MDOT

WORK ITEM PRODUCTION RATES FOR MDOT PROJECTS

FINAL REPORT – JUNE 2002

TESTING AND RESEARCH SECTION
CONSTRUCTION AND TECHNOLOGY DIVISION
RC-1419
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MichiganTech

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ABSTRACT:

The Michigan Department of Transportation (MDOT) utilizes production rates from the MDOT Construction Manual to estimate overall contract time duration on new construction projects. These published rates are of unknown origin and date, and often underestimate what current MDOT contractors can achieve. This leads to excessive contract time granted to contractors in many cases, leading to increased user delays and inconvenience to the traveling public.

This research project examined the use of existing MDOT FieldManager software data for extracting historical production rates with a Microsoft Access database. Crush and shape and passing relief lane type contracts from the 1999 and 2000 construction seasons in the Upper Peninsula were used as trial data for the project. Production rate data was found to be available from the FieldManager construction inspection records. A practical procedure was developed for MDOT to create and maintain a database of historical production rates. Testing the production rates developed against a completed MDOT project revealed a problem with the accuracy of applying the production rates to determining contract durations. Additional research for the application of these historical production rates for estimating durations of contracts is needed. It is believed that recording additional work item time data in FieldManager will improve production rate accuracy. A discussion of the results and recommendation for future work are included in order to effectively implement the procedure in future MDOT practice. A brief review of the procedures used in other state DOTs is also included.

CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

The Michigan Department of Transportation (MDOT) is the government agency responsible for transportation planning, design, construction, maintenance, and operation in the state of Michigan. As such, it is also ultimately responsible for the scheduling of construction projects within the state. Different types of projects require varying amounts of detail to be included in their construction schedules, however, all projects require that an initial engineer's estimate of the overall contract time be performed. The determination of the overall contract time is performed in order to judge the amount of time that should be required to complete the project. Ultimately, this time determination is incorporated into the bidding documents as a date that the project must be completed. This time length also serves to check the contractor's submitted schedule in order to assure MDOT and the citizens of Michigan that the contractor will perform the construction in a reasonable amount of time, without providing undue delays on the road users.

1.2 MDOT STRUCTURE

MDOT is currently organized in a decentralized structure, with the main office in Lansing, Michigan. The state is then divided into seven regional offices to serve different geographic regions, and each region has three to five Transportation Service Centers (TSCs). These TSCs provide focused contract administration and some design services for the MDOT projects in the immediate geographic area covered by the TSC. This structure allows for each TSC to develop expertise in the issues and challenges faced by each area, as well as to develop a closer relationship with the citizens and the contractors that work in the area served by the TSC. The Upper Peninsula is the Superior Region, and TSCs are located in Crystal Falls, Ishpeming, Escanaba, and Newberry. The Regional Office is also located in Escanaba. Each region of the DOT has a Region Engineer in charge; and each TSC has a Manager in charge of the area serviced by that TSC. As a result of this organizational structure, each TSC and each Resident Engineer have knowledge and techniques unique to their area. This structure can provide benefits to the construction process and to the road users, however, this decentralized structure can have negative consequences because of the

potential lack of standardized practices. Difficulties with sharing this local knowledge and documenting assumptions and local conditions may arise.

1.3 SCHEDULING

Scheduling is a critical component of the administration process for all types of construction. Scheduling provides all parties in the construction process with a timeline to major events and completion of the project. Road construction projects have an added incentive for proper scheduling in that they are typically very visible to the public, and are most often publicly funded projects. This makes the citizen both a partial owner and a critical eye of the construction process. Inaccurate initial scheduling can lead to either excessive or restrained timelines for the contractor. Both cases have detrimental impacts upon the public. Excessive contract time can lead to higher user costs for the roadway system, increased exposure to safety hazards for both the traveler and the construction workforce, and increased agency costs for the contracting authority. Restricted time schedules can also have negative impacts, such as raising bid costs and preventing smaller eligible contractors from bidding on the project. ("Construction", 1991)

1.3.1 Production Rates

Production rates provide a means for relating the quantity of work performed to the time it takes to do that unit of work. An example of a production rate is that a construction crew might be able to excavate an average of 1300 m^3 of earth per day. Many factors can affect the actual production rate on a particular job, such as geographic location, weather conditions, equipment and construction methods used, size of job, and worker skill, among others. Although production rates can widely vary for the same item of consideration, a typical approach for estimating contract durations is to use an average value that may be applied throughout the whole project. Production rate data can be obtained from several sources, such as published cost and productivity databases, construction personnel using past experience and engineering judgment, historical records from similar projects, and more sophisticated models to predict production rates based upon a number of input factors. More information on production rate determination can be found in Chapter 2.

1.3.2 Controlling Items

Controlling items are defined as those items that are located on the critical path of a project schedule. Controlling items are also known as critical items. This means that any delay in completion of the controlling items will delay the overall completion date of the project. Controlling items are typically the only activities listed in the MDOT Progress Schedule, as discussed in Section 1.3.3 below. The production rates used for controlling items are especially important, as these items are the key to completing a project on time, or in planning they determine the completion date.

1.3.3 MDOT methods

Currently, MDOT lists production rate data in the Preconstruction Administration section of the 1998 Construction Manual, under Division 1 – General Provisions ("Michigan", 1998). An example of the production rate data is shown below in Figure 1-1.

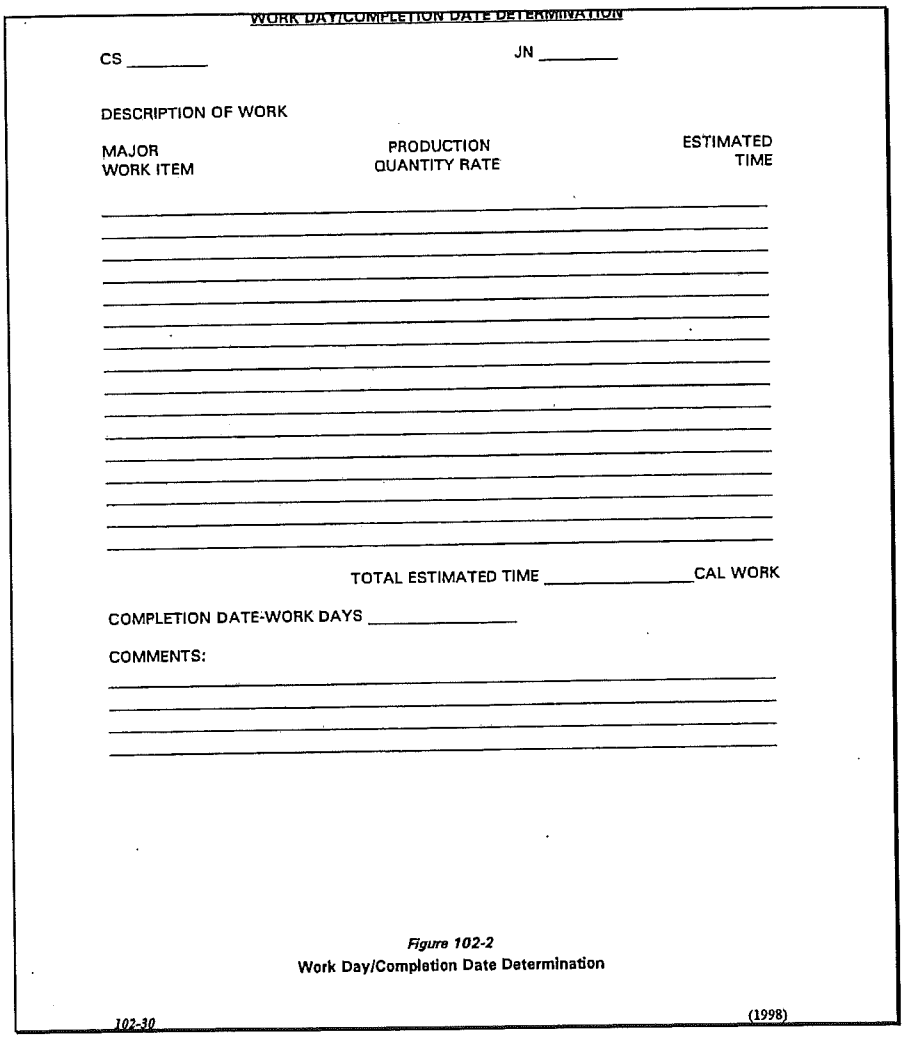
Although this data can be a helpful reference for MDOT employees, the origin and date of the data is not currently known. MDOT personnel have found that many of the rates are inaccurate and do not represent what Michigan contractors are routinely capable of achieving (Sikkema, 2001). With recent technological advancements in construction and increased pressure on contractors to perform faster, many of the rates listed in the Construction Manual have proven to be under-representative of actual production rates. This situation can lead to increased contract time allowance for contractors, which creates more user delays and more exposure for Michigan's commuters to ongoing construction projects.

Earthwork and Grading		
Work Item	Metro Exp Time	Rural Time
Embankment (CIP)	1500 m^3/day	5300 m^3/day
Excavation and/or Embankment (Freeway)	1500 m^3/day	9200 m^3/day
Excavation and/or Embankment (Reconst)	750 m^3/day	3800 m^3/day
Embankment (Lightweight Fill)	300 m^3/day	600 m^3/day
Muck (Excavated Waste and Backfill)		1500 m^3/day
Excavation (Widening)		600 m^3/day
Grading (G and DS)		750 m^2/day
Subbase and Selected Subbase (up to 7.4 m)		600 m^3/day
Subbase and Selected Subbase (7.4 m and over)		450 m^3/day
Subgrade Undercut and Backfill		1500 m^3/day
Subbase and Open-Graded Drainage Course		450 m^3/day

Figure 1-1: Example MDOT Production Rates

When MDOT is preparing to let a contract for bidding, the resident engineer makes an estimate of the overall contract time. This contract time duration is determined by utilizing either the published production rates from the Construction Manual, or updated production rates that the resident engineer may have kept for his/her own records. Currently there is no standardized method for resident engineers to update their production rates from past projects. The responsible engineer must examine the type and scope of the project to determine the controlling work items and associated quantities, then he/she must determine which production rates to use for estimating. This information is then used along with the "Work Day/Completion Date Determination" worksheet found in the construction manual to compute the amount of days required for each controlling item. (Refer to Figure 1-2 below.) The days for each item are then added in order to find the overall time required for the project. MDOT allows overlapping controlling items on projects in which Special Provision FUSP102(I) is utilized (FUSP102(I), 1996). Thus a simple addition of the days

required for the individual controlling items in a project is sufficient for all contracts except those that use Special Provision FUSP102(I). Projects that utilize this special provision require consideration of overlapping activities on the multiple critical paths of the schedule.



WORK DAY/COMPLETION DATE DETERMINATION

CS _____ JN _____

DESCRIPTION OF WORK

MAJOR WORK ITEM	PRODUCTION QUANTITY RATE	ESTIMATED TIME

TOTAL ESTIMATED TIME _____ CAL WORK

COMPLETION DATE-WORK DAYS _____

COMMENTS:

Figure 102-2
Work Day/Completion Date Determination

102-30 (1998)

Figure 1-2: MDOT Work Day/Completion Date Determination Worksheet

All MDOT contracts require a Progress Schedule to be submitted by the contractor and this becomes part of the contract documents. The contractor must submit the progress schedule on Form 1130, shown in Figure 1-3 below, unless a Critical Path Method (CPM) schedule is required on the project. This submission is generally done at the Preconstruction meeting between the contractor and MDOT. The contractor's proposed schedule is compared to the number of days that the MDOT resident engineer has calculated. If the

resident engineer believes that the contractor's duration is excessive, he will negotiate with the contractor for a new schedule to be submitted. Once the schedule is agreeable to all parties, it becomes part of the contract documents.

Michigan Department of Transportation
1130 (03/2001)

PROGRESS SCHEDULE

information required by MDOT in order to establish a construction schedule.

Distribution: Original - Finance/Contracts, copy - Region, copy - Project files

FILE 102

CONTROL SECTION	JOB NO.	☐ INITIAL ☐ UPDATE

OUTLINE OF PROPOSED ORDER OF WORK FOR CONTROLLING WORK ITEMS - when approved, this outline will become part of the contract.

CONTROLLING WORK ITEM ☐ CALENDER DAY ☐ WORK DAY ☐ CALENDER DATE	ATTACHMENT ☐ CRITICAL PATH ☐ BAR CHART ☐ LINEAR SCHEDULE	DURATION OF CONTROLLING OPERATION START (Date/Work Day)	 COMPLETE (Date/Work Day)

REMARKS

CONTRACT COMPLETION WORKDAYS	Conformance with progress clause and proposal (Maintain traffic requirements) ☐ Yes
OPEN TO TRAFFIC DATE(S) WORKDAYS	Overlapping dates? ☐ No ☐ Yes, If yes, attach justification.
A + B bid? ☐ No ☐ Yes, If yes, enter date(s):	If A + B bid or rental (lane/bridge/ramp), is schedule in accordance with contract? ☐ Yes
Lane/Bridge/Ramp rental ☐ No ☐ Yes	Incentive/ Disincentive? ☐ No ☐ Yes If yes, enter maximum total incentive amount: $
CONTRACTOR NAME (PRINT)	LOCAL AGENCY — DATE
CONTRACTOR SIGNATURE — DATE	APPROVAL - MDOT'S ENGINEER FOR REGION (Signature) — DATE

Figure 1-3: MDOT Form 1130

1.4 GOALS OF RESEARCH

The goal of this research project was to determine if typical production rate data could be extracted from the historical information contained in the FieldManager software data. If this data is available, a practical procedure would be developed to extract this data for MDOT to update their production rate documentation regularly. The intention is to develop average production rates based upon a normal 8 hour working day to estimate contract durations for MDOT projects. Updated production rate data could prove valuable in the contract time determination process for MDOT to ensure that the estimated contract time is actually representative of what contractors can achieve on MDOT projects.

CHAPTER 2: BACKGROUND

As part of this research project, a literature review was completed to determine current methods used to estimate production rates and contract durations. To accomplish this review, two tasks were completed: a review of published studies relating to this research project, and a review of the current procedures used in several other state DOTs.

2.1 LITERATURE REVIEW

Several studies related to contract time determination were reviewed for this research project. Although the scope of this research project was not to develop a new contract time determination system for MDOT, these studies are closely related to the research project and contain useful information for the MDOT's consideration. The U.S. Department of Transportation Federal Highway Administration (FHWA) published an important report to this research project in 1991. The report *Construction Contract Time Determination Procedures* outlines the factors involved in determining contract time and also discusses many of the procedures that may be used to establish overall contract time on highway transportation construction projects ("Construction", 1991). This document defines contract time as "the maximum time allowed in the contract for completion of all work contained in the contract documents." The document also requires all State Highway Agencies (SHA) to have adequate written procedures for determination of contract time to be approved by FHWA by six months after September 3, 1991, the effective date of final rule of Title 23, Code of Federal Regulations, Part 635. The essential elements in determining contract time are listed as: establishing production rates for each controlling item, adapting production rates to a particular project, and computation of contract time with a progress schedule. The document provides some guidelines for establishing production rates, including "production rates ranges should be established in the State's procedures based upon the size, type (grading, structures, etc.), and location (urban or rural) for controlling items of work." The recommendation is made to establish production rates based upon an accurate database of normal historical rates of efficient contractors, based upon an 8 hour day or per piece of equipment. It is noted that the most accurate data will be collected from site visits or review of recent documents where the contractor's efforts are clearly documented. A data file of

three to five years of historical data should be used. The report also notes that "rates should be updated regularly to assure they accurately represent the statistical average rate of production in the area." The report specifies that production rates should be adapted to a particular project by considering the urgency of the project, the traffic volumes and effects of detours, size and location of the project, availability of materials, and the effects of different levels of commitment from the contractor. The report also notes that special production rates may need to be developed for projects that are crucial and that may need to be expedited. The report contains many more suggestions and recommendations relating to contract time determination and techniques.

Another FHWA document contains a more extensive discussion of scheduling and contract time determination practices among various state DOTs in the United States (Thomas et al., 1985). This document contains a discussion of the factors that affect contract time, methods for determining contract time, activity durations and sequencing, conversion of working days to calendar days, responsibility for determining contract time, and a discussion of problems that may arise with completion times on projects. Herbsman and Ellis (1995) provide another reference for contract time determination. This document discusses the factors that affect contract time, the contract time determination process, and other relevant topics. A similar discussion was found in Thomas (Thomas et al., 1985).

2.1.1 Computerized Contract Time Determination Systems

Several state DOTs have developed computerized contract time determination systems. Kentucky, Louisiana, and Texas have developed computerized methods based upon templates of typical controlling work items for several different classes of job types. The Texas Transportation Institute research report *Construction Contract Time Determination* documents the construction of the Texas DOT Contract Time Determination System (CTDS) (Hancher et al, 1992). Based upon fourteen different classes of highway construction projects and the entry of quantities for controlling work items, the CTDS develops a bar chart schedule to predict contract time. The computerized method was developed to work with Lotus 123, Flash-Up, and SuperProject software. A provision in the report was also made for manual determination of contract time in a related procedure. Data for production rates was solicited from other state DOTs, Texas highway contractors, and a survey from Texas DOT personnel. Production rate data was unable to be collected from

contractors, and base production rates were developed from a combination of other state's rates and the rates supplied by Texas DOT personnel. Initial production rate data was listed for average, high, and low production rates. Next, a list of relevant sensitivity factors was developed for use as multipliers of the base production rates, including: location, traffic conditions, complexity, soil conditions, and quantity of work. Default adjustment factors ranged from 1.00 to 0.65, with the note given that users may develop their own adjustment factors if desired. It is noted that the adjustment factors are correlated and not truly independent, hence a maximum of two adjustment factors are recommended to be applied to base production rates. This helps prevent inaccuracies due to the interactions and overlap between the adjustment factors. The system computes contract time in work days, with a note that the user may later convert the work days to calendar days if desired.

