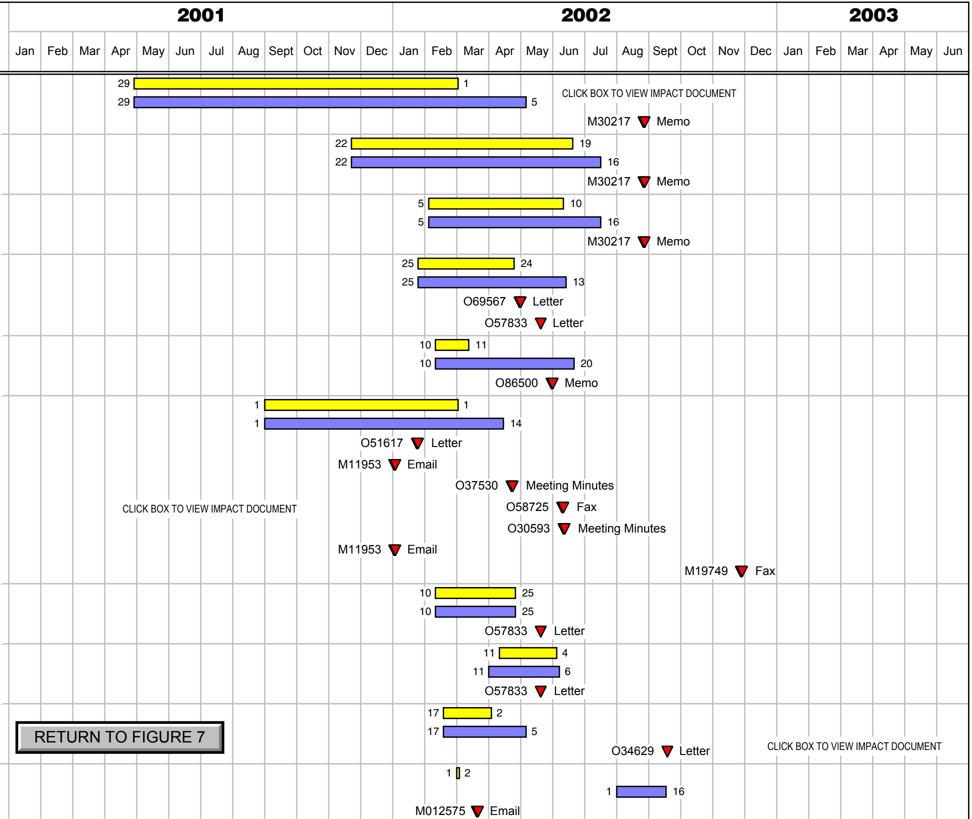
CLICK TO SEE FIGURE 7 (Page 1 of 2 – Detail)

Activity No	Activity Description or Impact Event	Window 3 Start	Window 3 Finish	Window 4 Start	Window 4 Finish	Document Date
W3102	EFFLUENT/CHANNEL SAMPLE PUMP FABRICATION	4/29/01	3/1/02	4/29/01	5/5/02	
	IMPACT					27-Aug-02
W3112	WWT AREA SUMP PUMP FABRICATION	11/22/01	6/19/02	11/22/01	7/16/02	
	IMPACT					27-Aug-02
W3118	RETENTION POND EMERGENCY PUMP FABRICATION	2/5/02	6/10/02	2/5/02	7/16/02	
	IMPACT					27-Aug-02
W2197	PIPING MATERIAL DELIVERY	1/25/02	4/24/02	1/25/02	6/13/02	
	IMPACT					30-Apr-02
	IMPACT					20-May-02
W1202	POWER DISTRIBUTION DRAWINGS	2/10/02	3/11/02	2/10/02	6/20/02	
W1202	IMPACT					31-May-02
W1315	INSTRUMENT LOOP DRAWINGS	9/1/01	3/1/02	9/1/01	4/14/02	
	IMPACT					24-Jan-02
	IMPACT					2-Jan-02
	IMPACT					22-Apr-02
	IMPACT					10-Jun-02
	IMPACT					11-Jun-02
	IMPACT					2-Jan-02
	IMPACT					27-Nov-02
W4355	RETENTION POND CIVIL WORKS	2/10/02	4/25/02	2/10/02	4/25/02	
	IMPACT					20-May-02
W4356	RETENTION POND COVER WORK	4/11/02	6/4/02	4/1/02	6/6/02	
	IMPACT					20-May-02
W4360	AEROBIC BIOLOGICAL BASIN CONSTRUCTION	2/17/02	4/2/02	2/17/02	5/5/02	
	IMPACT					18-Sep-02
W4367	AEROBIC BASIN AIR BLOWER ERECTION	3/1/02	3/2/02	8/1/02	9/16/02	
	IMPACT					21-Mar-02
W4369	AEROBIC BASIN FEED PUMP ERECTION	7/5/02	7/9/02	8/4/02	8/13/02	
	IMPACT					21-Mar-02
W4380	ANAEROBIC TANK FEED PUMP ERECTION	7/5/02	7/9/02	8/5/02	8/13/02	
	IMPACT					21-Mar-02
W4382	ANAEROBIC TANK PUMP ERECTION	7/5/02	7/9/02	9/20/02	9/24/02	
	IMPACT					21-Mar-02
W4386	HOMOGENIZATION CONDITIONING TANK ERECTION	7/5/02	7/6/02	8/26/02	9/9/02	
	IMPACT					21-Mar-02
W4388	HOMOGENIZATION TANK AGITATOR ERECTION	3/1/02	3/1/02	8/11/02	9/15/02	
	IMPACT					21-Mar-02
W4391	HOMOGENIZATION SODA TANK ERECTION	4/25/02	4/25/02	8/26/02	9/15/02	
	IMPACT					21-Mar-02
W4392	HOMOGENIZATION UREA TANK ERECTION	4/25/02	4/25/02	8/27/02	9/15/02	