The Louisiana Transportation Research Center developed a related system by using a program developed with Lotus 123 Release 5 macro language (McCrary et al, 1995). This system is based upon 23 different templates, along with production rates developed from review of approximately 100 completed construction projects. A discussion of the research project's recommendations revealed that "the greatest portion of time and effort for this research project was dedicated to determining verifiable production rates based on data obtained from recently completed construction projects." To improve upon this process, it was recommended that the Louisiana DOT adopt an automated system for collecting work progress information. This recommendation has already been met in Michigan with MDOT's use of FieldManager software.

The Kentucky Transportation Center developed a computerized, template based contract time determination system for the Kentucky Transportation Cabinet (KTC) (Werkmeister et al, 2000). This system was similar to the Louisiana system, with differences of utilizing only 6 project templates and using Microsoft Project 98 and Microsoft Excel 7.0 software. Design quantities are input to a Microsoft Excel template file for relevant work items, then applied to default production rates contained in the system. Calculated activity durations are then developed in Excel and passed on to Microsoft Project for application of scheduling logic and development of a bar chart schedule. Both the production rates used and the calculated activity durations can be manually updated by the system user if desired. Section 2.2.2 below details additional information on this system.

2.1.2 Production Rate Calculations

As a result of and an extension of the work done by McCrary et al in 1995, Leslie examined four different methods of determining production rates from historical quantity records (Leslie, 2000). Thirty-six historical Louisiana Department of Transportation and Development (LaDOTD) rural asphaltic concrete overlay projects were used to generate and validate the production rates. Quantities for relevant work items were determined from construction inspector's daily report information and from the project's final pay estimate. Quantities from these two sources were compared, with a result of either daily quantities were estimated for every day of work, or daily quantities were not estimated for every day of work. Modifiers were applied to the daily quantity data if necessary in order to account for all quantities from the final pay estimate. Since no information was contained in the inspection records of time for each work item, four different methods of assigning time values to the associated quantities were developed. These methods were "based upon logically assumed relationships between quantity values and time values." Method 1 assigned a full day to each daily quantity, which gives the mean of the daily production rates. Method 2 compared the daily quantity with the mean value and applied a correction factor of the daily quantity/mean to a value of 1 day's time if the daily quantity was found to be less than or equal to the mean. If the daily quantity was greater than the mean, a time of 1.0 day was applied. Method 3 assigned a time value of 0.5 days if the daily quantity was less than or equal to the mean. A time value of 1.0 day was applied again if the daily quantity was greater than the mean. Method 4 assigned times in increments of 0.5 days depending upon the relationship of the daily quantity to the mean. For values of the daily quantity between 0.5 X mean to 3.0 X mean and greater, the time values ranged from 1.0 day to 3.0 days maximum. For values of the daily quantity less than 0.5 X mean, the time value was modified similar to the equation in method 2. Refer to Figure 2 – 1.

- Method 1: Time = 1.0 day

- Method 2: If Quantity ≤ Mean:

$$Time = \frac{Daily\_Quantity}{Mean} * 1day$$

If Quantity > Mean: Time = 1.0 day

- Method 3: If Quantity ≤ Mean: Time = 0.5 day

If Quantity > Mean: Time = 1.0 day

- Method 4: If Quantity ≤ 0.5*Mean:

$$Time = \frac{Daily\_Quantity}{Mean} * 1day$$

If 0.5*Mean < Quantity ≤ 1.5*Mean: Time = 1.0 day

If 1.5*Mean < Quantity ≤ 2.0*Mean: Time = 1.5 days

If 2.0*Mean < Quantity ≤ 2.5*Mean: Time = 2.0 days

If 2.5*Mean < Quantity ≤ 3.0*Mean: Time = 2.5 days

If Quantity > 3.0*Mean: Time = 3.0 days

Figure 2-1: Time Calculations for Leslie Methods

After development of production rate data by the above methods, these production rates were applied to each of the 36 projects used to calculate the production rates in order to generate contract times. Contract time data was also available from the LaDOTD's original estimate, as well as the actual construction duration. Contract times were developed from the four production rate methods by utilizing the software program developed by McCrary et al (1995). This software develops two contract times for each production rate method: one contract time considers item overlapping, while the other method assumes all work items are performed sequentially and sums all individual item durations. Two data sets of contract times were created from this program: data set A considers overlapping activities, while data set B considers a summation of work items. A statistical analysis was performed to determine if there was a significant difference produced between the different contract

time methods. A significant difference was found to exist, and additional statistical analysis was performed to study the individual production rate methods. It was found that the mean production rates of method 1 most closely matched the actual contract times when the contract times were based upon concurrent work activities. When contract times were based upon sequential work activities, method 4 produced contract times which most closely matched the actual durations. Finally, the contract times of data set A and data set B were compared to the actual duration. Method 4 of data set B was found to have the overall best match with the actual contract time. The report notes that although method 4 produced the best match for the actual contract time, method 1 may still be the best overall method to use. This was attributed to the ease of computing mean production rates when compared with the noted minimal precision gained by utilizing method 4.

The report concludes that LaDOTD should continue to use mean production rate values in conjunction with their Contract Time Determination System software to develop contract times. The report concludes with recommendations to LaDOTD for future improvements in the contract time determination process, including the development of a computerized system of daily inspection reporting. A recommendation is included for the LaDOTD to consider requiring contractors to report daily quantities and daily production rates for their construction projects with LaDOTD. An additional recommendation is made for the LaDOTD to perform periodic checks of current production rate information.

Ellis performed a study to present the concept of a factorial model for explaining variance in construction production rates (Ellis, 1989). This study utilized a SAS software package to develop a detailed statistical model to quantify some of the factors that affect construction production rates. Performing a model of this detail was beyond the scope of this research project. The data gathering process for this research project could be utilized to create a database for development of a similar model for MDOT's use.

Herbsman and Ellis (1998) also performed a detailed study for the Florida Department of Transportation (FDOT) to examine their current production rates and recommend revisions where needed. This research project involved collecting data from production rates used by other DOTs, a field survey of production rates from FDOT projects, and discussions with FDOT contractors. The field observation data collected for each work item generally included the total quantity of work in the job, the date, quantity and number of hours worked for each of five individual work observations, and a record of

which factors may have had an effect upon the production, such as weather, traffic, insufficient manpower or equipment, and phasing of work required by contract. This study is an excellent example of a detailed statistical development of production rates, although the actual production rates developed by this study are now somewhat dated and may not be applicable.

2.2 STATE DOT REVIEWS

Personnel from several other state DOTs were contacted by the research team to determine some of their current production rates and contract duration determination procedures. Appendix B contains additional detail on the data gathered from these sources.

2.2.1 Iowa

According to the Iowa DOT document "Letting Guidelines", the Iowa Office of Contracts establishes contract time periods with input from field offices (Iowa, 2002). Average production rates are supplied in this document that are then utilized to evaluate the number of days needed for each item of controlling work. The reviewer must then apply his/her knowledge to the project to determine the overlap of concurrent operations. This step then leads to a calculation of the total number of working days required for the project, listed on the proposal/contract in increments of 5 days. The Iowa Estimate of Time Required Form allows for documentation and relevant comments to be recorded for the contract time establishment procedure. The type of contract period must then be selected from the following types: Specified Start Date, Approximate Start Date, Late Start Date, and Completion Date. Refer to Appendix B for more information.

The Iowa DOT employee Mr. Jack Krandel provided information that the production rates listed in the "Letting Guidelines" document were established approximately ten years ago, and are updated "at any time that our office feels a different rate is justified. The Letting Guidelines are printed once a year along with our yearly printing of standard bid items." (Krandel, 2002).

2.2.2 Kentucky

Mr. Donn E. Hancher provided additional information regarding the Kentucky Transportation Cabinet's use of the Kentucky Contract Time Determination System (Hancher, 2002). He provided that the Kentucky Transportation Cabinet (KTC) had implemented and tested the system within the state. He reports that the system "tightened up on the contract times, but can always be overridden by the user with their own production rates or just insert the times they want used." Mr. Hancher also provided the research team with a copy of the Microsoft Excel template files that were developed for the system. These template files contain default production rates for the necessary items. The production rates were specifically developed to support conceptual estimating and include supporting items necessary to complete the major work items.

Mr. Hancher also provided copies of the "KY-CTDS Operating Manual" and "Final Report KY-CTDS Kentucky Contract Time Determination System (KYSPR-99-195)" documents. Section 5.0, Development of a Conceptual Project Planning System for KYTC Projects, details the development of the model and production rates used. A study advisory team was constructed with members from the KTC and the University of Kentucky. A subset working committee of members with significant construction experience was selected. Only activities that were on the critical path, or could ever possibly become part of the critical path, were selected for inclusion in the templates. The report notes that difficulty was encountered by the research team to set aside all other project activities and focus on the project duration controlling activities. English units of measure were selected as the standard due to the Kentucky Transportation Cabinet's standardization with English units. Activity relationship logic levels were next determined in the form of listing the preceding activities for each item and the percentage required of the preceding item completed to start the new item.

Selecting default production rates for the systems was accomplished through debate and discussion among the members of the research working committee. The committee agreed to set default production rates with the understanding that the local districts of KTC could adjust these default rates for their needs. A total of forty different controlling activities were estimated with default production rates. These rates were then compared to old production rates from KTC's previous contract time determination system. The old rates

were discarded with the reasoning that they were too generous for contractor time. The new rates were then tested on recently completed highway projects with the result that the durations would have been challenging to the contractor but within reason.

The next task assigned a range of values for consideration in setting the actual production rates used in the system. A lower and an upper limit on the average production rates were created based upon the size and location of the job, the type of soil conditions and topography, and the complexity of the job.

The remainder of the final report details the development of the link between Microsoft Project and the Excel project templates, along with other details of the software development and implementation.

2.2.3 Wisconsin

The State of Wisconsin Department of Transportation Facilities Development Manual provides guidelines for Contract Time for Completion ("Facilities", 2000). This document defines key terms, lists procedures to establish contract time, lists factors affecting contract time, and includes estimated production rates for computing contract time. A note is given that production rates should be adjusted to meet the conditions of each individual contract. Relevant factors that affect production rates are listed as size of work areas, time of year constructed, and congestion due to traffic, etc. Appendix B contains a copy of this document for reference.

Mr. Richard R. Filsinger of the Wisconsin Department of Transportation Bureau of Highway Construction provided the research team with the document. Mr. Filsinger also provided that the current document was the first publishing of production rates, and that these rates had hence not been updated yet (Filsinger, 2002). He stated that Wisconsin DOT districts may have their own production rate records on file, but no centralized updating of records had taken place currently. Mr. Filsinger was unaware of the individual(s) responsible for development of the rates currently listed in the Facilities Development Manual.

2.2.4 Illinois

Production rate information was also obtained from the Illinois DOT. The rates are intended to be applied to a normal 8-hour workday. A listing of the production rates and notes for their application appears in Appendix B.

2.2.5 Florida

Production rate information was also obtained from the Florida DOT. A listing of the production rates and guidelines for establishing contract durations appears in Appendix B. ("Establishing", 1999 and "Guideline", 1994)

2.2.6 Indiana

As a final comparison for related production rate information, the Indiana Department of Transportation also provided the research team with current production rate information (Bertram, 1997) The production rates and notes for their application are included in Appendix B.

CHAPTER 3: FIELDMANAGER SOFTWARE

In the early 1990's MDOT realized the need for a computerized contract administration database system. An early version of the system called CPRKS was developed in-house by MDOT. MDOT currently utilizes a personal computer (PC) based contract administration software system called FieldManager, developed in conjunction with Info Tech, Inc. from Gainesville, Florida. This award winning software has been adopted with great success in recent MDOT practice (Overby, 2001 and Couto, 2001). FieldManager is utilized for recording Inspector's Daily Reports (IDRs), daily diaries, contract item documentation, contract material documentation, material stockpile quantities, pay estimates, contract modifications, and other important contract information. Figure 3 – 1 presents an example of the FieldManager list of IDRs. Numerous inquiries are also available to provide for additional presentation options of the data recorded in the FieldManager files. Inspector's Daily Reports are the primary source of recording data from construction in the field through the MDOT field inspectors. Figure 3 – 2 presents an example IDR from MDOT contract 75022-45618. Daily diaries are intended for documentation from the office personnel at the job's corresponding TSC to clarify or provide more detail on a job for a particular day. The pay estimates function of FieldManager allows for recording and tracking which items have been approved for payment to contractors. The contract modifications function allows for data entry and recording of contract modifications that are necessary for the completion of the project and the contract administration. The other remaining functions of FieldManager serve to present and organize the information entered through the IDRs, daily diaries, pay estimates, and contract modifications.

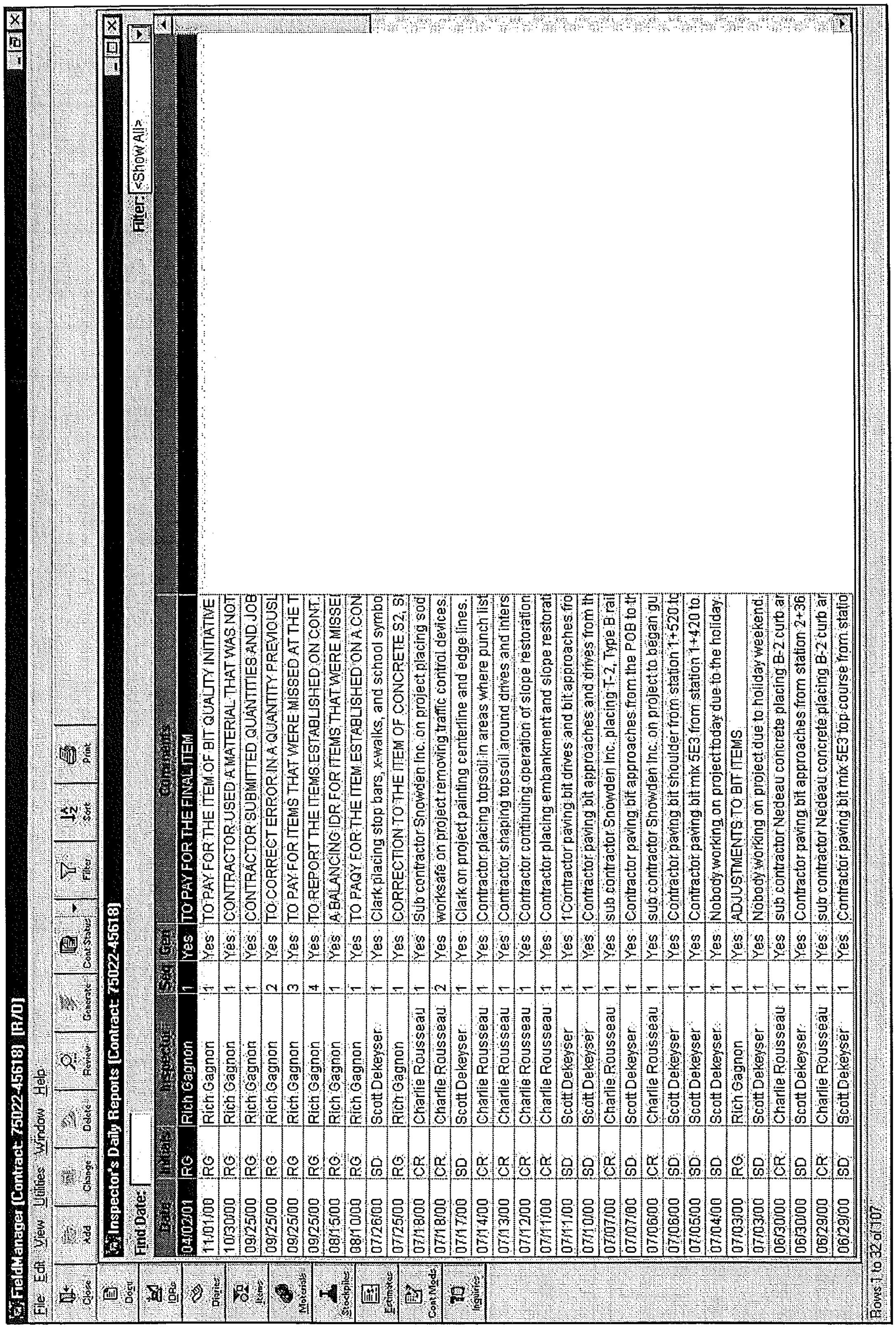
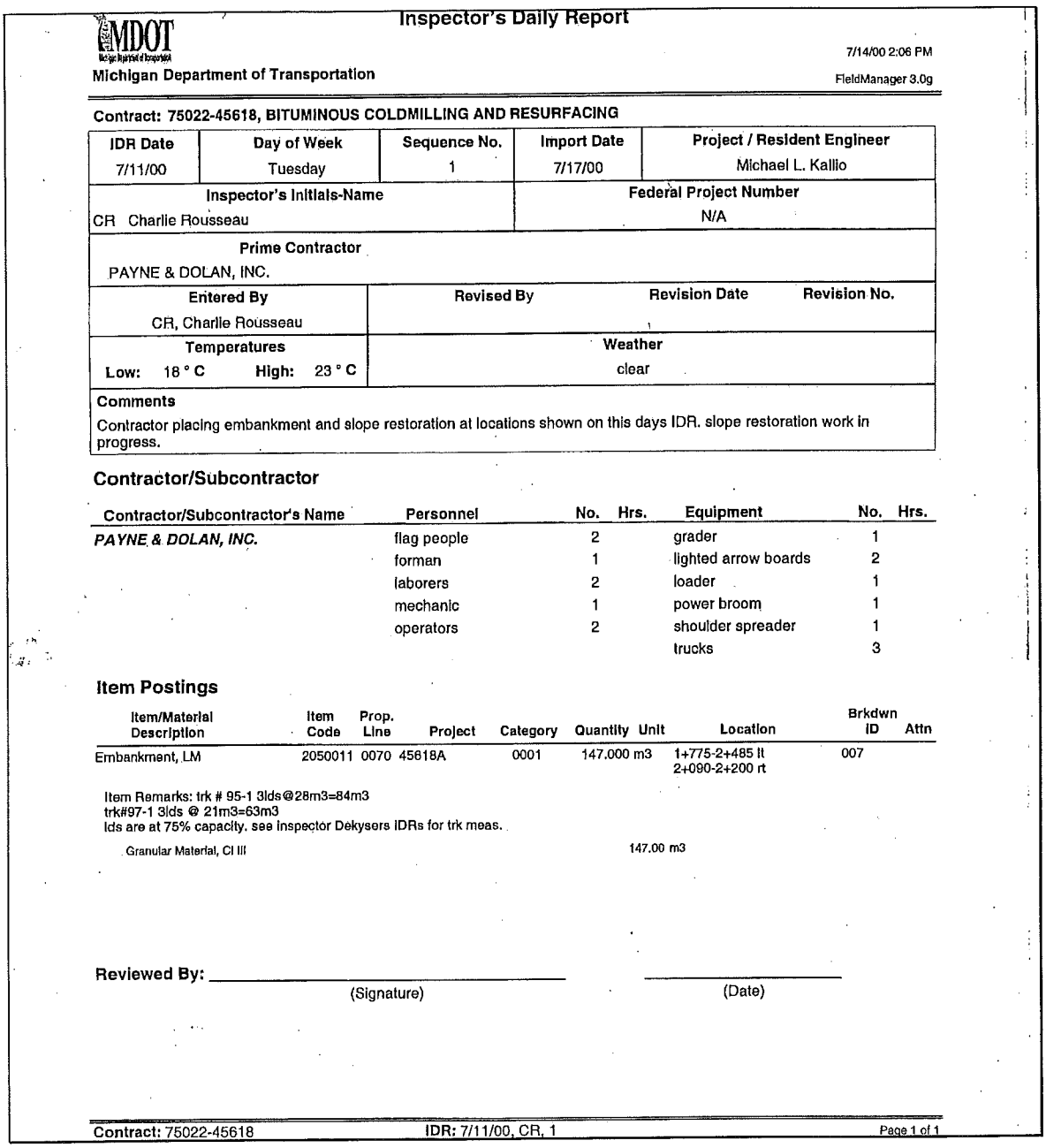