LEGEND

- As-Planned Dates
- As-Built Dates
- Bates No. & Impact Document


2001
2002
2003
Jan Feb Mar Apr May Jun Jul Aug Sept Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sept Oct Nov Dec Jan Feb Mar Apr May Jun
29 1
29 5
CLICK BOX TO VIEW IMPACT DOCUMENT
M30217 Memo
22 19
22 16
M30217 Memo
5 10
5 16
M30217 Memo
25 24
25 13
O69567 Letter
O57833 Letter
10 11
10 20
O86500 Memo
1 1
1 14
O51617 Letter
M11953 Email
O37530 Meeting Minutes
CLICK BOX TO VIEW IMPACT DOCUMENT
O58725 Fax
O30593 Meeting Minutes
M11953 Email
M19749 Fax
10 25
10 25
O57833 Letter
11 4
11 6
O57833 Letter
17 2
17 5
RETURN TO FIGURE 7
O34629 Letter
CLICK BOX TO VIEW IMPACT DOCUMENT
1 2
1 16
M012575 Email

Activity ID	Activity Description	Total Float	Orig Dur	WBS	Early Start	Early Finish
As-Planned Impacted Critical Path						
W2087	HOMOGENIZATION SLUDGE CENTRIFUGE FABRICATION	-141	367	P	26JUN01A	26AUG02
W2088	HOMOGENIZATION SLUDGE CENTRIFUGE DELIVERY	-141	7	P	27AUG02	02SEP02
W4411	HOMOGENIZATION SLUDGE CENTRIFUGE ERECTION	-141	7	C	03SEP02	09SEP02
W4581	CONDITIONED SLUDGE PUMP PIPING ERECTION	-141	2	C	10SEP02	11SEP02
W4593	DILUTED POLYELECTROLITE DOSING PUMP PIPING ERECT	-141	2	C	12SEP02	13SEP02
W4461	WWTP INSTRUMENT INSTALLATION	-141	35	C	14SEP02	18OCT02
W5928	WWTP NOTICE TO BEGIN TURNOVER	-141	1	T	19OCT02	19OCT02
W5930	WWTP JOINT PRE-HYDRO TEST INSPECTION	-141	1	T	20OCT02	20OCT02
W5932	WWTP HYDRO TEST	-141	3	T	21OCT02	23OCT02
W5933	WWTP RECONECT & FINISH INSTRUMENT INSTALLATION	-141	7	T	24OCT02	30OCT02
W5934	WWTP POST-HYDRO TEST JOINT PUNCHLIST WALKDOWN	-141	1	T	31OCT02	31OCT02
W5936	WWTP COMPLETE PUNCHLIST WORK	-141	7	T	01NOV02	07NOV02
W5938	WWTP PUNCHLIST VERIFICATION WALKDOWN	-141	1	T	08NOV02	08NOV02
W5940	WWTP ELECTRICAL & INSTRUMENT TESTING	-141	3	T	09NOV02	11NOV02
W5941	WWTP SUBMIT FOR ACCEPTANCE	-141	1	T	12NOV02	12NOV02
W5942	WASTE WATER TREATMENT PLANT OWNER ACCEPTANCE	-141	1	T	19NOV02	19NOV02
W9000	MECHANICAL COMPLETION	-141	0	T	—	19NOV02
W9999	FINAL ACCEPTANCE	-141	0	T	—	04DEC02

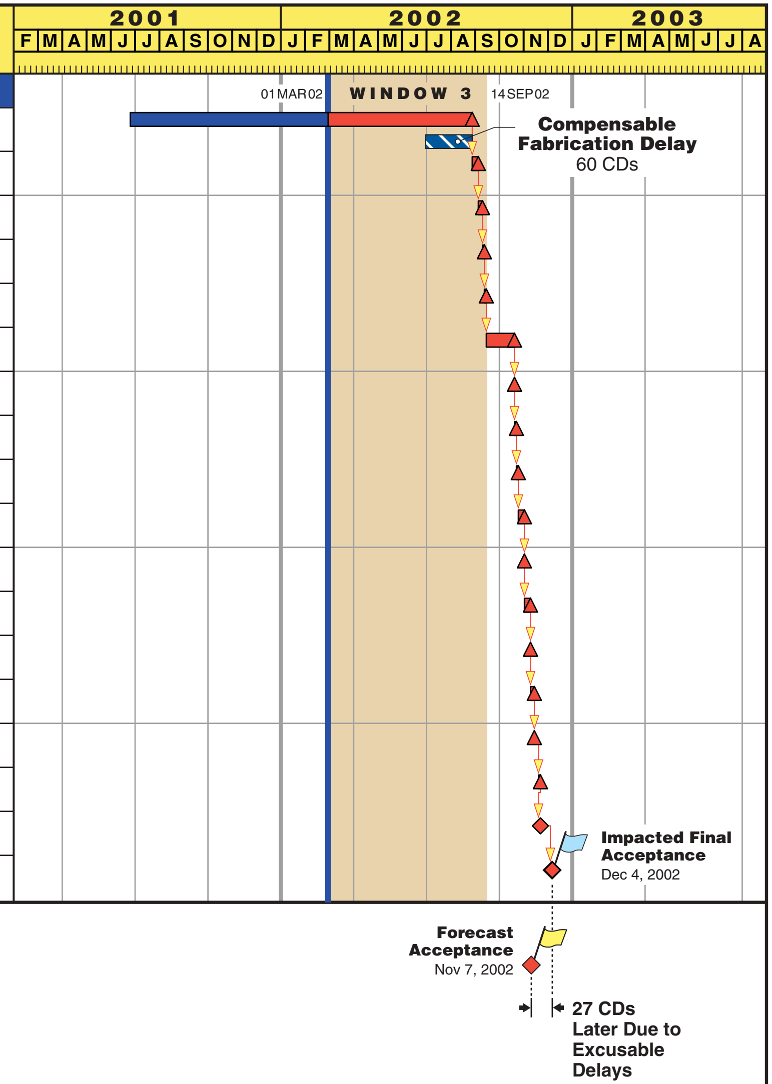


Figure 8

Start Date	01JAN01
Finish Date	04DEC02
Data Date	01MAR02
Run Date	06JUN03

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Early Bar
Progress Bar
Critical Activity
Driving Logic Tie
Non-Driving Logic Tie
Window Designation