Figure 3-1: Example FieldManager Screen



MDOT

Michigan Department of Transportation

Inspector's Daily Report

7/14/00 2:06 PM

FieldManager 3.0g

Contract: 75022-45618, BITUMINOUS COLDMILLING AND RESURFACING

IDR Date	Day of Week	Sequence No.	Import Date	Project / Resident Engineer
7/11/00	Tuesday	1	7/17/00	Michael L. Kallio

Inspector's Initials-Name	Federal Project Number
CR Charlie Rousseau	N/A

Prime Contractor

PAYNE & DOLAN, INC.

Entered By	Revised By	Revision Date	Revision No.
CR, Charlie Rousseau			

Temperatures	Weather
Low: 18 ° C High: 23 ° C	clear

Comments

Contractor placing embankment and slope restoration at locations shown on this days IDR. slope restoration work in progress.

Contractor/Subcontractor

Contractor/Subcontractor's Name	Personnel	No.	Hrs.	Equipment	No.	Hrs.
PAYNE & DOLAN, INC.	flag people	2		grader	1	
	forman	1		lighted arrow boards	2	
	laborers	2		loader	1	
	mechanic	1		power broom	1	
	operators	2		shoulder spreader	1	
				trucks	3	

Item Postings

Item/Material Description	Item Code	Prop. Line	Project	Category	Quantity	Unit	Location	Brkdwn ID	Attn
Embankment, LM	2050011	0070	45618A	0001	147.000	m3	1+775-2+485 lt 2+090-2+200 rt	007	

Item Remarks: trk # 95-1 3lds@28m3=84m3
trk#97-1 3lds @ 21m3=63m3
lds are at 75% capacity. see inspector Dekysers IDRs for trk meas.

Granular Material, Cl III 147.00 m3

Reviewed By: _____ (Signature) _____ (Date)

Contract: 75022-45618 IDR: 7/11/00, CR, 1 Page 1 of 1

Figure 3-2: Example FieldManager IDR

FieldManager is part of a suite of related software products, including FieldBook, FieldPad, FieldBuilder and FieldNet. Together, these products allow state DOTs to manage their contracts and maintain electronic documentation of these projects. Other state DOTs that currently use FieldManager in a manner similar to MDOT are Oklahoma, Maine, Wisconsin, and Iowa (Baldwin, 10 April 2002).

3.1 CURRENT MDOT USE

MDOT has a considerable amount of time, money, and training invested in this software system. As an example, all of the MDOT inspectors have been issued a laptop computer with FieldBook software, a companion subset of FieldManager developed to automate the data entry process for field construction inspectors. The field inspectors utilize FieldBook to enter their IDRs. These are used to document important job conditions and activities, such as the day's weather conditions, the inspector's comments, which contractor(s) were working, which equipment was used on site and their quantities and hours, which personnel were on site and their number and hours, the material quantities placed, and the location(s) of work activity.

FieldManager operates in a client/server network system on MDOT computers throughout the state. This means that MDOT client computers with FieldManager at TSCs can communicate and share information with MDOT server computers to provide centralized payment estimates and other functions for jobs.

3.2 TRAINING

Basic training in the use of FieldManager software for the research was conducted at Michigan Technological University in May 2001. This training included the basics of FieldManager use, such as program setup, program navigation, and data entry. This training also introduced the possibility of accessing the FieldManager data with Microsoft Access. Advanced FieldManager training was conducted with InfoTech in Gainesville, Florida on September 11 and September 12, 2001. The Advanced training session included the following topics: Database Fundamentals, FieldManager table structure, ODBC linking of FieldManager with Microsoft (MS) Access, creating Access queries and creating Access reports.

3.3 INTERNAL FIELDMANAGER STRUCTURE

The basic structure and organization of the FieldManager software system is documented in the InfoTech publication *FieldManager System Design Document* ("FieldManager", 2000). This publication includes detailed information on such subjects as

the hardware and software requirements of the system, data flow structure, development process, and internal table and report structure utilized in FieldManager.

Of particular interest to this research project was Chapter 3, FieldManager Reports, as well as Chapter 4, Database. A condensed version of the *FieldManager System Design Document* with these two chapters was obtained at the Advanced FieldManager training session, and served as a useful reference for the development of the MS Access database described below. Section 5.1.2 of this report describes the FieldManager tables and fields that were utilized in this research project.

CHAPTER 4: DATA COLLECTION

Current MDOT FieldManager data files were needed for analysis by the research team in the project. Read-only copies of the FieldManager data files were obtained from MDOT offices for the various contracts studied in this research project as outlined below. These read-only files were then imported into FieldManager software on a computer at Michigan Technological University available to the research team.

4.1 PROJECT SELECTION PROCESS

During the summer of 2001, the research team met with various representatives of MDOT at numerous Transportation Service Centers (TSC's) and regional offices. Projects from the Upper Peninsula were focused upon to facilitate the data collection process and also because of their simplified job complexity compared to many jobs in the Lower Peninsula. Many jobs located downstate require additional restrictions, such as expedited construction, or lane closures that serve to complicate the schedules. To focus upon the underlying data in FieldManager, and as a trial to determine if the data could be collected in the manner desired, these more complicated projects were not selected for this research study. As discussed below in the Data Analysis Chapter, the procedure developed will allow for any job in the FieldManager system to be analyzed, so this restriction upon project complexity will not be a problem for future application of the analysis procedure. Through interviews with the responsible MDOT engineers, it was found that common projects in the Upper Peninsula were "Crush and Shape" and "Passing Relief Lanes" (Sikkema, 2001). Bituminous base crushing and shaping is defined by MDOT as "constructing an aggregate base from an existing bituminous pavement" (MDOT, 1996). Passing relief lane jobs create one or more additional lanes on a roadway to facilitate safe passing of automobiles. Focusing upon common projects such as these may allow for immediate benefit to the Upper Peninsula MDOT personnel upon completion of this study. Compared to other projects such as bridge construction or new freeway construction, the controlling activities are of limited scope and are readily identifiable, which allows for easier analysis.

4.2 Upper Peninsula Jobs

Tables 4 – 1 and 4 – 2 provide details on the projects selected for inclusion in this research project, including the Contract ID number, the TSC responsible for the project, the year of construction, the type of contract, and the type of job. The contracts include all 26 crush and shape and passing relief lane type jobs completed by MDOT in the Superior Region from the 1999 construction season through the 2001 construction season.

Table 4-1: Crush and Shape Type Jobs

Contract	Managing TSC	Year	Contract Type
66021-45097	Crystal Falls	1999	Completion Date
27011-44291	Crystal Falls	2000	Completion Date
27023-45009	Crystal Falls	2000	Completion Date
66032-45050	Crystal Falls	2001	Completion Date
27041-45096	Crystal Falls	2001	Completion Date
22012-47237	Crystal Falls	2001	Completion Date
21032-38007	Escanaba	1999	Completion Date
21031-45612	Escanaba	2000	Completion Date
75022-45618	Escanaba	2000	Completion Date
75021-45610*	Escanaba	2001	Completion Date
07013-34037	Ishpeming	1999	Working Day
52081-38112	Ishpeming	1999	Completion Date
52043-44973*	Ishpeming	1999	Completion Date
52022-50392	Ishpeming	2000	Working Day
31031-44292	Ishpeming	2000	Working Day
07012-45108*	Ishpeming	2001	Completion Date
17062-38019	Newberry	2000	Completion Date
17042-45599	Newberry	2001	Completion Date

* Job is listed as both a Crush and Shape and a Passing Relief Lane project

Table 4-2: Passing Relief Lane Type Jobs

CONTRACT	MANAGING TSC	YEAR	CONTRACT TYPE
75022-47188	Escanaba	1999	Completion Date
55031-51434	Escanaba	2000	Completion Date
75021-45610*	Escanaba	2001	Completion Date
55022-47233	Escanaba	2001	Completion Date
07023-47218	Ishpeming	1999	Completion Date
52043-44973*	Ishpeming	2000	Completion Date
07012-45108*	Ishpeming	2001	Completion Date
49021-44927	Newberry	1999	Completion Date
49023-44989	Newberry	1999	Completion Date
17061-47043	Newberry	2000	Completion Date
49022-47047	Newberry	2000	Completion Date

* Job is listed as both a Crush and Shape and a Passing Relief Lane project

CHAPTER 5: DATA ANALYSIS

5.1 MICROSOFT ACCESS

Microsoft Access is a powerful database management system that is included with some installations of the Microsoft Office software suite. Because many users of the Microsoft Office Suite have little or no knowledge of Access, the following is a brief introduction to terms and concepts necessary to understand the use of Access in this report.

5.1.1 Basics of Relational Database Management Systems (RDBMS)

A database management system (DBMS) is a computer program that records, sorts, and presents data in a flexible manner to the end user. A DBMS is the computer analog to file cabinets containing paper documents, however, computers allow for a much more versatile system than that of file cabinets and paper records. A properly prepared DBMS system can allow for multiple methods of inputting, displaying, manipulating, and presenting data. Microsoft Access is an example of a relational DBMS. Although there are many types of database systems available, the most popular and arguably the best for many systems are *relational* database management systems (RDBMS). RDBMS are comprised of several tables that store different, but related data in a structured method utilizing relationships between the data. Microsoft Access also supports a common computer language called Structured Query Language (SQL), which allows Access to work with other database programs and systems that also support SQL, such as Oracle or MySQL. This can allow for easier portability of data to different systems. Following is a brief discussion of some of the terminology necessary to understand a MS Access database.

A *database* is the overall container for all the data, forms, reports, tables, macros, modules, and queries. A *table* stores the raw data. *Queries* can be used to view, organize, modify, and to perform calculations upon the underlying table data. Further information on queries can be found below. *Forms* can be used to enter, edit, or search the data from tables or queries. They can provide a more user-friendly interface to the database user, limiting the methods of viewing and modifying the data to what is designed to be appropriate for the situation and user. *Reports* are used to organize and publish data from tables and queries, they do not modify the data except to organize and possibly perform summary calculations upon

it. *Macros* and *modules* are used to automate or enhance certain tasks. Macros are typically written to automate frequently used procedures. Modules are more complex and powerful than most macros, and are written in the Visual Basic for Applications language.

Tables are the actual storage container for the data in a database. Refer to Figure 5-1 for a typical MS Access table of FieldManager data. The basic components of a table are the *records, fields,* and *values.* Fields are the most basic unit of a table, as they represent a single category of information. A correctly structured table does not allow for fields to be broken down into smaller useful units. A field in a database may be thought of as analogous to a column of data in a computer spreadsheet program. Fields also define the type of data being stored, as in text, numerical, date, etc. Records are the combination of all the fields of data pertaining to a specific person, thing, or event. Records may be thought of as analogous to a row in a computer spreadsheet program. The intersection of a field and a record results in a value of data from the table, which is the actual data element being stored about the particular entity. A value is analogous to a cell in a spreadsheet program. Most tables contain more than one field, with the number and type of fields being set when the table was created. It is possible to create or delete a field after the table is created, however, it is best to anticipate all the fields needed when creating the tables. A table may have any number of records contained in it, these records may be added or deleted at will by the database user. The order of records in a table is not import to the database design.

A relational database management system typically includes many separate tables that store different information. A fundamental premise of a relational DBMS is to eliminate redundancy of data stored in the database. This is done by logically grouping related information into separate tables, and then linking them back together when needed by using *relationships* and *keys.* Eliminating redundancy allows for easier input and maintenance of data, as the relationships in a properly structured database ensure that all records agree with one another and are current. Correctly structured relational databases also allow for easy modifications with future changes in design requirements.

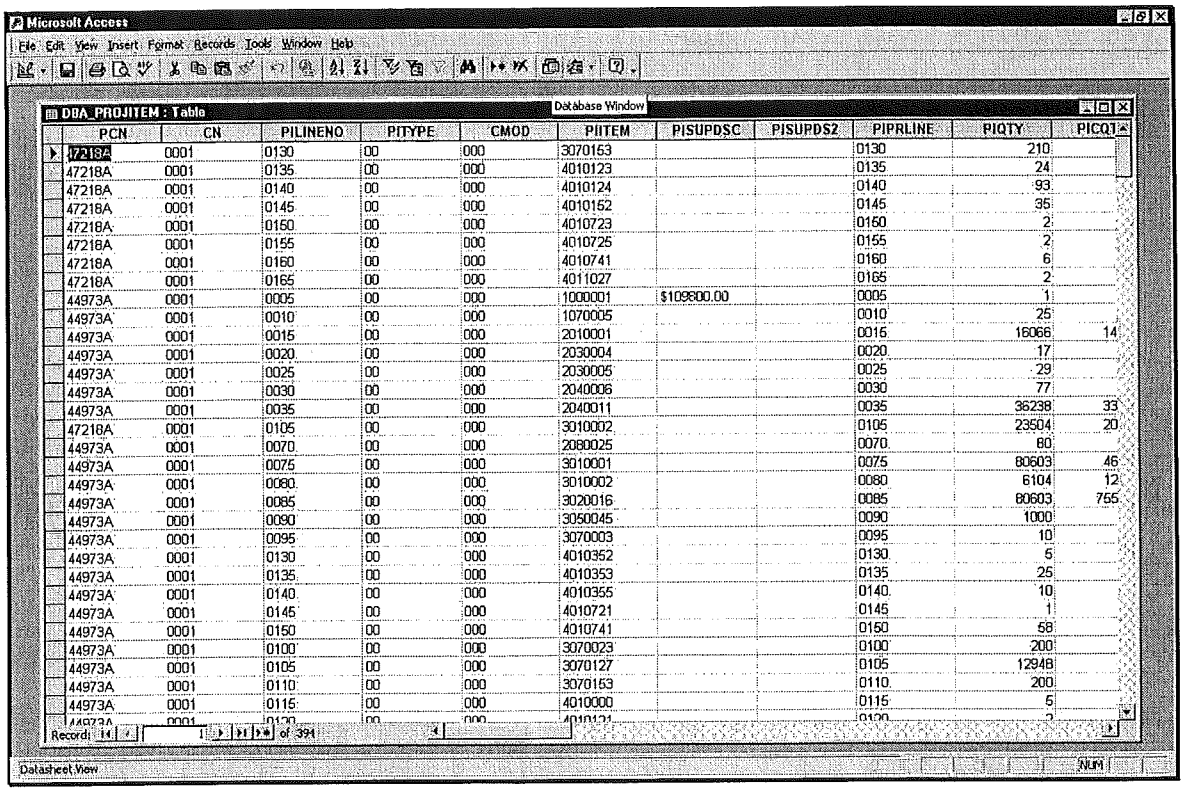


Figure 5-1: Example Microsoft Access Table

Each table in a relational database needs to have a *primary key*, which is a unique identifier for every record. A good example of a primary key is a social security number for citizens of the United States. This number uniquely identifies every citizen of the United States, providing a way to distinguish between multiple people with the same name. Primary keys allow for linking data between two or more tables. They also help ensure *referential integrity,* which ensures that the relationships between tables are intact and that no record is destroyed or altered that would affect other related data needed.

Primary keys are used to link tables together with related information. One table holds the primary key, while the other table holds the *foreign key* that the primary key corresponds to. Linking the primary and foreign keys together ensures that the correct data is accessed in queries with multiple tables utilized.

Sometimes a table will have a structure that is not conducive to using only one field as the primary key. In these cases, two or more fields are used as a *composite key* that serves the same purpose as the primary key. When two tables with composite keys are both utilized in a query, the common composite key fields must be linked together to ensure the proper records are selected.