W3IM

OLYMPIA WASTEWATER TREATMENT PLANT
UPDATE IMPACTED SCHEDULE-WINDOW 3
CRITICAL PATH ACTIVITIES

Work Breakdown (WBS) Activity Codes

- E ENGINEERING
- P PROCUREMENT
- C CONSTRUCTION
- T TESTING & TURNOVER

LONG INTERNATIONAL

As-Built But-For Critical Path

Activity ID	Activity Description	Total Float	Orig Dur	WBS	Early Start	Early Finish
W2435	WWTP PIPING DELIVERY	-156	282	P	28OCT01A	05AUG02
W4555	HOMOGENIZATION TANK PIPING ERECTION	-156	6	C	15SEP02	20SEP02
W4556	HOMOGENIZATION CONDITIONING TANK PIPING ERECTION	-156	8	C	21SEP02	28SEP02
W4461	WWTP INSTRUMENT INSTALLATION	-156	35	C	29SEP02	02NOV02
W5928	WWTP NOTICE TO BEGIN TURNOVER	-156	1	T	03NOV02	03NOV02
W5930	WWTP JOINT PRE-HYDRO TEST INSPECTION	-156	1	T	04NOV02	04NOV02
W5932	WWTP HYDRO TEST	-156	3	T	05NOV02	07NOV02
W5933	WWTP RECONECT & FINISH INSTRUMENT INSTALLATION	-156	7	T	08NOV02	14NOV02
W5934	WWTP POST-HYDRO TEST JOINT PUNCHLIST WALKDOWN	-156	1	T	15NOV02	15NOV02
W5936	WWTP COMPLETE PUNCHLIST WORK	-156	7	T	16NOV02	22NOV02
W5938	WWTP PUNCHLIST VERIFICATION WALKDOWN	-156	1	T	23NOV02	23NOV02
W5940	WWTP ELECTRICAL & INSTRUMENT TESTING	-156	3	T	24NOV02	26NOV02
W5941	WWTP SUBMIT FOR ACCEPTANCE	-156	1	T	27NOV02	27NOV02
W5942	WASTE WATER TREATMENT PLANT OWNER ACCEPTANCE	-156	1	T	04DEC02	04DEC02
W9000	MECHANICAL COMPLETION	-156	0	T	—	04DEC02
W9999	FINAL ACCEPTANCE	-156	0	T	—	19DEC02

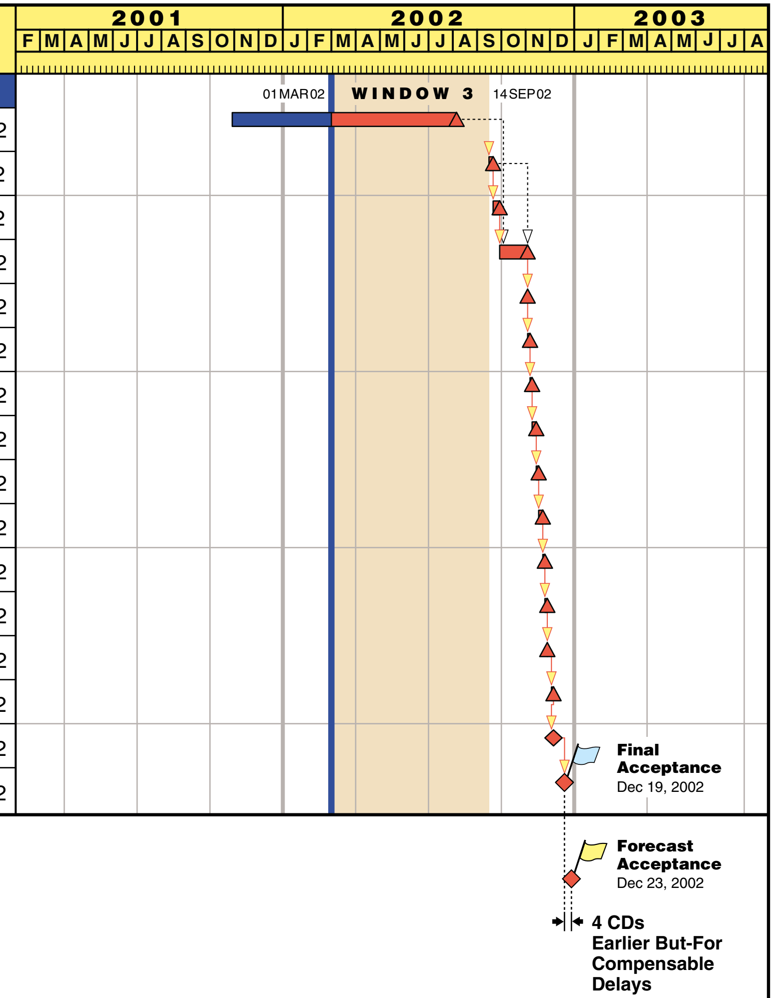

Figure 9

Start Date	01JAN01
Finish Date	19DEC02
Data Date	01MAR02
Run Date	06JUN03

Early Bar
Progress Bar
Critical Activity
Driving Logic Tie
Non-Driving Logic Tie
Window Designation

W3BF

OLYMPIA WASTEWATER TREATMENT PLANT
AS-BUILT BUT-FOR SCHEDULE - WINDOW 3
CRITICAL PATH ACTIVITIES

Work Breakdown (WBS) Activity Codes

- E ENGINEERING
- P PROCUREMENT
- C CONSTRUCTION
- T TESTING & TURNOVER

LONG INTERNATIONAL

LONG INTERNATIONAL --- W3AB   TABLE 1 – TARGET COMPARISON   WWTP WINDOW 3 AS-BUILT SIMULATION

CURRENT = WINDOW 3 SIMULATION SCHED   START DATE 1JAN01 FIN DATE 23DEC02

TARGET = WINDOW 3 AS-BUILT SCHED   DATA DATE 1MAR02 PAGE NO. 1

"Current" start and finish date columns refer to the As-Built Simulation Schedule Dates.