MS Access and FieldManager are both compatible with Open Database Connectivity (ODBC) standards, which allows Access to link to and utilize the data from FieldManager when they are installed on the same PC. Access allows for two different ways of obtaining data from FieldManager: you may *link* the data, or you may *import* it into Access. Linking data leaves the data in its original source and provides a path for Access to retrieve the data from its source when needed. The data does not become part of the Access database itself, and the size of the database file does not grow appreciably. Importing data into Access makes a copy of the data from its original location and stores it within the Access database, often substantially increasing the size of the database file. Linking data is useful for situations in which the data is dynamic and the most current information is desired. Importing data is more useful for situations in which the data either will not change, or you wish to capture the data at a particular time. Importing data ensures that the data remains in the Access database unless the user deletes or modifies the data in Access. One import note on linking external data into Access is that it will no longer ensure referential integrity between tables.

For most purposes of this research project, only two data tables need be linked or imported in from FieldManager. The names of these tables are ITEMPROG and PROJITEM. ITEMPROG records item posting information from the IDRs, while PROJITEM records project item information from IDRs. The DDIARY table contains comments and other notes from the IDRs. The CONTRACT table also contains useful general contract information, such as managing office, resident engineer, etc. Two additional tables that provide useful information include DDEQUIP, and DDWORKER. The DDEQUIP table provides information from the equipment information posted in IDRs. The DDWORKER table provides information from the worker information posted in the IDRs. A procedure for linking or importing these tables into Access can be found in Appendix C. Once the data files are linked or imported into Access, they may be viewed and manipulated with queries. Access will add a prefix of DBA_ or DBO_ to the table name from FieldManager when the table is linked or imported into Access.

As mentioned above, queries can be used to view, organize, modify, and to perform calculations upon the underlying table data. A query returns a group of records known as a dynaset. This dynaset is a dynamic source of the actual data from the database tables, updated each time the query is run. The dynaset is not stored in a new table, however, each time the query is used, Access updates the dynaset to reflect any changes that may have

occurred in the underlying data tables. This ensures that the most current data is always returned by the queries. A number of queries were created to aid this research project. Queries in Access can be viewed several different ways. The design of the query may generally be viewed either as the actual SQL code that comprises it, or in the Access Design Grid. One view of the Access design grid is presented in Figure 5-2. The design grid allows the user to create a query with Query by Example (QBE). This method allows for an easier, graphical approach to creating queries. SQL code is designed to be compatible among a number of different database systems, and thus produces a reliable means or transferring a query design to another database program. Figure 5-3 depicts the SQL code from an example query.

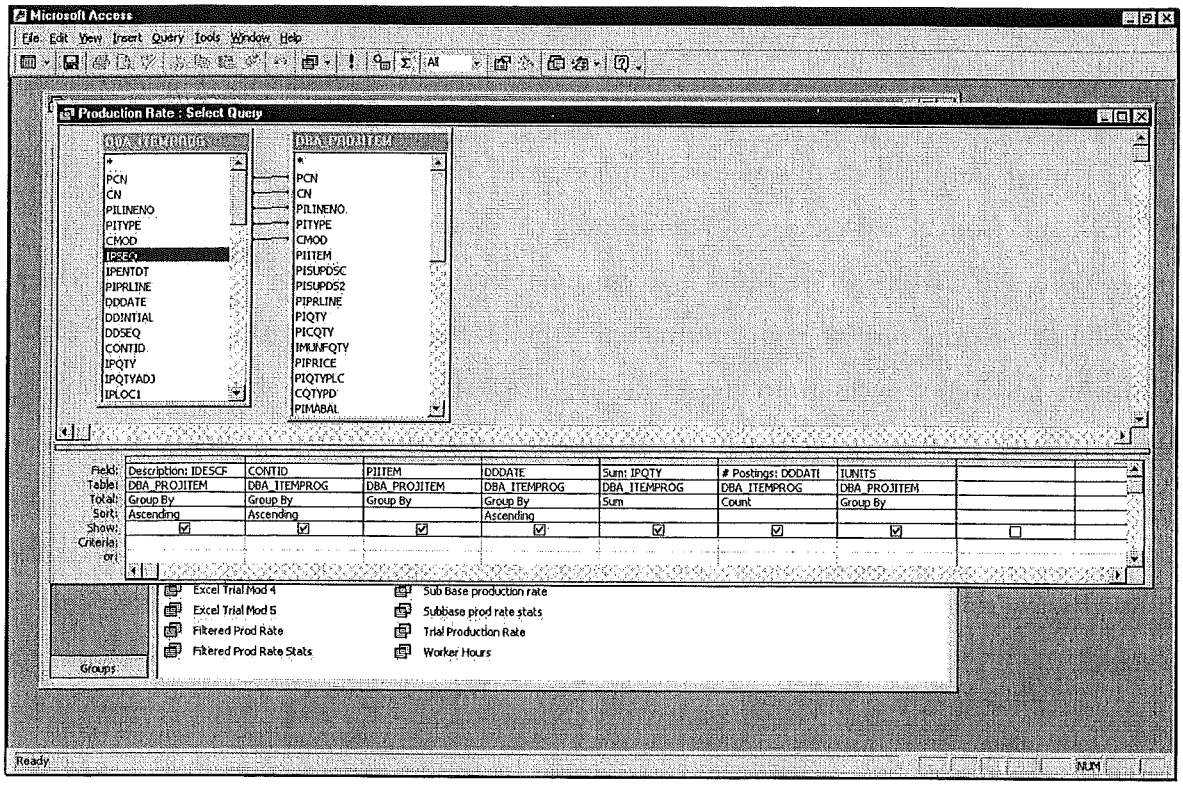


Figure 5-2: Example Microsoft Access Query

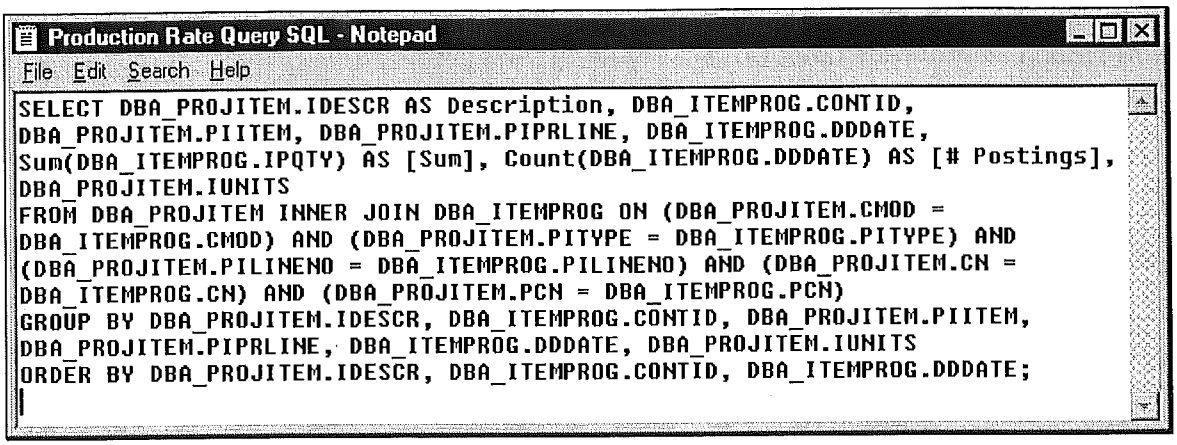


Figure 5-3: Example SQL Code

There are several different types of queries available in Access, however the most common type for this research project were Select Queries. Queries may also be used to perform actions on the table data, such as deleting or appending information from them. These queries should be used with caution, however, as their actions can be destructive and the user can not undo the action after running the query. These types of queries can perform useful functions for maintaining a database with changing data, for example to purge outdated data, or to import new data into the database from FieldManager. The user should always create a backup copy of the Access database file on a different location, or under a different name before performing an action query. Appendix D contains a discussion of the procedure to create action queries such as this.

In order to create a query, the table(s) and other query(s) used for the underlying data must be known. Once the source of the data is decided, the user can perform any joins between the tables and/or queries used, if necessary. Next, the user selects which fields will be included in the query, and determines if they will be sorted. Any criteria used to filter on the field information included in the query is selected, and the user also selects if the field will be shown in the query results. Access allows for the criteria to be listed as a constant value in the criteria, or else the user may place some text between square brackets in the criteria field that Access will use to prompt the user for the criteria at the time the query is run. This allows for an easy change of the data that will be included in the query's results. Another feature available is to show the "Total" row in the Access Design Grid. This total row may be used to perform several useful functions upon the data. There are four basic options available for the total row options: group by, aggregate, expression, and total field

record limit. The group by option is used to group common records together in the query results. The aggregate option allows for nine types of mathematical or selection options to be performed on the data. The nine options available include: Count, Sum, Avg, Max, Min, StDev, Var, First, and Last functions. The expression option is used for creating a calculated field with one or more of the aggregate options. The total field record limit, or where operator, allows for specifying criteria in several ways to limit the results of the query. Further information on creating queries may be found in *Microsoft Access 97 Bible, Gold Edition* (Prague and Irwin, 1999).

Access contains provisions for database security measures in order to prevent users from viewing, modifying, or running certain tables, queries, forms, reports, or macros. If data is linked in to Access from an active FieldManager contract, some concern may be warranted to ensure that the Access user does not accidentally or deliberately modify the data from the FieldManager contract file. InfoTech has stated that versions 3.1 and above of FieldManager should not have any security issues through modifying the data by linked Access tables (Baldwin, 13 March 2002). Additional information regarding Access security issues can be found in Chapter 37 of *Microsoft Access 97 Bible, Gold Edition* (Prague and Irwin, 1999). Another possible solution to any security concerns with linking to an active contract in FieldManager may be to create a separate PC with both Access and FieldManager, then import read-only copies of the desired contracts into FieldManager. These contracts could then be linked to with Access without concerns of modifying an active contract.

5.1.2 Queries

Construction of queries in Access was a critical component of the data analysis for this research project. As such, the queries developed require special attention to their use and construction. In general, two queries are utilized in order to estimate average daily production rates. The first query is used to define the data set used, while the second query performs calculations upon the data to determine some basic statistics. Access allows for easy changes to the structure of the queries, providing an easy means of revising the criteria for the query.

The first query, used to define the data set, utilizes the tables ITEMPROG and PROJITEM. If desired, the user can also include the table CONTRACTS in order to filter out desired contracts by contract ID number, managing office, or other criteria. This first

query creates a dynaset of the records from the IDR data in FieldManager that will be used to calculate the statistics on production rates desired. This dynaset structures the records according to each item description, for each date, and for each contract ID. In the case of more than one posting to a particular item on the same date, the individual postings are totaled for that date. This leads to the generation of a data set for the daily production rate for each item description and for each contract ID. Table 5 – 1 summarizes the structure of the query. The SQL code for this query is listed as the "Production Rate" query in Appendix E. The key fields linked together in this query were PCN, CN, PILINENO, PITYPE, and CMOD. These keys were the common composite keys between the two tables, as found in Chapter 4 of the *FieldManager System Design Document* ("FieldManager", 2000).

Table 5-1: Production Rate Data Set Query

Field Name	Table Utilized	Total Row Operator	Comment
IDESCR	DBA_PROJITEM	Group By	Item Description
CONTID	DBA_ITEMPROG	Group By	Contract ID number
PIITEM	DBA_PROJITEM	Group By	Proposal Item Number
DDDATE	DBA_ITEMPROG	Group By	IDR Date
IPQTY	DBA_ITEMPROG	Sum	Quantity Posted
DDDATE	DBA_ITEMPROG	Count	Number of Postings
IUNITS	DBA_PROJITEM	Group By	Unit

Once the data set query is established, a second query can be constructed to provide some statistics for estimating production rates. This query utilizes the previous "Production Rate" data set query as its input. It provides the average daily production rates for each item description across all the contracts selected in the data set query. Additional statistics that are calculated with this query include the minimum daily production rate found, the maximum daily production rate found, the number of observations the statistics are based upon, the standard deviation of the daily production rates, and the coefficient of variation of the daily production rates. The query also lists the item description, the item number, and the units used. Table 5 – 2 summarizes the structure of the query. The SQL code for this query is

listed as the "Production Rate Statistics" query in Appendix E. The results of this query for several pay items were manually checked against the values found in the original FieldManager records in order to check the calculations done in Access.

Table 5-2: Production Rate Statistics Calculation Query

FIELD NAME	QUERY UTILIZED	TOTAL ROW OPERATOR	COMMENT
Description	Production Rate	Group By	Item Description
PIITEM	Production Rate	Group By	Contract ID number
Sum	Production Rate	Avg	Average Daily Production Rate
Sum	Production Rate	Min	Minimum Daily Production Rate
Sum	Production Rate	Max	Maximum Daily Production Rate
Sum	Production Rate	Count	Number of Observations
Sum	Production Rate	StDev	Standard Deviation of Daily Production Rates
[StDev]/[Avg]		Expression	Coefficient of Variation (COV) of Daily Production Rates
IUNITS	Production Rate	Group By	Unit

One problem that may be encountered with the queries is negative item quantities posted in IDRs. These negative postings are generally a result of the inspector adjusting an earlier incorrect posting. These negative quantities can give misleading results for the minimum daily production rate field calculated with the Production Rate Statistics query. A negative value for this field is logically incorrect and does not provide useful information on the actual minimum daily production rate. This problem may be avoided through the use of an additional query to correct the minimum daily production rate field, although this query does affect the data the other statistics are based upon. All the daily production rate postings that are not greater than zero are filtered out before computing the statistics. The "Nonnegative Production Rate Statistics" query filters out values less than or equal to zero in the sum of IPQTY field to calculate statistics similar to the "Production Rate Statistics" query. The SQL code for both of this query is also listed in Appendix E.

Table 5 – 3 provides a sample subset of the data that results from running the "Nonnegative Production Rate Statistics" query on the contracts listed in chapter 4.

Table 5-3: Sample Production Rate Statistics

DESCRIPTION	PIITEM	AVG	MIN	MAX	COUNT	STDEV	COV	UNIT
Aggregate Base	3020001	398.00	5.52	8839.45	86	1020.44	2.564	T
Aggregate Base, 100 mm	3020010	81.48	55.45	108.80	3	26.70	0.328	m2
Aggregate Base, 160 mm	3020016	7551.20	61.75	16081.00	20	4726.84	0.626	m2
Aggregate Base, 200 mm	3020020	4782.29	264.00	15016.00	23	4170.93	0.872	m2
Aggregate Base, 260 mm	3020026	6759.83	564.00	10369.90	6	4810.19	0.712	m2
Aggregate Base, 300 mm	3020030	158.77	9.20	483.40	13	146.62	0.924	m2
Aggregate Base, LM	3020002	131.34	11.50	464.85	8	138.91	1.058	m3
Bit Base Crushing and Shaping	3050001	10288.52	6.00	27943.50	95	5631.17	0.547	m2

One additional set of queries that may prove useful is constructed to filter out certain contracts. By using the "Filtered Jobs" query and adding criteria to select or filter out certain contracts in the criteria field of the CONTID field, the database user can select exactly which contracts from a group he wishes to include in the production rate statistics. Then, the "Filtered Production Rate" and "Filtered Production Rate Statistics" queries can be used to calculate the production rates for the subset of contracts desired. The SQL code for these three queries is listed in Appendix E.

Queries may also be constructed to calculate production rate statistics for a group of related pay item codes or item descriptions. This may be done through the use of a criteria field, along with the WHERE operator in the Access totals row within the query design

view. Items with equivalent units must be selected for combination. One example of this situation may be to create a combined production rate estimator for all Aggregate Base item postings with units of m^2. Refer to Appendix G for statistics of several common items combined in this manner.

5.2 MICROSOFT EXCEL

Microsoft Excel is a powerful PC based spreadsheet program. Access allows for easy exporting of query data into Excel for further analysis and manipulation. This capability was utilized to calculate confidence intervals for the average daily production rates developed in the Access queries. The average, or mean, production rate value computed in the Access queries is the best estimate of the mean from the population of all possible daily production rates for each item. However, all data sets exhibit some level of variability that will affect a user's confidence in applying the statistics. Confidence intervals help quantify the uncertainty in the actual mean value based upon the variation in the data used to estimate the mean. An item with a large range for the confidence interval on the mean suggests that caution and judgment should be used when applying the estimated mean to predict other samples from the population. A large range also suggests that further research or additional data should be collected on the item before trusting the results of the statistical analysis.

After a "production rate statistics" query is run in Access, the values can be exported to Excel. The available functions in Excel can be used to easily compute confidence intervals for all the items returned from the Access query. A normal distribution for the production rates is assumed for application of the confidence intervals. A procedure for calculating these confidence intervals is presented in Appendix F. With additional development, it may be possible to calculate the confidence intervals within Access, possibly with Visual Basic for Applications code. This could provide an automated and integrated method of calculating the confidence intervals along with the other statistics, without requiring an additional step in Excel.

Table 5 – 4 provides a sample of several confidence intervals that have been calculated in Excel, along with the supporting values from the "production rate statistics" query in Access. The LL column lists the lower limit of the two-sided 95% confidence interval, while the UL column lists the upper limit of the two-sided 95% confidence interval. The minimum

and maximum daily production rates, along with the coefficient of variation values have been omitted for clarity in Table 5 – 4. These values are given in Table 5 – 3 for the sample data.

Table 5-4: Sample Confidence Interval Calculations

DESCRIPTION	PITEM	AVG	LL	UL	COUNT	STDEV	UNITS
Aggregate Base	3020001	398.00	179.22	616.79	86	1020.44	t
Aggregate Base, 100 mm	3020010	81.48	15.16	147.81	3	26.70	m2
Aggregate Base, 160 mm	3020016	7551.20	5338.97	9763.43	20	4726.84	m2
Aggregate Base, 200 mm	3020020	4782.29	2978.64	6585.94	23	4170.93	m2
Aggregate Base, 260 mm	3020026	6759.83	1711.86	11807.81	6	4810.19	m2
Aggregate Base, 300 mm	3020030	158.77	70.17	247.37	13	146.62	m2
Aggregate Base, LM	3020002	131.34	15.20	247.47	8	138.91	m3
Bit Base Crushing and Shaping	3050001	10288.52	9141.39	11435.65	95	5631.17	m2

Exporting data from Access into Excel may also prove to be useful for developing charts of daily production rates for a specific work item, a group of related work items, or for other graphing purposes. Although Access contains some charting functions, the charting functions in Excel are generally easier to use and more familiar to computer users. Graphically analyzing daily production rates could lead to additional insight regarding the actual distribution of production rates for the selected projects. Figure 5 – 4 presents a sample of a plot of daily production rates developed in Excel for the item "Aggregate Base".