ACTIVITY ID	TAR DUR	CUR DUR	%	ACTIVITY DESCRIPTION	CURRENT START	EARLY FINISH	TARGET START	EARLY FINISH	VAR.
W0000	0	0	100	CONTRACT AWARD	1MAR01A		1MAR01A		0
W0001	15	15	100	PROCESS RELEASE - MECHANICAL EQUIPMENT	1MAR01A	15MAR01A	1MAR01A	15MAR01A	0
W0002	15	15	100	PROCESS RELEASE - PUMPS	1MAR01A	15MAR01A	1MAR01A	15MAR01A	0
W0005	265	265	100	PROCESS RELEASE - P&ID´S REVIEW	1MAR01A	20NOV01A	1MAR01A	20NOV01A	0
W0008	319	48	85	WWTP PLOT PLAN	3JUN01A	17APR02	3JUN01A	17APR02A	0
W0010	155	38	76	RETENTION POND PLOT PLAN	4NOV01A	7APR02	4NOV01A	7APR02A	0
W0012	184	81	56	GENERAL FOUNDATION PLAN	18NOV01A	20MAY02	18NOV01A	20MAY02A	0
W0014	178	75	58	SECONDARY CONTAINMENT SYSTEM DRAWINGS	18NOV01A	14MAY02	18NOV01A	14MAY02A	0
W0015	143	40	72	EQUIPMENT FOUNDATION DRAWINGS	18NOV01A	9APR02	18NOV01A	9APR02A	0
W0016	129	26	80	SECONDARY CLARIFIER DRAWINGS	18NOV01A	26MAR02	18NOV01A	26MAR02A	0
W0017	170	67	61	CONTROL BUILDING FOUNDATION DRAWINGS	18NOV01A	6MAY02	18NOV01A	6MAY02A	0
W0020	122	122	100	RETENTION POND PIPING LAYOUT DRAWINGS	31JUL01A	29NOV01A	31JUL01A	29NOV01A	0
W0021	287	74	74	WWTP PIPING LAYOUT DRAWINGS	31JUL01A	13MAY02	31JUL01A	13MAY02A	0
W0150	6	6	100	WWTP PIPING ISOMETRIC DRAWINGS	8DEC01A	13DEC01A	8DEC01A	13DEC01A	0
W1199	201	201	100	6.6Kv / 380v ONE LINE DIAGRAM	12AUG01A	28FEB02A	12AUG01A	28FEB02A	0
W1200	36	36	100	COMMUNICATION SYSTEM DISTRIBUTION DRAWINGS	1JAN02A	5FEB02A	1JAN02A	5FEB02A	0
W1201	23	23	0	GROUNDING DISTRIBUTION DRAWINGS	3MAR02	25MAR02	3MAR02A	25MAR02A	0
W1202	131	112	15	POWER DISTRIBUTION DRAWINGS	10FEB02A	20JUN02	10FEB02A	20JUN02A	0
W1203	29	29	0	LIGHTING DISTRIBUTION DRAWINGS	3MAR02	31MAR02	3MAR02A	31MAR02A	0
W1204	90	31	66	MOTOR CONTROL CENTER ONE LINE DIAGRAM	1JAN02A	31MAR02	1JAN02A	31MAR02A	0
W1305	269	26	90	WWTP INSTRUMENT LIST	1JUL01A	26MAR02	1JUL01A	26MAR02A	0
W1310	396	153	61	INSTRUMENT & ELECTRICAL LAYOUT DRAWINGS	1JUL01A	31JUL02	1JUL01A	31JUL02A	0
W1315	226	45	80	INSTRUMENT LOOP DRAWINGS	1SEP01A	14APR02	1SEP01A	14APR02A	0
W1320	135	15	89	MAIN CABLE ROUTING DRAWINGS	1NOV01A	15MAR02	1NOV01A	15MAR02A	0
W1325	393	150	62	WWTP CABLE LIST	1JUL01A	28JUL02	1JUL01A	28JUL02A	0
W1330	135	15	89	JUNCTION BOX DRAWINGS	1NOV01A	15MAR02	1NOV01A	15MAR02A	0
W1335	334	91	73	PROCESS HOOK-UP DRAWINGS	1JUL01A	30MAY02	1JUL01A	30MAY02A	0
W1340	244	1	100	PNEUMATIC INSTRUMENT HOOK-UP DRAWINGS	1JUL01A	1MAR02	1JUL01A	1MAR02A	0
W1345	268	25	91	PNEUMATIC INSTRUMENT LAYOUT	1JUL01A	25MAR02	1JUL01A	25MAR02A	0
W2027	374	126	66	AEROBIC BASIN AIR DIFFUSER FABRICATION	26JUN01A	4JUL02	26JUN01A	4JUL02A	0
W2028	45	45	0	AEROBIC BASIN AIR DIFFUSER DELIVERY	7JUL02	20AUG02	7JUL02A	20AUG02A	0
W2030	365	117	68	AEROBIC BASIN AIR BLOWER FABRICATION	26JUN01A	25JUN02	26JUN01A	25JUN02A	0
W2031	16	16	0	AEROBIC BASIN AIR BLOWER DELIVERY	26JUN02	11JUL02	26JUN02A	11JUL02A	0
W2033	365	117	68	AEROBIC BASIN FEED PUMP FABRICATION	26JUN01A	25JUN02	26JUN01A	25JUN02A	0

Note: As indicated by the letter "A" Actual Date designations for Activity W1201, the As-Built Simulation Schedule dates are the same as the As-Built Schedule dates but are calculated by the scheduling software using activity durations and logic relationships to facilitate "what if" analyses.

"Target" start and finish date columns refer to the As-Built Schedule Dates.

Table 2

DURATION VARIANCES - WINDOW 3

ACTIVITY ID	ACTIVITY DESCRIPTION	WBS	WIN 3 START	A	WIN 3 FINISH	A	WIN 4 START	A	WIN 4 FINISH	A	WIN 3 DUR	WIN 4 DUR	DURATION VARIANCE (CAL DAYS)	DELAY APPORTIONMENT: CHANGE ORDERS (CAL DAYS)	DELAY APPORTIONMENT: STRIKES (CAL DAYS)	DELAY APPORTIONMENT: ADVERSE WEATHER (CAL DAYS)	DELAY APPORTIONMENT: CONTRACTOR DELAY (CAL DAYS)	COMMENTS
W3025	WWTP VENDOR DRAWING RECEIPT	E	26-Jun-01	A	1-Mar-02		26-Jun-01	A	30-Jun-02		249	370	121	2			119	CO 64- 2 days; Late Drawing Delivery- 119 days
W3026	WWTP VENDOR DRAWING COMMENTS	E	5-Aug-01	A	1-Mar-02		5-Aug-01	A	30-Jun-02		209	330	121	2			119	CO 64- 2 days; Late Drawing Review 119 days
W3093	EFFLUENT/CHANNEL SAMPLE FILTER FABRICATION	P	29-Oct-01	A	26-Apr-02		29-Oct-01	A	23-Mar-02		180	146	-34				-34	Accelerated Fabrication- <34> days
W3098	EFFLUENT/CHANNEL SAMPLE FILTER DELIVERY	P	27-Apr-02		10-May-02		11-Apr-02		15-Apr-02		14	5	-9				-9	Accelerated Delivery- <9> days
W3102	EFFLUENT/CHANNEL SAMPLE PUMP FABRICATION	P	29-Apr-01	A	1-Mar-02		29-Apr-01	A	5-May-02		307	372	65				65	Late Fabrication- 65 days
W3103	EFFLUENT/CHANNEL SAMPLE PUMP VENDOR DRWG RECEIPT	E	1-Jul-01	A	1-Mar-02		1-Jul-01	A	11-Mar-02		244	254	10				10	Late Drawing Delivery- 10 days
W3104	EFFLUENT/CHANNEL SAMPLE PUMP VENDOR DRWG COMMENT	E	21-Aug-01	A	1-Mar-02		21-Aug-01	A	11-Mar-02		193	203	10				10	Late Drawing Review- 10 days
W3105	EFFLUENT/CHANNEL SAMPLE PUMP DELIVERY	P	2-Mar-02		15-Mar-02		6-May-02		14-May-02		14	9	-5				-5	Accelerated Delivery- <5> days
W3112	WWT AREA SUMP PUMP FABRICATION	P	22-Nov-01	A	19-Jun-02		22-Nov-01	A	16-Jul-02		210	237	27	47			-20	CO 74- 2 days, CO 104- 45 days; Accelerated Fabrication- <20> days
W3115	WWT AREA SUMP PUMP DELIVERY	P	20-Jun-02		26-Jun-02		17-Jul-02		22-Jul-02		7	6	-1				-1	Accelerated Delivery- <1> day
W3118	RETENTION POND EMERGENCY PUMP FABRICATION	P	5-Feb-02	A	10-Jun-02		5-Feb-02	A	16-Jul-02		126	162	36	47			-11	CO 74- 2 days, CO 104- 45 days
W3119	RETENTION POND EMERGENCY PUMP VEND DRWG RECEIPT	E	17-Feb-02	A	18-Mar-02		17-Feb-02	A	10-Apr-02		30	53	23				23	Late Drawing Delivery- 23 days
W3120	RETENTION POND EMERGENCY PUMP VEND DRWG COMMENTS	E	19-Mar-02		8-Apr-02		24-Mar-02		22-Apr-02		21	30	9				9	Late Drawing Review- 9 days
W3121	RETENTION POND EMERGENCY PUMP DELIVERY	P	11-Jun-02		17-Jun-02		17-Jul-02		22-Jul-02		7	6	-1				-1	Accelerated Delivery- <1> day
W3126	SAMPLE WATER FILTER FABRICATION	P	2-Aug-01	A	3-Apr-02		2-Aug-01	A	20-Mar-02		245	231	-14				-14	Accelerated Fabrication- <14> days
W3127	SAMPLE WATER FILTER VENDOR DRAWING RECEIPT	E	2-Aug-01	A	1-Mar-02		2-Aug-01	A	21-May-02		212	293	81				81	Late Drawing Delivery- 81 days
W3128	SAMPLE WATER FILTER VENDOR DRAWING COMMENTS	E	16-Sep-01	A	1-Mar-02		16-Sep-01	A	28-May-02		167	255	88				88	Late Drawing Review- 88 days
W3129	SAMPLE WATER FILTER DELIVERY	P	4-Apr-02		17-Apr-02		21-Mar-02		21-Mar-02		14	1	-13				-13	Accelerated Delivery- <13> days
W4355	RETENTION POND CIVIL WORKS	C	10-Feb-02	A	25-Apr-02		10-Feb-02	A	25-Apr-02		75	75	0		2		-2	Strike No.2 - 2 days; Accelerated civil works- <2> days
W4356	RETENTION POND COVER WORK	C	11-Apr-02		4-Jun-02		1-Apr-02		6-Jun-02		55	67	12		2	1	9	Weather - 1 day, Strike No. 2 - 2 days; Late Cover Work- 9 days
W4357	RETENTION POND TRENCH TO RIVER	C	1-Jan-02	A	31-Mar-02		1-Jan-02	A	7-Mar-02		90	66	-24				-24	Accelerated Trenching- <24> days
W4358	SUMP OIL EFFLUENTS CONSTRUCTION	C	2-Mar-02		31-Mar-02		2-Jun-02		15-Jun-02		30	14	-16			3	-19	Weather - 3 days; Accelerated Construction- <19> days
W4360	AEROBIC BIOLOGICAL BASIN CONSTRUCTION	C	17-Feb-02	A	2-Apr-02		17-Feb-02	A	5-May-02		45	78	33	5	2		26	CO 68- 5 days, Strike No. 2 - 2days; Late Construction- 26 days
W4362	AEROBIC BASIN AIR BLOWER FOUNDATIONS	C	17-Feb-02	A	2-Mar-02		17-Feb-02	A	1-May-02		14	74	60		2		58	Strike No.2 - 2 days; Late Foundation Work- 58 days
W4364	AEROBIC BASIN FEED PUMP FOUNDATIONS	C	1-Mar-02		14-Mar-02		6-Mar-02		6-Jun-02		14	93	79		2	1	76	Weather - 1 day, Strike No. 2 - 2 days; Late Foundation Work- 76 days
W4367	AEROBIC BASIN AIR BLOWER ERECTION	C	1-Mar-02		2-Mar-02		1-Aug-02		16-Sep-02		2	47	45		2		43	Strike No. 8 - 1 day, Strike No. 9 - 1 day; Late Erection- 43 days
W4369	AEROBIC BASIN FEED PUMP ERECTION	C	5-Jul-02		9-Jul-02		4-Aug-02		13-Aug-02		5	10	5				5	Late Erection- 5 days
W4371	AEROBIC BASIN STEEL LADDER & PLATFORM ERECTION	C	1-Mar-02		2-Mar-02		14-Jul-02		16-Sep-02		2	65	63		4		59	Strike No. 6 - 1 day, Strike No. 7 - 1 day, Strike No. 8 - 1 day, Strike No. 9 - 1 day; Late Erection- 59 days
W4373	ANAEROBIC REACTOR TANK CONSTRUCTION	C	1-Mar-02		4-Apr-02		3-Mar-02		4-May-02		35	63	28		2		26	Strike No.2 - 2 days; Late Construction- 26 days
W4376	ANAEROBIC TANK CONDENSATE DRUM ERECTION	C	1-Mar-02		2-Mar-02		26-Aug-02		16-Sep-02		2	22	20				20	Late Erection- 20 days
W4377	ANAEROBIC TANK FEED PUMP FOUNDATIONS	C	1-Mar-02		14-Mar-02		6-Mar-02		6-Jun-02		14	93	79		2	1	76	Weather - 1 day, Strike No. 2 - 2 days; Late Foundation Work- 76 days
W4379	ANAEROBIC TANK PUMP FOUNDATIONS	C	1-Mar-02		14-Mar-02		6-Mar-02		6-Jun-02		14	93	79		2	1	76	Weather - 1 day, Strike No. 2 - 2 days; Late Foundation Work- 76 days
W4380	ANAEROBIC TANK FEED PUMP ERECTION	C	5-Jul-02		9-Jul-02		5-Aug-02		13-Aug-02		5	9	4				4	Late Erection- 4 days
W4384	HOMOGENIZATION TANK CONSTRUCTION	C	1-Mar-02		4-Apr-02		3-Mar-02		4-May-02		35	63	28		2		26	Strike No.2 - 2 days; Late Construction- 26 days
W4385	HOMOGENIZATION TANK AREA PAVING WORK	C	5-Apr-02		25-Apr-02		4-Aug-02		22-Aug-02		21	19	-2		1		-3	Strike No. 9 - 1 day; Accelerated Paving- <3> days
W4386	HOMOGENIZATION CONDITIONING TANK ERECTION	C	5-Jul-02		6-Jul-02		26-Aug-02		9-Sep-02		2	15	13				13	Late Erection- 13 days
W4387	HOMOGENIZATION CLARIFIER TANK CONSTRUCTION	C	1-Mar-02		4-Apr-02		6-Mar-02		4-May-02		35	60	25		2		23	Strike No.2 - 2 days; Late Construction- 23 days