Graphing the production rates may also assist MDOT personnel with locating

extreme values that may not accurately represent normal production rates. For example, Figure 5 – 4 shows a production rate of approximately 8,900 tons/day on the date 8/23/2000, while the remainder of the production rates are less than 3,000 tons/day. These extreme values require additional scrutiny when analyzing production rate statistics. Further information on exporting data to Excel may be found in Chapter 24 of *Microsoft Access 97 Bible, Gold Edition* (Prague and Irwin, 1999).

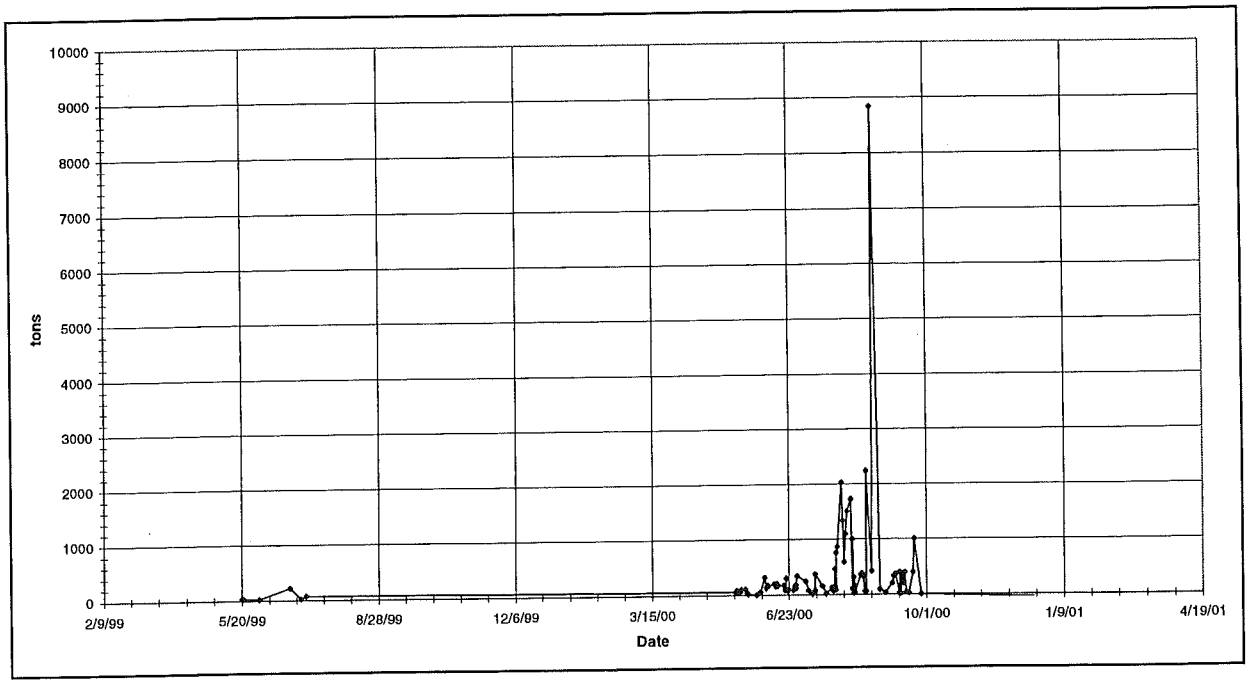


Figure 5-4: Aggregate Base Production Rate Chart

CHAPTER 6: DISCUSSION OF RESEARCH RESULTS

A complete listing of the calculated production rate statistics, with the addition of calculated confidence interval statistics from Excel, on the mean production rates from the query "Nonnegative Production Rate Statistics" is presented in Appendix G. These results were computed based upon all items in FieldManager from the contracts listed in Chapter 4. Table 5 – 4 presents an example subset of the data from Appendix G. As seen in the Count column in Table 5 – 4, much variation exists in the number of observations for each item. In order to get accurate statistics for an item, an adequate number of observations must be included in the calculations. This may require that data from more contracts be included in the calculations before reliable conclusions can be drawn from the calculated statistics.

The user of the results discussed in this report should examine the confidence interval on the mean values. As mentioned in section 5.2, a large spread on the confidence intervals indicates that caution and judgment must be applied to the application of the average production rates. Items with large confidence intervals will require experience and judgment to narrow the production rates applied to a specific job or application. The results and calculations discussed in this report serve only as a guide to assist MDOT personnel with selecting appropriate production rates. The methods discussed allow for MDOT personnel to easily retrieve actual historical production rates for virtually any pay item.

Limited conclusions can be drawn when comparing the average production rates developed from this study to the existing rates supplied in the MDOT Construction Manual. Many of the items listed in the MDOT Construction Manual do not correlate well with the units and descriptions contained in the FieldManager records. Some items appeared in the FieldManager records for which no corresponding rate could be found in the current MDOT records. Other items had incompatible units that prevented drawing direct comparisons. Table 6 – 1 compares the average production rates calculated with the query "Nonnegative Production Rate Statistics" from all 26 contracts studied. Figure 6 – 1 presents a graphical view of the table data. The average calculated production rates were generally lower than those of the MDOT manual. Exceptions were found in the items Pavement, Removal, which had a much higher calculated average than the current MDOT rate.

Bituminous Base Crushing and Shaping was found to have a similar, but slightly higher calculated average production rate than the rate in the MDOT manual.

Table 6-1: Comparison of Calculated Production Rates with Existing MDOT Rates

Item Description in MDOT Manual	Item Description and PIITEM Number in FieldManager Records	Existing MDOT Production Rate	Calculated Historical Production Rate
Earthwork and Grading: Embankment (CIP)	Embankment (CIP) [2050010]	5,300 m^3 / day	672 m^3 / day
Surfacing – Concrete: Sidewalk	Sidewalk, Conc, 100mm [8030002]	180 m^2 /day	55 m^2 /day
Miscellaneous: Removing Concrete Pavement	Pavt, Rem [2040011]	450 m^2 /day	1,002 m^2 /day
Miscellaneous: Longitudinal Joint Repair	Joint Repr, Longit [6030040]	1,600 m / day	510 m / day
Surfacing – Bituminous, Rural – Primary: Crush and Shape	Bit. Base Crushing and Shaping [3050001]	10,000 m^2 /day	10,129 m^2 /day
Miscellaneous: Clearing	Clearing [2010001]	8,000 m^2 /day	2,955 m^2 /day

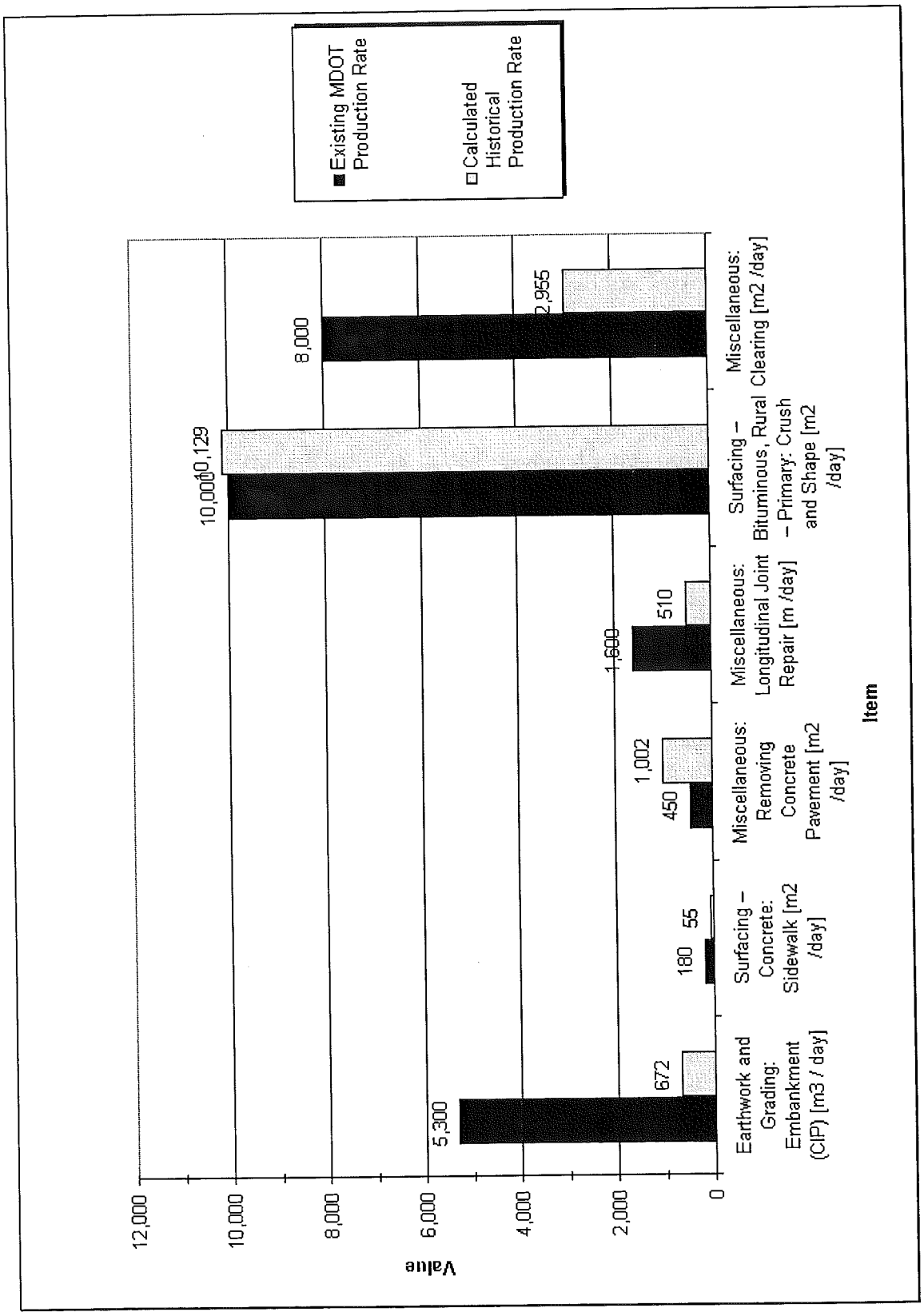


Figure 6-1: Comparison of Calculated Production Rates with Existing MDOT Rates

6.1 TESTING RESULTS

In order to determine the applicability of the calculated production rates developed from this research project, the rates developed have been applied to a sample test project. The MDOT contract 75022-45618 was selected as a test contract due to the availability of the "Work Day/Completion Date Determination" worksheet for this job. This contract was a completion date type contract for bituminous coldmilling and resurfacing. This contract was managed by the Escanaba TSC during the 2000 construction season.

The following items were listed as major, or controlling work items from the Work Day/Completion Date worksheet on the project:

- curb and gutter removal
- large culvert extension
- small culvert work
- sewer work
- curb and gutter
- cold milling bituminous surface
- bituminous mixture, bituminous approach
- G.R. work
- slope restoration
- paint.

A copy of the Work Day/Completion Date worksheet and the results of the queries "Production Rate" and "Nonnegative Production Rate Statistics" appears in Appendix H.

Table 6 – 2 presents a summary of the data from the original Work Day/Completion Date Determination worksheet for this job. The summation of the individual estimated times resulted in a requirement for 43 working days for this project. The responsible MDOT engineer then converted this value to 75 calendar days by multiplying the duration by 7/4 on the worksheet. Examining the FieldManager records shows that construction began on this project on May 8, 2000. The project was open to traffic on July 11, 2000, and construction was complete on July 26, 2000. This gives the project an overall actual construction duration of 79 calendar days, which corresponds well with the original estimated duration of 75 calendar days.

Table 6-2: Original Duration Estimate

MAJOR WORK ITEM	QUANTITY	RATE	ESTIMATED TIME
Curb and Gutter Rem	785 m	450 m / day	2 days
Large Culvert Extension	3 each	3 days each	9 days
Small Culvert Work	9 locations	3 locations / day	3 days
Sewer Work	[none listed]	[none listed]	3 days
Curb & Gutter	850 m	300 m / day	3 days
Cold Mill Bit. Surface	80178 m^2	18000 m^2 / day	5 days
Bit. Mix	19858 t	2000 t /day	10 days
Bit. Appr.	2099 t	1000 t / day	2 days
G. R. work	6 locations	1.5 locations / day	4 days
Slope Restoration	[none listed]	[none listed]	1 day
Paint	[none listed]	[none listed]	1 day

Σ = 43 working days

Utilizing the calculated production rate statistics from the twenty-six contracts discussed in Chapter 4, along with the query "Nonnegative Production Rate Statistics", a predicted duration was developed for this project. A summary of the results from this calculation is presented in Table 6 – 3. The values listed as N/A were not obtained due to either incompatible units between the given quantities and the calculated production rates, or there was no quantity given for that item in the original worksheet, as shown by a [none listed] note in the quantity column for that item. The corresponding duration from the initial MDOT estimate was utilized for these items in order to provide an equivalent comparison between the two durations.

Table 6-3: Predicted Duration from all Calculated Results

MAJOR WORK ITEM	PIITEM USED	QUANTITY	RATE	ESTIMATED TIME
Curb and Gutter Rem	2040006	785 m	71.70 m / day	11 days
Large Culvert Extension	N/A	3 each	N/A	9 days
Small Culvert Work	N/A	9 locations	N/A	3 days
Sewer Work	N/A	[none listed]	N/A	3 days
Curb & Gutter	8020018	850 m	64.97m / day	13 days
Cold Mill Bit. Surface	5020005	80178 m^2	9,687.42 m^2 / day	8 days
Bit. Mix	5020183	19858 t	1,186.72 t / day	17 days
Bit. Appr.	5020200	2099 t	121.12 t / day	17 days
G. R. work	N/A	6 locations	N/A	4 days
Slope Restoration	N/A	[none listed]	N/A	1 day
Paint	N/A	[none listed]	N/A	1 day

Σ = 87 working days

A summation of the days required for each major item listed results in an overall duration of 87 working days required. This value is significantly different than the 43 working days originally estimated by MDOT for this project. Further examination of this result revealed that the actual production rates that occurred on the project were significantly below the original estimated production rates. Table 6 – 4 shows the actual average daily and maximum production rates that were observed on the construction of this job. The average daily production rates for these 5 items in Table 6 – 4 were significantly lower than the original estimated production rates. Only the *maximum* production rate for the item Cold Milling Bituminous Surface approached the original estimated production rates. The other

items had maximum production rates that were much less than the originally estimated average rates for this project.

Table 6-4: Statistics from Completed Job 75022-45618

Major Work Item	PIITEM Used	Average Production Rate	Minimum Production Rate	Maximum Production Rate	Original estimated Production Rate
Curb and Gutter Rem	2040006	135.60 m / day	7.30 m / day	209.90 m / day	450 m / day
Curb & Gutter	8020018	81.63 m / day	45.00 m / day	126.00 m / day	300 m / day
Cold Mill Bit. Surface	5020005	8616.14 m^2 / day	1872.70 m2 / day	17610.07 m2 / day	18000 m^2 / day
Bit. Mix	5020183	887.05 t / day	123.21 t / day	1449.79 t / day	2000 t / day
Bit. Appr.	5020200	140.54 t / day	0.02 t / day	358.66 t / day	1000 t / day

Utilizing the calculated production rate statistics from only the eighteen crush and shape contracts discussed in Chapter 4, another estimated duration was developed for this project. A summary of the results from this calculation is presented in Table 6 – 5. The same procedure as above was utilized for this calculation, along with the updated average production rates from the ten crush and shape projects. This calculation was performed to analyze the effect of basing the production rate statistics upon a different subset of projects.

Table 6-5: Predicted Duration from Crush and Shape Calculated Results

Major Work Item	PIITEM Used	Quantity	Rate	Estimated Time
Curb and Gutter Rem	2040006	785 m	66.27 m/ day	12 days
Large Culvert Extension	N/A	3 each	N/A	9 days
Small Culvert Work	N/A	9 locations	N/A	3 days
Sewer Work	N/A	[none listed]	N/A	3 days
Curb & Gutter	8020018	850 m	67.53 m day	13 days
Cold Mill Bit. Surface	5020005	80178 m2	10477.15 m2 / day	8 days
Bit. Mix	5020183	19858 t	1184.37 t / day	17 days
Bit. Appr.	5020200	2099 t	128.00 t / day	17 days
G. R. work	N/A	6 locations	N/A	4 days
Slope Restoration	N/A	[none listed]	N/A	1 day
Paint	N/A	[none listed]	N/A	1 day

Σ = 88 working days

A summation of the days required for each major item listed results in an overall estimated duration of 88 working days required. This value is significantly different than the 43 working days originally estimated by MDOT for this project. This value is also a less accurate estimate of the actual contract duration than the original MDOT estimate. It is very close to the 87 working days estimated by using statistics from all twenty-six contracts studied.

The MDOT contract 17062-38019 was also selected as a test contract due to the availability of the "Work Day/Completion Date Determination" worksheet for this job. This contract was a completion date type contract for bituminous coldmilling and resurfacing. This contract was managed by the Newberry TSC during the 2000 construction season.

The following items were listed as major, or controlling work items from the Work Day/Completion Date worksheet on the project:

- shoulder aggregate
- culverts
- D.S.
- ditching
- earth excavation
- aggregate base
- crush and shape
- bituminous paving
- seeding

A copy of the Work Day/Completion Date worksheet and the results of the queries "Production Rate" and "Nonnegative Production Rate Statistics" appears in Appendix I.

Table 6 – 6 presents a summary of the data from the original Work Day/Completion Date Determination worksheet for this job. The summation of the individual estimated times resulted in a requirement for 153 working days for this project. Examining the FieldManager records shows that construction began on this project on May 9, 2000. The project was open to traffic on July 11, 2000, and construction was complete on September 27, 2000. This gives the project an overall actual construction duration of 141 calendar days, which corresponds well with the original estimated duration of 153 calendar days.

Table 6-6: Original Duration Estimate

MAJOR WORK ITEM	QUANTITY	RATE	ESTIMATED TIME
Shoulder Agg	13580	700	20 days
Culverts	N/A	N/A	12 days
D.S.	N/A	N/A	1 day
Ditching	9653	600	16 days
Earth Ex.	N/A	N/A	1 day
Agg Base	N/A	N/A	2 day
Crush & Shape	102198	10000	10 days
Bit. Paving	47203	1100	43 days
Seeding	78488	1650	48 days
			Σ = 153 days

Utilizing the calculated production rate statistics from the twenty-six contracts discussed in Chapter 4, along with the query "Nonnegative Production Rate Statistics", a predicted duration was developed for this project. A summary of the results from this calculation is presented in Table 6 – 7. The values listed as N/A were not obtained due to either incompatible units between the given quantities and the calculated production rates, or there was no quantity given for that item in the original worksheet. The corresponding duration from the initial MDOT estimate was utilized for these items in order to provide an equivalent comparison between the two durations. The items with in column PIITEM with composite listed utilized statistics calculated from a composite of several PIITEM numbers combined, as listed in Appendix G.

Table 6-7: Predicted Duration from all Calculated Results

MAJOR WORK ITEM	PIITEM USED	QUANTITY	RATE	ESTIMATED TIME
Shoulder Agg	Composite	13580	613.13	22 days
Culverts	N/A	N/A	N/A	12 days
D.S.	N/A	N/A	N/A	1 day
Ditching	9210022	9653	40	242 days
Earth Ex.	N/A	N/A	N/A	1 day
Agg Base	N/A	N/A	N/A	2 days
Crush & Shape	3050001	102198	10128.79	10 days
Bit. Paving	Composite	47203	1275.82	37 days
Seeding	Composite	78488	223.66	351 days

Σ = 678 working days

A summation of the days required for each major item listed results in an overall duration of 678 working days required. This value is significantly different than the 153 working days originally estimated by MDOT for this project.

The two contracts used to test the application of the calculated production rates revealed a significant discrepancy between the new calculated rates and the production rates used by MDOT, as well as the actual construction duration. Additional research is needed to study the applicability of the average production rates developed by this research project to the estimation of overall contract duration. Refer to Chapter 7 for more discussion of this issue.

CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

The research project determined that daily production rate data could be obtained from existing data in FieldManager software files. A procedure was developed to determine the daily production rates for each pay item description for a number of contracts, and to determine the average daily production rate and other basic statistics for daily production rates. MS Access allows for very flexible designs in its queries that may be adapted to suit other needs and filtering of the projects and items to be included in the queries.

Since most MDOT offices possess a SQL and ODBC compatible database program of Corel Paradox, and the data is already available and being recorded on all MDOT projects in FieldManager, minimal time and expense need be expended to implement this procedure. Additional development of the Access database could also lead to other beneficial data uses in addition to estimating average daily production rates. This possibility is further discussed in Section 7.3.

Although production rate information could be determined with Microsoft Access from the historical FieldManager records, this data may not be appropriate for direct application to estimating contract durations. Since no time data is generally available for the quantities listed in the IDRs, accurately gauging the production rates is difficult. It is likely that more than one item of work is undertaken on the same day for many projects. This effect could help explain the low average production rates in test contract durations. If time data were to be included along with the quantities posted in IDRs, the user of this database system could determine if a posting was representative of effort from a normal 8 hour work day. Additional discussion of this issue is contained in section 7.2.

The comments field in the IDR postings was checked for a mention of the text "hour" to determine if field inspectors were including comments regarding hours worked. An Access query filtering the text strings was created on the field DDCOM in the table DDIARY. Of the 1761 total records in the DDCOM field, only 31 records included the string "hour." Most of these comments were relating to force account records, and did not provide significant insight into the daily activities on the projects selected. A similar query

may be used to find dates in which rain was reported at the site; however, this information generally does not provide significant additional insight into the exact hours worked. The field DDWEACOM in the table DDIARY contains comments on site weather conditions.

Caution should be applied when interpreting and applying any statistics calculated using the procedures discussed in this report. Additional research into selecting appropriate data for development of production rates, and application of the estimated production rates to determination of contract time should also be undertaken. Additional research should also be performed to quantify and explain the sources of the variability of the production rate data. It is unknown at this time the amount of variability introduced into the data as a result of the measurement process, and how much is due to natural variability in the work processes. A study should be performed to assess the accuracy of the IDR information being collected in the field. Section 7.2 contains additional recommendations for the implementation and application of the results of this study.

7.2 RECOMMENDATIONS TO MDOT

To most effectively implement the results of this research project and expand upon its potential benefits, several recommendations are presented here for consideration by MDOT personnel.

1. It is recommended that MDOT implement an Access or other SQL and ODBC compliant database program to create a database for estimating daily work item production rates.

This database will most likely perform best if implemented at the region level. This would allow for more projects to choose from than implementing at the TSC level, while still allowing for regional variations in contractors, geography, weather, project complexity, and other factors. A region-level implementation could also allow for one individual to be responsible for maintaining the system and distributing the results to the TSCs within the region. It would also be possible to implement the database at the TSC level, or at the MDOT central office in Lansing. Using a central implementation may create problems with utilizing the unique local knowledge of job conditions that regions and TSCs possess, and also with distributing production rate data in a timely manner to personnel at TSCs.

MDOT should be able to implement a database system with their current Corel Paradox database software; however, this research project revealed a lack of knowledge of Paradox and database software among MDOT personnel. MDOT is currently planning to transition to Microsoft Office software in the near future. It may be beneficial to wait until this switch is made before implementing the recommendations of this research project on a broad scale. Implementing this research project on the current Corel Paradox software system could create problems with the transition to Microsoft Office and its Access database program. Waiting for the transition to Microsoft Office would reduce training time and effort that could result from trying to implement the system on two different database programs.

2. It is recommended that MDOT personnel from each region or from each TSC become trained in the use of Access or a similar database program.

The extent of the training needed depends upon the exact implementation of the procedure for estimating production rates, and any further expansion of the scope of the database. A few short training courses or time spent in self-study with an Access database book could provide the minimum level of knowledge to competently utilize the database. Attending an Advanced FieldManager topics class from InfoTech could provide significant advantages to the users and maintainers of the database system. Computer database systems and Microsoft Access can be very complicated subjects, and as such, they require proper training and support in order to most effectively utilize their powerful concepts.

3. It is also recommended that MDOT personnel use Microsoft Excel to determine confidence intervals for the mean daily production rates.

Excel can also provide additional descriptive statistics and other functions. MDOT personnel could also utilize the Access data in Excel to develop charts of daily production rates, which would help to analyze the distribution of daily production rates for a specific work item, or a group of related work items. More information regarding the use of Access data in Excel appears in section 5.2.

4. It is recommended that whenever a construction project is completed and the FieldManager file is ready to be finalized and archived in Lansing, a read-only copy of the contract file should be created prior to removing the contract from the TSC computers.

This file could then be transferred by email or other medium to the individual(s) responsible for maintaining the database. Two options then exist for creating and maintaining a comprehensive database for production rates. One option would be to create a computer with FieldManager and Access or another database program separate from the computers with active FieldManager contracts on it. The read-only contract files could then be imported into FieldManager on this computer, and then linked with the database program. Since the information would be linked with the database program, and not stored within the database program itself, contracts could be maintained through FieldManager. Read-only contracts may be easily added and deleted with FieldManager. Contracts may be imported through the File / Import function. Read-only contracts may be deleted from the contracts list screen by clicking on the contract and simultaneously pressing the SHIFT and DELETE keys. It may be practical to maintain many different types of contracts within FieldManager, as this would allow the user to utilize the functions and viewing capabilities of the program for additional details. The user could also maintain several different types of contracts at once, which could create a robust database for estimating production rates for different types of contracts. This may lead to the need for some contracts to be filtered out from the queries. This may be done by adapting the "Filtered Jobs" query discussed in section 5.1.2.

An alternative to creating a separate PC to contain the read-only contracts within FieldManager would be to import the table data from FieldManager into Access or another database program before the contract is archived to Lansing. The action queries described in Section 5.1.1 could be used to maintain by appending or deleting contracts from Access as desired. The jobs could also be filtered in the same manner as described above. To comply with the recommendations of the FHWA, a database of 3 to 5 years of contracts should be maintained ("Construction", 1991).

It is also possible to obtain a read-only copy of the archived FieldManager contract data from the central Lansing archive if so desired. To use this information in Access, it would first have to be imported into FieldManager, then linked or imported into Access.

5. MDOT, along with Info Tech, should also develop an automated, required procedure in FieldManager that will export the relevant table data from FieldManager into an Access or other database system prior to archiving of the contract from the TSC's local FieldManager system. This step would ensure that the MDOT TSC personnel could utilize the data from FieldManager in future database applications.

The procedure to obtain estimated average daily production rates described here allows for much flexibility in its implementation. The procedure proposed relies upon the responsible MDOT personnel's judgment to select the appropriate contracts for inclusion in the database, and to focus attention upon the correct controlling work items. The procedure also assumes that the information contained in the IDRs is correct, as the production rates estimated with this system are derived directly from the IDR postings. Because of this dependence, MDOT should perform a study to determine the accuracy of the field data recorded in the IDRs. MDOT may also wish to provide additional training and auditing for the field inspectors' record keeping. The current procedure will also require careful attention of the user when applying estimated production rates to determining contract durations.

6. MDOT should determine how they wish to implement the procedure developed in this research project.

Some factors to consider are who is responsible for creating and maintaining the database and at which level in MDOT the database is implemented: statewide, at the region level, at the TSC level, or at some other level. Organizing the database at the region or TSC level is recommended to take advantage of the local knowledge the decentralized structure of the regions and TSCs allows.

7. To have more data available from which to generate and examine production rates, MDOT should require usage of the hours reporting fields in the IDRs for both equipment and personnel records.

Of the twenty-six contracts studied, only three contracts had any equipment hours posted in the IDRs, with only 17 of 8560 records posted in the IDRs reporting any hours. Hours for equipment postings in IDRs is contained in the field DDEHOURS in the DDEQUIP table. Only four of the twenty-six contracts had any personnel hours posted in the IDRs, with only 19 of 5269 records posted in the IDRs reporting any hours. Hours for

worker postings in IDRs is contained in the field DDWHOURS in the table DDWORKER. If the hours fields were utilized, it would facilitate examining the amount of work done on each job on each day posted. This information would be useful to examine if a particular day was representative of a full 8 hour day's work, if the work was shortened due to rain or other factors, or if more than 8 hours of work was performed on a day.

8. A future modification to FieldManager could provide fields to include hours worked along with each item posting in the IDRs.

These fields are expected to greatly assist with subsequent examination of historical production rates, and would require relatively little additional effort from MDOT field inspectors. If data were available for hours worked for each item posting, Access would allow for revising of the query code discussed in this project to either filter out values not consistent with a normal 8 hour work day, or a model could be developed to factor in the deviation from a normal 8 hour work day to compute average production rates on an 8 hour day basis. Although not verified in this report, the addition of these time fields in the production rate calculation is expected to produce more accurate rates.

9. Additional research should also be undertaken to study the results of this research project with regards to the recommendations of Leslie (Leslie, 2000).

His study suggested that utilizing mean production rates from historical records should generate accurate contract times. The results of the limited testing performed for this research project do not seem to support this conclusion. Leslie studied a number of methods of applying time estimates to daily quantity rates to most accurately estimate production rates. The method of calculating production rates in this research project corresponds with Leslie's method 1, which was his recommended method for use in the LaDOTD. The Leslie study was discussed in more detail in Section 2.1.2. Additional research should be performed to determine if the alternate methods proposed in Leslie's study could generate more accurate production rates with the results of this research project for MDOT's use.

10. MDOT should also request more reporting using the Daily Diary function in order to record additional information for analysis of production rates.

The Daily Diary allows for entry of the "Hours Available", "Hours Worked", "Controlling Operation", "Time Charge", and "Reason for Delay" fields to describe a day's work. These fields can offer a good method of recording the responsible engineer's opinion of the work done on a particular day of a contract. Comparing the "hours available" to the "hours worked" on any given day could give added insight to the contractor's level of effort on the job. If a contractor had excessive time allotted by MDOT in the schedule to complete the work, he/she may not work as many hours as was originally scheduled, which could potentially be analyzed by checking these fields. The "time charge" and "reason for delay" fields allow for documentation of extenuating circumstances that are out of the contractor's control and would preclude him/her from completing work on a given day. MS Access could provide an easy way to link to the FieldManager data for these fields and analyze their effect upon the contract's schedule. The data for these fields would first have to be collected on new projects to analyze these items.

7.3 FUTURE WORK

MDOT should perform further investigation into several possibilities that were discovered through this research project to improve upon its operations.

1. One option that may prove to create a more user-friendly database system is to program an interface through an Access form where the user may select the options he wishes to use.

These options could include selecting the specific contracts on which to base the production rate data, the specific items to estimate production rates for, and possibly to create an automated function to develop a plot of daily production rates for specific items in Access. Programming a more user-friendly link to Microsoft Excel should also be possible, to create more advanced analyses and graphs. It should also be easy to change the database to estimate production rates on a different time scale, e.g. weeks, or months. A form could also be created from which to run action queries to append or delete new contracts in imported tables from FieldManager.

2. Another possible structure to develop with Access would be to create a client/server type database, with all the tables of FieldManager data held on one or more servers, with the table data linked into a server side Access database with the queries, forms, reports, etc. used to perform analyses.

With the appropriate structure created, this could potentially allow for easier data management of the FieldManager tables, as well as allowing multiple simultaneous users of the system, and other benefits. This structure is discussed in Chapter 24 of *Microsoft Access 97 Bible, Gold Edition* (Prague and Irwin, 1999).

3. Once a database system is created at MDOT to estimate production rates, the data may be used to create a more advanced predictive model for production rates.

Although it may involve significant additional work, it should be possible to utilize the historical data from the FieldManager files to develop equations to predict future work item production rates when supplied with the desired input factors, such as location, weather, scope of project, etc. Ellis (1989) attempted to model production rates utilizing a factorial model in this manner, as discussed in Chapter 2. The data could also be utilized to perform a statistical analysis of the distribution of daily production rates for each pay item, or group of items.

4. MDOT should investigate the possible benefits that could result from making additions to the FieldManager software.

Comparing FieldManager with other current highway/heavy construction contract administration software such as HeavyJob, produced by Heavy Construction Systems Specialists, Inc. (HCSS) provides some insight into possible improvements with FieldManager. Although HeavyJob is targeted more for contractors than for DOTs, it allows for much of the same functionality as FieldManager, such as tracking site weather conditions, materials used, quantities used, and general comments on the day's work. HeavyJob also allows for automatic reporting of production quantities and production rates for the current day, the current week, the previous week, the job to-date, and the budgeted values (HCSS, 2002). Adding these reporting functions to FieldManager may help MDOT personnel keep their contracts on time and on budget, as well as allowing for a better

understanding of actual construction production rates and quantities. Adding these functions to FieldManager should require little additional work by Info Tech.

REFERENCES:

Baldwin, I. "Re: Question for Research." E-mail to the author. Info Tech Implementation Project Manager. 13 March 2002.

Baldwin, I. "Re: States that use FieldManager?" E-mail to the author. Info Tech Implementation Project Manager. 10 April 2002.

Bertram, T.D. "Guidelines for Setting Contract Time. Memorandum 97-27." Operations Support Division, Indiana Department of Transportation, Indianapolis, IN. 10 December 1997.

"Construction Contract Time Determination Procedures," Technical Advisory No. T5080.15, (1991) Federal Highway Administration (FHWA), Washington, D.C.

Couto, D. (2001) "NECCC FieldManager.ppt" Internet. http://www.ec3.org/InfoCenter/12_Conference_Information/2001_Conference/2001%20presentations/Couto_Doug_2001.pdf, April 22, 2002.

Ellis, R.D. Jr., (1989). "Model for Prediction of Highway Construction Production Rates." Ph.D. Diss. University of Florida, Gainesville, FL.

"Establishing Contract Durations." (1999) Florida Department of Transportation. Internet http://www11.myflorida.com/construction/Design%20Build/guidelines/english.pdf. April 22, 2002.

"Facilities Development Manual. Procedure 19-10-30." (2000) State of Wisconsin Department of Transportation, Madison, WI

"FieldManager System Design Document Release 3.0." (2000). InfoTech, Gainesville, FL.

Filsinger, R.R.. Facsimile to Dr. Kris Mattila. Wisconsin Department of Transportation employee. 12 February 2002.

"Guideline for Establishing Contract Duration." (1994) Florida Department of Transportation. Internet http://www11.myflorida.com/construction/manuals/cpam/CPAM70000000/PDF_Files/1_3new.PDF. 23 April 2002

Hancher, D.E.. "Re: Kentucky Contract Time Determination System" E-mail to Dr. Kris Mattila. University of Kentucky Department of Chemical & Materials Engineering Interim Chair. 22 March 2002.