Table 3
LAG VARIANCES - WINDOW 3

																DELAY APPORTIONMENT				
PRED ACTIVITY	PREDECESSOR DESCRIPTION	WIN 4 PRED START	A	WIN 4 PRED FINISH	A	SUCC ACTIVITY	SUCCESSOR DESCRIPTION	WIN 4 SUCC START	A	WIN 4 SUCC FINISH	A	REL	WIN 3 LAG	WIN 4 LAG	LAG VARANCE (CAL DAYS)	CHANGE ORDERS (CAL DAYS)	STRIKES (CAL DAYS)	ADVERSE WEATHER (CAL DAYS)	CONTRACTOR DELAY (CAL DAYS)	COMMENTS
W0010	RETENTION POND PLOT PLAN	4-Nov-01	A	7-Apr-02		W0012	GENERAL FOUNDATION PLAN	18-Nov-01	A	20-May-02		FS	0	-141	-141				-141	Resequenced work- <141> days
W0010	RETENTION POND PLOT PLAN	4-Nov-01	A	7-Apr-02		W4355	RETENTION POND CIVIL WORKS	10-Feb-02	A	25-Apr-02		FS	0	-57	-57				-57	Resequenced work- <57> days
W0010	RETENTION POND PLOT PLAN	4-Nov-01	A	7-Apr-02		W4357	RETENTION POND TRENCH TO RIVER	1-Jan-02	A	7-Mar-02		FS	0	-97	-97				-97	Resequenced work- <97> days
W0012	GENERAL FOUNDATION PLAN	18-Nov-01	A	20-May-02		W0014	SECONDARY CONTAINMENT SYSTEM DRAWINGS	18-Nov-01	A	14-May-02		FS	0	-184	-184				-184	Resequenced work- <184> days
W0012	GENERAL FOUNDATION PLAN	18-Nov-01	A	20-May-02		W4373	ANAEROBIC REACTOR TANK CONSTRUCTION	3-Mar-02		4-May-02		SS	0	105	105	6			99	CO 39- 1 day, CO 64- 2 days, CO 68- 1day, CO 103- 2 days; Late start- 99 days
W0012	GENERAL FOUNDATION PLAN	18-Nov-01	A	20-May-02		W4426	RETENTION POND EMERGENCY PUMP FOUNDATION	1-Mar-02		6-Jun-02		FS	0	-81	-81				-81	Resequenced work- <81> days
W0015	EQUIPMENT FOUNDATION DRAWINGS	18-Nov-01	A	9-Apr-02		W4362	AEROBIC BASIN AIR BLOWER FOUNDATIONS	17-Feb-02	A	1-May-02		FF	0	22	22				22	Late Finish- 22 days
W0015	EQUIPMENT FOUNDATION DRAWINGS	18-Nov-01	A	9-Apr-02		W4364	AEROBIC BASIN FEED PUMP FOUNDATIONS	6-Mar-02		6-Jun-02		FF	0	58	58			1	57	Weather- 1 day; Late Finish- 57 days
W0015	EQUIPMENT FOUNDATION DRAWINGS	18-Nov-01	A	9-Apr-02		W4377	ANAEROBIC TANK FEED PUMP FOUNDATIONS	6-Mar-02		6-Jun-02		FF	0	58	58			1	57	Weather- 1 day; Late Finish- 57 days
W0015	EQUIPMENT FOUNDATION DRAWINGS	18-Nov-01	A	9-Apr-02		W4379	ANAEROBIC TANK PUMP FOUNDATIONS	6-Mar-02		6-Jun-02		FF	0	58	58			1	57	Weather- 1 day; Late Finish- 57 days
W0015	EQUIPMENT FOUNDATION DRAWINGS	18-Nov-01	A	9-Apr-02		W4387	HOMOGENIZATION CLARIFIER TANK CONSTRUCTION	6-Mar-02		4-May-02		SS	0	108	108	7			101	CO 39- 1 day, CO 64- 2 days, CO 104- 2 days, CO 103- 2 days; Late start- 101 days
W0150	WWTP PIPING ISOMETRIC DRAWINGS	8-Dec-01	A	13-Dec-01	A	W2195	PIPING MATERIAL TAKE OFF	1-Apr-02		7-Apr-02		FS	0	108	108				108	Late start- 108 days
W1199	6.6Kv / 380v ONE LINE DIAGRAM	12-Aug-01	A	28-Feb-02	A	W1204	MOTOR CONTROL CENTER ONE LINE DIAGRAM	1-Jan-02	A	31-Mar-02		FF	0	31	31	1			30	CO 39- 1 day; Late Finish- 30 days
W1200	COMMUNICATION SYSTEM DISTRIBUTION DRAWINGS	1-Jan-02	A	5-Feb-02	A	W1201	GROUNDING DISTRIBUTION DRAWINGS	3-Mar-02		25-Mar-02		SS	0	61	61	5			56	CO 104- 5 days; Late start- 56 days
W1201	GROUNDING DISTRIBUTION DRAWINGS	3-Mar-02		25-Mar-02		W1202	POWER DISTRIBUTION DRAWINGS	10-Feb-02	A	20-Jun-02		SS	0	-21	-21				-21	Resequenced work- <21> days