Hancher, D.E., McFarland, W.F., and Alabay, R.T.. (1992) *Construction Contract Time Determination.* Research Report 1262-1F. Texas Transportation Institute, Texas A & M University System, Austin, TX

HCSS (2002) "Construction Estimating and Job Tracking Software." Heavy Construction Systems Specialists, Internet, http://www.hcss.com/Examples/hjfwex.asp. 19 April, 2002

Herbsman, Z.J., and Ellis, R. (1995) *Determination of Contract Time for Highway Construction Projects.* Synthesis of Highway Practice 215, National Cooperative Highway Research Program, Transportation Research Board, Washington D.C.

Herbsman, Z.J., and Ellis, R. (1988) *Establishing Contract Duration Based on Production Rates for FDOT Construction Projects.* Department of Civil Engineering, University of Florida. Gainesville, FL

Leslie, D.A. (2000) *Establishing Production Rates Used to Estimate Contract Time on Highway Construction Projects.* Master's Thesis, College of Engineering and Science, Louisiana Tech University, Ruston, LA

"Letting guidelines." (2002) Iowa Department of Transportation. Ames, IA

Krandel, J. "Production Rates" E-mail to Nicholas Laeder. Iowa Office of Contracts Proposal Engineer. 20 March 2002.

McCrary, S.W., Corley, M.R., Leslie, D.A., Aparajithan, S. (1995). *Evaluation of Contract Time Estimation and Contracting Procedures for Louisiana Department of Transportation and Development Construction Projects.* Louisiana Transportation Research Center Report No. 296. Louisiana Transportation Research Center, Baton Rouge, LA

"Michigan Department of Transportation 1996 Standard Specification for Construction." (1996) Second Printing, Michigan Department of Transportation, Lansing, MI

"Michigan Department of Transportation 1998 Construction Manual." (1998) Michigan Department of Transportation, Lansing, MI

Michigan Department of Transportation. (1996). "Special Provision for Proposal Submission, Award and Execution of Contract. FUSP102(I)." Special Provision. Michigan Department of Transportation, Lansing, MI.

Overby, S. (2002) "Paving Over Paperwork" *CIO Magazine* February 1, 2002. Internet. http://www.cio.com/archive/020102/dot_content.html, April 22, 2002.

Prague, C.N., and Irwin, M.R. (1999) *Microsoft Access 97 Bible, Gold Edition.* IDG Books Worldwide, Foster City, CA.

Sikkema, A. (2001) Personal interview, MDOT Ishpeming TSC Manager. L'Anse, MI, June 7, 2001.

Thomas, H.R., Jr., Jones, J.R. Jr., Willenbrock, J.H., Hester, W.T., and Logan, P.A. (1985) *Analysis of Time and Schedule Performance on Selected Highway Projects* Report No. FHWA-

TS-85-217, Report by Nittany Engineers and Management Consultants, Inc. State College, PA, for Federal Highway Administration, U.S. Department of Transportation

Werkmeister, R.F., Luscher, B.L., and Hancher, D.E.. (2000) "Kentucky Contract Time Determination System." Transportation Research Record No. 1712, Transportation Research Board National Research Council, Washington, D.C.

LIST OF APPENDICES

APPENDIX A: CURRENT MDOT PRODUCTION RATES

Critical Path - Construction Time Estimates

The following are average production rates for major work items, which, when multiplied or divided by the work item quantities on a project, determine the estimated time, in workdays, to complete the item.

Drainage	
Work Item	**Time**
Cross Culverts	
Rural Highways	40 m/day
Expressways	50 m/day
Large Headwalls	5 days/unit
Slab or Box Culverts	5 days/pour
Plowed in Edge Drain (production-type project)	4500 m/day
Open-Graded Underdrain (production-type project)	1200 m/day
Sewers	
0 m-5 m (up to 1500 mm)	40 m/day
0 m-5 m (over 1500 mm)	25 m/day
5 m-over (up to 1500 mm)	25 m/day
5 m-over (over 1500 mm)	20 m/day
Jacked-In-Place	13 m/day
Including excavation pit and set up	min. 5 days
Tunnels	
Hand Mining	8 m/day
Machine Mining	20 m/day
Including excavation pit and set up	min. 5 days
Manholes	3 units/day
Catch Basins	4 units/day

Utilities	
Work Item	**Time**
Water Main (up to 400 mm) Flushing, Testing and Chlorination	100 m/day 4 days
Water Main (500 mm-1050 mm) Flushing, Testing and Chlorination	25 m/day 5 days
Order and Deliver 600 mm HP Water Main	50 days/order
Gas Lines	100 m/day

102-20 (1998)

Figure A – 1

Earthwork and Grading		
Work Item	Metro Exp-Time	Rural-Time
Embankment (CIP)	1500 m^3/day	5300 m^3/day
Excavation and/or Embankment (Freeway)	1500 m^3/day	9200 m^3/day
Excavation and/or Embankment (Reconst)	750 m^3/day	3800 m^3/day
Embankment (Lightweight Fill)	300 m^3/day	600 m^3/day
Muck (Excavated Waste and Backfill)		1500 m^3/day
Excavation (Widening)		600 m^3/day
Grading (G and DS)		750 m^2/day
Subbase and Selected Subbase (up to 7.4 m)		600 m^3/day
Subbase and Selected Subbase (7.4 m and over)		450 m^3/day
Subgrade Undercut and Backfill		1500 m^3/day
Subbase and Open-Graded Drainage Course		450 m^3/day

Surfacing - Concrete	
Work Item	Time
Concrete Pavement (7.3 m) Including Forming and Curing	450 m^2/day min. 7 days
Pavement (7.3 m)	1200 m/day/course
Concrete Ramps (4.9 m) Including Forming and Curing	300 m/day min. 7 days
Curb (1side)	750 m/day
Concrete Shoulder-Median	1200 m^2/day
Sidewalk (Patching)	65 m^2/day
Sidewalk	180 m^2/day

(1998) *102-21*

Figure A – 2

Structures	
Work Item	**Time**
Sheeting (Shallow)	30 m/day
General Excavation at Bridge Site	750 m^3/day
Excavation for Substructure (Footings)	1 unit/day
Piles (12m)	15 piles/day
Substructure (Piers and Abutments)	5 days/unit
Order and Delivery of Beams Plate Girders Rolled Beams	 100-120 days/order 90-120 days/order
Concrete Beams	50 days/order
Erection of Structural Steel	3 days/span
Bridge Decks Form and Place Reinforcement (60m Structure) Pour Deck Slab (1 1/5 days/pour) Cure	 15 days 2 days/span 14 days
2 Course Bridge Decks Add 9 days for Second Course Latex Add 12 days for Second Course Low Slump	
Sidewalks and Railings Sidewalks and Parapets Slip Formed Barriers	 5 days/span 2 days/span
Clean Up	10 days
Pedestrian Fencing Shop Plan Approval and Fabrication Erection	 1-2 months 1 week/bridge
Riprap Replacement Bucket Dumped Bucket Dumped and Hand Finished	 385 m^3/day 131-523 m^3/day

Retaining Walls	
Work Item	**Time**
Retaining Walls	1 panel/day min. 10 days

102-22 (1998)

Figure A – 3

Railroad Structures	
Work Item	Time
Grade Temporary Runaround	750 m^3/day
Ballast, Ties, and Track	50 m/day
Place Deck Plates	5 days/span
Waterproof, Shotcrete and Mastic	5 days/span

Railroad Crossing Reconstruction	
Work Item	Time
Railroad Crossing Reconstruction	10-15 workdays (depends whether concrete base is involved)

Temporary Railroad Structures	
Work Item	Time
Order and Deliver Steel	55 days/order
Erect Steel	1 day/span
Ties and Track	3 days/span

Pump House	
Work Item	Time
Structure	30 days/m
Order and Deliver Electrical and Mechanical Equipment	90 days
Install Electrical and Mechanical Equipment	30 days

Figure A – 4

Miscellaneous	
Work Item	Time
Removing Old Pavement	60 m/day
Removing Old Pavement for Recycling (7.3 m)	450 m/day
Crushing Old Concrete for 6A or OGDC	1350 mtons/day
Removing Trees (Urban)	15 units/day
Removing Trees (Rural)	30 units/day
Removing Concrete Pavement	450 m^2/day
Removing Sidewalk	250 m^2/day
Removing Curb and Gutter	450 m/day
Removing Bituminous Surface	1600 m^2/day
Conditioning Aggregate	900 m^2/day
Bituminous Base Stabilizing	2500 m^2/day
Ditching	600 m/day
Trenching for Shoulders	750 m/day
Station Grading	610 m/day
Clearing	8000 m^2/day
Restoration (Topsoil, Seeding, Fertilizer and Mulch)	1650 m^2/day
Sodding	2100 m^2/day
Seeding	40,000 m^2/day
Guardrail	230 m/day
Fence (Woven Wire)	360 m/day
Fence (Chain Link)	150 m/day
Cleanup	600 m/day
Concrete Median Barrier Cure	300 m/day min. 7 days
Reroute Traffic (Add 4 days if 1st item)	1 day/move
Concrete Glare Screen	450 m/day

102-24 (1998)

Figure A – 5

Miscellaneous	
Work Item	Time
Light Foundations Order and Delivery	6 units/day 6-8 week/order
Remove Railing and Replace w/Barrier (1-2 decks at a time)	4 days/side
Longitudinal Joint Repair	1600 m/day
Crack Sealing	4800 m/day
Joint and Crack Sealing	500 m/day
Repairing Pavement Joints - Detail 7 or 8	200 m/day
Seal Coat	6400 lane m/day
Diamond Grinding/Profile Texturing Concrete	3300 m^2/day
Rest Area Building Order Material Construct Building	 3 months 9 months
Tower Lights Order and Deliver Towers	 100 days
Weigh-In-Motion Order and Deliver Materials Order and Deliver with Installation	 1 month-6 wks 3 months
Raised Pavement Markers	300 ea/day
Attenuators	2 ea/day
Shoulder Corrugations, Ground or Cut	8 km-9.7 km/ side/day
Aggregate Base	2900 m^2/day
Aggregate Shoulders	350 m^3/day
Freeway Signing - 3# Post Type	50 signs/day

Figure A – 6

Concrete Joint Repair	
Work Item	Time
Concrete Joint Repair (High Production - Project with >1000 patches) Average (1.8 m) Large (>1.8 m)	 50 patches/day 500 m^2/day

Structural Repair	
Work Item	Time
Bridge Painting	90 m^2/day
Pin and Hanger Replacement Order Pin and Hanger	3 beams/day 60 days
Scarifying (Including Cleanup)	10,000 m^2/day
Joint Removal (Including Cleanup) Forming and Placement	4 m/day 3.5 m/day
Hydro-demolishing	300 m/day
Barrier Removal Placement	15 m/day 45 m/day
Hand Chipping (Other than Deck)	0.24 m^3/person/day
Casting Latex Overlay	250 m/day
Curing Overlay Regular High Early	 4 days 1 day
Thrie Beam Retrofit	30 m/day
Beam End Repairs Welded Repairs Bolted Repairs Bolted Stiffeners (Pair) Grind Beam Ends Welded Stiffeners (Pair) H-Pedestal Repairs Welded Repair Replacement	 0.75 days/repair 0.50 days/repair 0.25 days/repair 0.25 days/repair 0.25 days/repair 0.50 days/each 1 day/each
Deck Removal	235 m^2/day

102-26 (1998)

Figure A – 7

Metro-Primary (< 18,000 mtons)	
Paving	540 mtons/day
Joints	150 m/day
Cold Milling	3400 m^2/day
Aggregate Shoulders	900 mtons/day
Metro-Primary (> 18,000 mtons)	
Paving	540 mtons/day
Joints	200 m/day
Cold Milling	7500 m^2/day
Metro-Interstate (> 18,000 mtons)	
Paving	1100 mtons/day
Joints	360 m/day
Aggregate Shoulders	900 mtons/day
Urban-Primary (< 18,000 mtons)	
Paving	640 m/tons/day
Joints	100 m/day
Cold Milling	1700 m^2/day
Rubblizing	1700 m^2/day
Aggregate Shoulders	450 mtons/day
Urban-Primary (> 18,000 mtons)	
Paving	1000 mtons/day
Joints	120 m/day
Cold Milling	1700 m^2/day
Aggregate Shoulders	500 mtons/day
Bituminous Shoulders (1 side per course)	750 m/day
Urban-Interstate (> 18,000 mtons)	
Paving	1200 mtons/day
Joints	220 m/day
Cold Milling	1700 m^2/day
Rubblizing	5800 m^2/day
Aggregate Shoulders	640 mtons/day
Rural-Primary < 18,000 mtons)	
Paving	640 mtons/day
Joints	120 m/day
Cold Milling	590 mtons/day
Crush and Shape	10,000 m^2/day
Aggregate Shoulders	640 mtons/day
Rural-Primary (> 18,000 mtons)	
Paving	1100 mtons/day
Joints	150 m/day
Cold Milling	800 mtons/day
Crush and Shape	10,000 m^2/day
Rural-Interstate (> 18,000 mtons)	
Paving	1280 mtons/day
Joints	220 m/day

(1998)

102-27

Figure A – 8

Determination of Work Days/ Completion Date

Work Day/Completion Date Determination, ***Figure 102-2***, shows the worksheet to be used for calculating the estimated time to complete major work items and arrive at the total work days/completion date for completion of all work items. This worksheet should remain on file at the project office and become part of the permanently-retained project files for audit purposes.

Examples of Progress Schedules

Figures 102-3 and ***102-4*** are examples of Progress Schedules for Work Day Projects with normal schedules (i.e., routine, non-expedited schedules, four day work week). ***Figure 102-5*** is an example of a Progress Schedule for a Calendar Date Project with a normal schedule. ***Figure 102-6*** is an example of a Calendar Date Project with an expedited schedule (i.e., five day work week). It is important to include the standard "boilerplate" language associated with expedited schedules starting with the paragraph "No extensions of time will be allowed. . ." and ending with the paragraph "Any extra costs incurred by the contractor. . ." when preparing the Progress Schedule.

Progress Schedules w/ Incentive/ Disincentive (I/D) or A+B Clauses

The construction staff engineer (Construction Section, Construction and Technology Division) assigned to your particular region should be contacted if it has been determined that Incentive/Disincentive (I/D) or A+B Clauses are required to be placed in the Progress Schedule to complete the project. They cen provide the engineer with the most current language for these clauses. The use of these clauses must be justified by user cost analysis. The Special Provision for Extension of Time and Extra Costs for Incentive/Disincentive Projects [SP 108(B)] must also be included in the project's proposal on I/D and/or A+B projects.

Contractor-Furnished Detailed Progress Schedule, Form 1130

A requirement of the Progress Schedule (written by the engineer and included in the project's proposal) is that the low bidder(s) meet with MDOT representatives to work out a detailed progress schedule. The low bidder(s) submits their detailed progress schedule on Progress Schedule, Form 1130. This Progress Schedule is presently a requirement for contract award and is most often submitted by the contractor for approval at the preconstruction meeting. The authorized engineer reviews and approves this Progress Schedule. The original is sent to the Construction Section of the Construction and Technology Division, attention Construction Management Unit. After the Progress Schedule is reviewed and approved by the authorized Construction Section engineer, it is given to the Bureau of Finance and Administration for inclusion in the contract. Timely handling and submission of this Progress Schedule at all steps is essential for prompt award of the contract.

The Progress Schedule will include, as a minimum, the starting and completion dates for major items of work and the final project completion date specified in the bidding proposal. If an open to traffic

Figure A – 9

APPENDIX B: STATE DOT PRODUCTION RATE AND TIME DETERMINATION INFORMATION

Index of Subjects

1. Functions of the Office of Contracts

The Office of Contracts is responsible for three major functions of the Iowa Department of Transportation:

1. Estimating and Contract Letting
2. Bid Review Monitoring and Collusion Detection
3. External Civil Rights Compliance

The Office of Contracts is at the focal point where all of the pre-letting activities converge together so contracting can take place for the construction work. The office awarded 568 million dollars worth of work during the 2000 state fiscal year.

2. Letting Process Philosophy

The following is the Office of Contracts general philosophy used in the letting process.

B-3

- Increase competition by contractors.
  1. Create craft specific proposals.
  2. Package contracts to maximize competition.
  3. Set reasonable contract periods.

- Decrease the risk to the contractor.
  1. Establish open contract periods.
  2. Provide good quality plans.
  3. Promote standard use of bid items.
  4. Minimize use of incidental items.

- Provide a level playing field for all bidders.
  1. Avoid statements such as "as directed by the engineer" in the contract documents.
  2. Assure that all contractors have the same information.
  3. Provide uniform application of Standard Specifications.
  4. Provide complete and clear set of contract documents.

- Maintain fair and consistent letting practices
  1. Projects should be let in "good faith" with intentions and money to award.
  2. Negotiations with the low bidder should only be done after the decision to award has been made.
  3. Any changes made after the letting should not substantially change the scope of the contract.

- Special requests for projects
  1. The Office of Contracts will take special requests.
  2. A reason must be given for the request.
  3. The request should be timely, at least with the final plan submittal.
  4. The request should be submitted on a written form, letter or electronically.

3. Lettings

The Iowa DOT's Office of Contracts normally has 10 highway lettings, public opening of bids, each year. These lettings give contractors the opportunity to bid on approximately 800 projects each state fiscal year. These include interstate, primary and secondary road work and maintenance projects. The Iowa DOT also receives bids on most city projects that involve federal-aid. The Office of Contracts will hold additional special lettings. A special letting follows the regular advertising and bidding procedures. The time taken for processing by the Office of Contracts is usually much shorter.

The Iowa Department of Transportation (IDOT) suggests future letting dates to the Iowa Joint Policy Council (IJPC) and both will commit to dates three to four years in the future. The IJPC is made up of members from the Association of General Contractors of Iowa (AGCI), the Iowa Concrete Pavers Association (ICPA), the Asphalt Pavers Association of Iowa (APAI), the Iowa limestone Producers Association (ILPA) and the IDOT. The IJPC reserves a block of rooms for contractors at the hotel where bids are being received, usually the Des Moines Marriott or the Embassy Suites. There is also an IDOT room that has letting information and a room for Disadvantaged Business Enterprises (DBE's) that has the DBE consultant in it.