W1202	POWER DISTRIBUTION DRAWINGS	10-Feb-02	A	20-Jun-02		W1203	LIGHTING DISTRIBUTION DRAWINGS	3-Mar-02		31-Mar-02		SS	0	21	21				21	Late start- 21 days
W1305	WWTP INSTRUMENT LIST	1-Jul-01	A	26-Mar-02		W1315	INSTRUMENT LOOP DRAWINGS	1-Sep-01	A	14-Apr-02		FF	0	19	19	8			11	CO 39- 1 day, CO 47- 2 days, CO 103- 2 days,CO 104- 3 days; Late Finish- 11 days
W2027	AEROBIC BASIN AIR DIFFUSER FABRICATION	26-Jun-01	A	4-Jul-02		W2028	AEROBIC BASIN AIR DIFFUSER DELIVERY	7-Jul-02		20-Aug-02		FS	0	2	2				2	Late start- 2 days
W2028	AEROBIC BASIN AIR DIFFUSER DELIVERY	7-Jul-02		20-Aug-02		W4366	AEROBIC BASIN AIR DIFFUSER ERECTION	15-Sep-02		19-Sep-02		FS	0	25	25				25	Strike No. 6-1 day, Strike No. 7- 1 day; Late start- 25 days
W2031	AEROBIC BASIN AIR BLOWER DELIVERY	26-Jun-02		11-Jul-02		W4367	AEROBIC BASIN AIR BLOWER ERECTION	1-Aug-02		16-Sep-02		FS	0	20	20		2		18	Strike No. 6-1 day, Strike No. 7- 1 day; Late start- 18 days
W2034	AEROBIC BASIN FEED PUMP DELIVERY	26-Jun-02		26-Jun-02		W4369	AEROBIC BASIN FEED PUMP ERECTION	4-Aug-02		13-Aug-02		FS	0	38	38		2		36	Strike No. 6-1 day, Strike No. 7- 1 day; Late start- 36 days
W2037	ANAEROBIC TANK BIOTHANE REACTOR DELIVERY	26-Jun-02		26-Jun-02		W4375	ANAEROBIC TANK BIOTHANE REACTOR ERECTION	15-Sep-02		17-Sep-02		FS	0	80	80		4		76	Strike No. 6- 1 day, Strike No. 7- 1 day, Strike No. 8- 1 day, Strike No. 9- 1 day; Late start- 76 days
W2038	ANAEROBIC TANK CONDENSATE DRUM FABRICATION	26-Jun-01	A	25-Jun-02		W2039	ANAEROBIC TANK CONDENSATE DRUM DELIVERY	27-Jun-02		11-Jul-02		FS	0	1	1				1	Late start- 1 day
W2039	ANAEROBIC TANK CONDENSATE DRUM DELIVERY	27-Jun-02		11-Jul-02		W4376	ANAEROBIC TANK CONDENSATE DRUM ERECTION	26-Aug-02		16-Sep-02		FS	0	45	45		4		41	Strike No. 6- 1 day, Strike No. 7- 1 day, Strike No. 8- 1 day, Strike No. 9- 1 day; Late start- 41 days
W2041	ANAEROBIC TANK FEED PUMP DELIVERY	26-Jun-02		26-Jun-02		W4380	ANAEROBIC TANK FEED PUMP ERECTION	5-Aug-02		13-Aug-02		FS	0	39	39		2		37	Strike No. 6-1 day, Strike No. 7- 1 day; Late start- 37 days
W2044	HOMOGENIZATION CONDITIONING TANK FABRICATION	26-Jun-01	A	24-Jun-02		W2045	HOMOGENIZATION CONDITIONING TANK DELIVERY	7-Jul-02		20-Aug-02		FS	0	12	12				12	Late start- 12 days
W2045	HOMOGENIZATION CONDITIONING TANK DELIVERY	7-Jul-02		20-Aug-02		W4386	HOMOGENIZATION CONDITIONING TANK ERECTION	26-Aug-02		9-Sep-02		FS	0	5	5				5	Late start- 5 days
W2046	HOMOGENIZATION TANK AGITATOR FABRICATION	26-Jun-01	A	24-Jun-02		W2045	HOMOGENIZATION CONDITIONING TANK DELIVERY	7-Jul-02		20-Aug-02		FS	0	12	12				12	Late start- 12 days
W2047	HOMOGENIZATION TANK AGITATOR DELIVERY	25-Jun-02		26-Jun-02		W4388	HOMOGENIZATION TANK AGITATOR ERECTION	11-Aug-02		15-Sep-02		FS	0	45	45		2		43	Strike No. 6-1 day, Strike No. 7- 1 day; Late start- 43 days
W2062	HOMOGENIZATION SODA TANK FABRICATION	26-Jun-01	A	4-Jul-02		W2063	HOMOGENIZATION SODA TANK DELIVERY	7-Jul-02		20-Aug-02		FS	0	2	2				2	Late start- 2 days
W2063	HOMOGENIZATION SODA TANK DELIVERY	7-Jul-02		20-Aug-02		W4391	HOMOGENIZATION SODA TANK ERECTION	26-Aug-02		15-Sep-02		FS	0	5	5				5	Late start- 5 days

Author: MYERS, LAURA
Date: 02/0l/02 18:44
Priority: Normal
TO: ARTHUR CROSLEY
SUBJECT: Instrument Loops vs. Local Instruments

X400# Document Id: 0042
Item 3685050 02/JAN/02 17:44

From: LAURA MYERS, PROJECT ENGINEER, OLYMPIA CHEMICAL CORPORATION
To: ARTHUR CROSLEY, PROJECT MANAGER, MILESTONE CONSTRUCTION

Subject: Instrument Loops vs. Local Instruments

Arthur,

I have said repeatedly that a major problem exists in Milestone Construction's numbering and representation of instruments on the P&IDs. Please make this the last time I have to call attention to this continuous problem.

The P&ID drawings are not fit for use according to our specs because of this.

ALL INSTRUMENTS WHICH ARE POWERED MUST HAVE LOOP NUMBERS AND THEREFORE MUST HAVE LOOP DRAWINGS ASSOCIATED WITH THEM.

EXAMPLE: PX-MH-3576, FL-MA-9878
- THIS INCLUDES ALL SIGNALS TO AND FROM THE DCS
- AND ALL INSTRUMENTS ON PACKAGES (with a few approved exceptions)
- AND ALL SIGNALS TO AND FROM PLCs
- AND ALL PANEL MOUNTED SIGNALS
- AND ALL LOCAL OR REMOTE POWERED SIGNALS

INSTRUMENTS WHICH DO NOT HAVE POWER SUPPLIES REQUIRE LOCAL INSTRUMENT TAGS PER OUR JOB SPECIFICATION. THEY DO NOT REQUIRE LOOP DRAWINGS.

Please correct these problems immediately. All of the current packages are wrong in their numbering and representation of instrument and control logic.
Please follow the key drawing for graphical representation.

Sincerely,

Laura Myers
Project Engineer
Olympia Chemical Corporation

RETURN

M11953

MILESTONE
CONSTRUCTION

ISSUE DATE: 27-Aug-02

TO: I. MOORE

FROM: V. SANDOVAL

CC: J. ALLEN
R. DENSON
J. BELL
M. OWENS

SUBJECT: CONTRACT:
OLYMPIA WWTP
PUMP FABRICATION DELAYS

The inspection report of August 14, 2002 indicates delays in the delivery of three pumps. Apparently, the problem, according to the vendor, is that they were not informed by their sales representative of the required delivery dates that appeared on the purchase order.

PUMP DESCRIPTION	REQUIRED EX-WORKS	ACTUAL EX-WORKS	DELAY DAYS
EFFLUENT/CHANNEL SAMPLE PUMP	1-Mar-02	5-May-02	65
WWT AREA SUMP PUMP	19-Jun-02	16-Jul-02	27
RETENTION POND EMERGENCY PUMP	10-Jun-02	16-Jul-02	36

VNS

RETURN

M30217

OLYMPIA CHEMICAL CORPORATION

Inter Office Correspondence

Letter No: OCC/MC – 801
File No: **7.3**

Date: September 18, 2002

TO : Arthur Crosley

FROM: Kevin Mathews

SUBJECT: OLYMPIA WASTEWATER TREATMENT PLANT CONCRETE BASIN TESTS

Dear Mr. Crosley:

The Waste Water Treatment concrete basins were hydro-tested previously and were found to have leaks. A coating has been applied to stop the leaks, and some of the internals have been installed. However, a final hydro-test has not been performed to certify the basins. In order to prevent delays in the transition process due to the removal of internals in the event further leaks are found, I would like for you to perform the required hydrostatic stand tests as soon as possible to confirm the integrity of the basins.

Olympia Chemical Corporation representatives wish to witness these tests, so please notify me of the date once it is arranged.

Sincerely,

Kevin Mathews

Kevin Mathews
Engineering & Construction Manager

RETURN

O34629