Emergency Lettings

There are times when a site will need immediate repair work requiring a quick turnaround from design to construction. In this case, the Office of Contracts will use an emergency letting procedure to contract for the work that meets the requirements in the Iowa Code Article 313.10 Bids - Advertising. The conditions for using emergency procedure are as follows:

1. The emergency was caused by an unforeseen event causing the failure of a highway, bridge, or other highway structure so that the highway is unserviceable, or where immediate action is necessary to prevent further damage or loss.
2. The department solicits written bids from three or more contractors engaged in the type of work needed.
3. The necessary work can be done for less than seventy-five thousand dollars.

MAXPREQ = (Current + Non-current + LL)*F

Where:

MAXPREQ = maximum pre-qualification amount
Current = current assets minimum current liabilities
Non-current = (non-current assets minus non-current liabilities)/2 if greater than zero
Non-current = (non-current assets minus non-current liabilities) if less than zero
LL = approved authorization to loan letter
F = experience factor

The Contracting Authority will qualify contractors into three categories:

A. Individually Prepared Statement.

This type of statement may be prepared by the Contractor without the assistance of a CPA. A compilation by a CPA will be also considered an Individually Prepared Statement. The experience factor (F) of 1.0 will be used in the Pre-qualification formula. A contractor who submits an Individually Prepared Contractor's Financial Statement will be limited to awards which do not exceed the maximum pre-qualification amount from the Pre-qualification Formula ($100,000 maximum) minus the amount of their uncompleted work under contract.

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B. CPA Reviewed Statement.

The experience factor (F) will be within a range of 0.0 to 10.0 based on past performance with projects let by the Department. A contractor who submits a CPA Reviewed Contractor's Financial Statement will not be awarded any individual contract that exceeds $600,000. A contractor who submits a CPA Reviewed Contractor's Financial Statement will be limited to awards which do not exceed the maximum pre-qualification amount from the pre-qualification formula minus the amount of their uncompleted work under contract.

C. CPA Audited Statement.

The experience factor (F) will be within a range of 0.0 to 10.0 based on past performance with projects let by the Department. A contractor who submits a CPA Audited Contractor's Financial Statement will be limited to awards which do not exceed the maximum pre-qualification amount from the pre-qualification formula minus the amount of their uncompleted work under contract.

The experience factor (F) is based on the contractor's past performance relative to equipment, organization/management, attitude/cooperation and work performance. Information on a contractor's past performance is obtained from contractor evaluations completed by the State, County, and City Engineers on every contract and subcontract amounting to $20,000 or more.

The pre-qualification amount may be increased using two methods: by furnishing an authorization to loan letter, for an amount not to exceed $300,000 and by using appraised values for property, plant and equipment, provided the appraisal is accompanied by a certification letter from the appraisal company on their letterhead paper (original signed).

The filing of the statement, in itself, does not constitute qualification. A bidder will receive definite approval of his/her qualifications.

A prospective bidder may voluntarily lower their qualification limit if received by noon the day before the letting.

A Contractor's Financial-Experience- Equipment Statement is valid for 16 months from the contractor's close of business date.

A contractor who has not previously completed contracts in excess of the following quantities will not be qualified to receive awards for projects involving more than the following quantities:

Concrete Paving:	100,000 square yards.
Grading:	500,000 cubic yards.
Bridges:	$200,000.00
Culverts:	$100,000.00
Bituminous Pavement:	50,000 tons.

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On other classes of work, no fixed maximum is prescribed. In all cases a bidder will be restricted to a volume of work within the reasonable limits of his ability to properly finance, equip and perform within the specified contract time.

5. Project Number Determination

A project number is a unique combination of alpha-numeric system prefixes established by various offices within the Iowa DOT, based on the federal numbering system, and assigned to highway construction, maintenance and research, rail, aeronautics, public transit, capital improvement, and other projects. Policy No. 130.01 of the Iowa DOT Policies and Procedures Manual defines the varying segments of these unique numbers and how the Office of Contracts establishes them.

The format for a project number follows a set pattern and can best be described as a combination of several codes. These codes combined in the order given include the following: system prefix letter code, route number code, federal control section number code, chronological sequence of assignment of projects code, mile post number code if applicable, alpha-numeric system prefix code and county number code.

Once a project number is established for a specific project, the number is project specific and will never be used again in the future. This guarantees the accuracy of the Iowa DOT information databases and allows for future retrieval of this information when needed by Iowa DOT personnel.

6. Size of Projects (Packaging)

The objective of project packaging is to have a project or a group of projects that are optimized according to several factors. One of those factors is the amount of competition obtained for the package. When a package consists primarily of one type of work and is within most contractors bidding capabilities, then there will be a larger number of bidders on the project. More bidders on a package should lead to better bid prices.

Optional Combination

To obtain the maximum number of bidders the package must be attractive to them, this would mean that it is large enough to entice them to bid but also not too large that it exceeds their bidding capacity. The attractive size range of a package will vary from one contractor to another and also from one type of work to another. At times there will be a group of contractors that only bid smaller projects and others that will only bid very large groups of projects.

To allow both of these contractors to bid, the Office of Contracts will occasionally offer an "optional combination". For example, four bridges can be let singularly and also all four as one large package. The contractor may choose to bid any of the single bridges and may also choose to bid the package with all four bridges. The Office of Contracts will decide if the four separate projects or the four combined are less expensive. The lowest dollar amount of the responsive bids is what will be awarded. Following are some of the criteria used in packaging various types of work:

Structures

Iowa has a lot of smaller contractors that build box culverts and bridges. Some of these contractors cannot bid packages that are extremely large; others aren't interested in smaller projects. RCB extensions and new RCB culverts in the same area should be combined on the same project especially if the total dollar cost is under $250,000.00. Multiple extensions and new culverts should be divided into separate projects if the total cost exceeds $500,000.00. Culverts should primarily be packaged by location, but if possible, same-sized culverts should be grouped together to help reduce contractors costs.

Bridge projects routinely obtain good competition except for those structures that are very large or very small. Single bridges are usually let as a separate contract except that two dual bridges (same width and length) are usually the same design number and therefore on the same project/contract.

PCC Pavement

There are two distinct areas PCC pavers specialize in, urban type paving and rural type paving. Some contractors do only one or the other type while others can function well in either area. Generally speaking small PCC paving projects will cost more per area of pavement due to the mobilization costs. More complex construction/traffic staging will increase cost substantially. There does not seem to be a distinct dollar amount where competition increases or decreases, however the Office of Contracts will usually look to split a PCC paving project up into parts if it exceeds about 10 million dollars. These multiple paving projects will then usually be offered as an optional combination.

ACC Pavement

Smaller ACC paving projects will often have very few bidders. This is common due to the fact that there is usually only one local ACC plant and it may not be economical for another contractor to move in a portable ACC plant. Therefore, whenever possible, ACC projects should be grouped together to try and attract other ACC bidders to an area. When there are more than one or two ACC bidders, the bid prices are usually better.

Grading

Iowa is fortunate to have an abundance of good grading contractors that do both small and large projects. Most of the smaller contractors can not bid projects over 2.5 to 3 million dollars due to their bonding capacity. Some of the larger contractors do not bid projects lower than 1.5 to 1 million dollars. The Office of Contracts has discovered that better bid prices are obtained from projects worth 2 to 2.5 million. When a grading project rises above 3 million dollars, the project may be split up into 2 or more projects to increase competition. These multiple grading projects will then usually be offered as an optional combination.

Other

When contractors can bid on their own work type rather than being a subcontractor, more favorable bid prices are usually obtained. Therefore it is preferred to have small items such as traffic signals, lighting, erosion control, fencing, landscaping let as their own separate projects. However there are times when construction staging or traffic staging will require having some small items included in a larger project of a different work type. Combinations of different work types are at times unavoidable but the designer should try their best to design a project that will separate work types resulting in the same quality project for a lower price.

7. Balancing Work load/Fall-winter letting

The number of projects available for bid will vary from letting to letting. Usually during the fall and winter lettings (October through March) there will be well over one hundred construction projects per letting for contractors to bid on while in the spring and summer lettings (April through September) the number of construction projects range from thirty to sixty for each letting.

The Iowa DOT lets most of their projects, particularly the larger projects, in the fall and winter months to lower the construction cost. By letting projects during this time period, the contractors are given more time to adequately schedule their future work. The number of contractors available to bid on Iowa DOT projects are generally higher during the fall and winter months, and thus the construction prices are be more competitive.

The Office of Contracts works with those involved in the projects (within and outside the Iowa DOT) to determine when a project should be let. While most projects are let during the fall and winter lettings, the Iowa DOT tries to balance the workload to avoid a feast or famine situation. It is not good to have all the projects for one work type in one letting; it is better to spread some projects out over multiple lettings. This insures adequate work for contractors and a sufficient number of contractors available to do the work.

8. Plan Review by Proposal Section

The Office of Contracts reviews the plans to see if they are complete and biddable. This review allows a proposal to be generated and helps it to accurately reflect the work in the plans.

Following are things reviewed for each project submitted to Contracts.

- Items on plan versus work type.
- Bid item usage.
- Usage of "As directed by the Engineer", this is not normally accepted.
- Items or work that is incidental.

Following is a list of items that may be checked for obvious errors.

- Detail sheets
- Tabulations
- Road / Bridge standards
- Quantities
- Specifications
- Traffic Control Staging

Office of Contracts personnel may make clerical changes to the project plans. The engineer who signed the plan will be notified of the change by either Contracts personnel or other DOT personnel.

Office of Contracts personnel can make minor design changes to the project plans if a letter or fax detailing the changes is received from the engineer that signed the plans. The engineer that signed the plan or their designee should make major design changes.

Letting Plan Standards

The Reproduction Department has been instructed by those using its services that plan sheets need to be reproduced at 100% of the printed size. This allows designers to produce a plan that is scalable. The space in the margins to allow proper reproduction is as follows: 11" x 17" plan sheets must have a "white border" minimum of 0.25 in (1/4") top and bottom and 0.625 inch (5/8") left and right. If any printing falls within this required 'white border" it is in jeopardy of being lost when the sheet is reproduced.

Printing of Plans

The Office of Contracts indicates on the front of each set of plans how many the Office of Printing and Assembly is to reproduce. Following are some general guidelines on how many plans should be made:

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Work Type	Number of Plans to Print
Bridges and Bridge Repairs	150
RCB Culverts	135
PCC / Reconstruction	150
ACC Paving / Resurfacing	150
Patching / Surface Rehabilitation	100
Grading	150
Signing	100
Lighting	100
Miscellaneous	80
Erosion Control / Landscaping	80

Some of the larger structures, PCC, ACC and grading projects may require more copies if the Estimate of Quantities shows the project as having a combination of multiple work types. Urban projects or projects that are within city limits also require more copies because of the number of utilities and extra bid items involved.

The following system is used to prioritize the printing the plans:
Put "* *" on primary, interstate, state park, institutional roads and urban systems.
Put "- -" on secondary, farm to market and local systems.
Circle the amount for all PS&E jobs.

Cross Sections for Local System Plans

The Office of Contracts needs to receive any available cross sections on all projects. These will be made available to contractors either as part of the plan or by request.

- If the cross sections are 10 sheets or less, they will be included in the plan.
- If the cross sections are more than 10 sheets and the local agency wants them included as part of the plans, they will be shown in the Index of Sheets and they will be included in the sheet count for printing costs.
- If the cross sections are more than 10 sheets and the local agency does not want them included as part of the plans, the following note will be in the index of Sheets: **Cross Sections are available from the Iowa DOT Office of Contracts.** They will be listed on the order form as available for purchase from the Office of Contracts. They will not be included in the sheet count for printing costs.

Cross Sections for Iowa DOT plans

Plans with 50 or more cross sections have the cross sections printed separately. They will be listed on the order form as available for purchase from the Office of Contracts. If there are 49 or fewer cross sections, they will be printed with the plan.

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9. Cost Estimating

Before a project is advertised, an estimate is established by the Iowa DOT. One of the purposes of the estimate is to make sure that funding is available for the project. Estimating the cost will help control the limits of the design of the project and also determine what functions of the project can be achieved from available funding.

Estimates are also prepared to make sure that contractors bid submittals are reasonable. After the letting, the low bid is compared with the estimate to check for reasonableness in unit prices and total cost of the project. Each bid item is evaluated and studied to determine what significant differences in unit price occur between the estimate and the low bid. In some cases, these comparisons are used to determine if the project should be awarded or rejected.

It is the State's policy to keep the estimates confidential and not to release them publicly either prior to or after lettings. Also, no information is released publicly which may indicate the actual or approximate value of the estimate prior to the letting. The intent of this confidentiality is so that the estimate does not influence the bidders' unit prices and encourage more accurate and competitive prices.

The unit prices for project estimates are achieved by a combination of computer generated statistical results of historical unit prices and research to find data not readily available from historical record.

There are almost 3,000 bid items (in both English and Metric) of which there are historical cost records. These data are maintained on the DOT's mainframe computer of which programs are used to sort and analyze the records to generate a unit price. When a computer-generated result is not satisfactory, further research will be done to find a unit price that fits the item of work.

The tool used to generate and enter the unit prices is a mainframe software program called TRNS*PORT. This program is also used for maintaining the historical records as well as analyzing the bid results

There are several factors to consider when preparing an estimate. One of the factors is the road type. There are five different types of road, interstate, primary, farm to market, urban, and institutional. Unit price items can be influenced by the road type, which can be equated with volume of traffic.

The type of work can also influence unit prices. There are at approximately 145 work types available for use. An example of how price are affected – prices for seeding in a PCC paving project may be significantly different than a price for seeding in an erosion control project.

Quantity of the item also affects unit prices. Typically if there is a large quantity for that item, unit prices will generally be lower than if there were low quantities for that item.

Another factor that affects unit prices is when the project is let. Generally when the project is opened for bid in the fall and winter months where the start date does not take place till the following spring, the unit prices are going to be favorable. Contractors prefer to use this time of year to schedule construction for the next season. If a project is let in the spring or summer and needs to be completed the same year, prices will be higher as the contractors' schedule become much tighter.

Location of the work is another factor to consider. This is especially true for items that require aggregates. In Iowa for example, there are more quarries in the northern half of the states than there are in the southern half. The availability of quarries will affect the unit prices for PCC and ACC paving, subbase items, erosion control items.

10. Liquidated Damages

Liquidated damages is a contract agreed upon amount of damages that will be paid by the contractor should they not be able to complete the contract within the time frame designated in the contract documents.

The Office of Contracts reviews and updates the liquidated damage rates every two years and submits the rates to the Federal Highway Administration (FHWA) for approval per 23 CFR 635.127.

The Office of Contracts has calculated the average daily contract administration cost for completed contracts let between January 1, 1997 and December 31, 1999. The average contract administration cost is the sum of all inspection, vehicle, and subsistence expenses for each project divided by the number of working days charged against the project. Based on these average contract administration costs, the Office of Contracts has prepared the Liquidated Damage Schedule in the Appendix.

The liquidated damages set for a contract must be reasonable and not punitive. The charging of days for the contract must also be reasonable. When the contract is complete and the contractor has liquidated damage days charged against them, the contracting authority must be able to show that they were damaged.

11. Contract Periods

The Contract Period is the time period allowed in the contract for completion of all work contained in the contract documents. The duration of highway construction projects is critical due to the following factors:

- More projects are being constructed under traffic, resulting in increased exposure of construction workers and motorists to hazards
- Traffic volumes on most roadways are continuing to increase which impacts safety and cost.
- Proper selection of contract time allows optimizing all available resources including construction engineering staff and the available contracting industry.

Instructions for Estimating Contract Periods

The proper establishment of contract periods is a balance between minimizing road user inconvenience and maximizing the most efficient use of the construction industry's available resources, while conforming to the administrative limitations of the contracting authority. Contracts that provide more time than is actually needed for the project may discourage innovative management or construction techniques, encourage contractors to bid more work than can be handled and increase agency costs. However, additional

time may also result in lower bid prices and permit smaller, lower volume contractors to bid. Contracts specifying less time than necessary for completion of a project can result in high bid prices and eliminate potential bidders. However, this could also encourage good management, higher productivity and result in lower administrative and engineering costs. The goal of standardized contract periods is that similar projects should be completed in similar time frames across the state.

Important factors that always need to be taken into account in contract period determination are traffic volumes, staging requirements and project complexity. Other factors that may be taken into account when they have a substantial impact on the project or the traveling public are high profile tourism events, agreements with other agencies, environmental constraints, availability of materials (structural steel, traffic signals, signs, etc.) and coordination with other construction projects.

The Office of Contracts has the responsibility for establishing contract time periods with input from the appropriate field offices.

The first step in establishing contract periods is to become familiar with the Traffic Control Plan (including Detail Sheets), Staging Plan (including Detail Sheets), items of work and the estimate reference notes. This will give the reviewer an opportunity to become familiar with how the project will be constructed and what items of work may control the completion of the project.

The average production rates shown in the appendix are used to evaluate the number of days possible for each item.

Based on the knowledge of the project and the reviewer's knowledge of typical construction practices, the amount of overlap or concurrent operations is determined.

Once the amount of overlap has been determined the total number of working days required for the project is calculated. These days are listed on the proposal/contract in increments of 5 days.

Periodically, there is the need to adjust the production rates used on a particular project. Careful thought must go into the reasoning for adjusting the production rates. Some reasons may be special staging, emergencies, unique construction methods, special materials or restricted working conditions.

The comments section at the bottom of the "Estimate of Time Required Form" is for briefly describing the project's traffic control, staging requirements, length, local considerations, start or completion dates, intermediate dates and whether winter free time is allowed.

Type of Contract Period

After the length of the contract period has been determined, the type of contract period must be established. The basic philosophy is to allow the contractor as much flexibility as possible in which to complete the contract work. This philosophy allows contractors to

schedule their work in an efficient manner, which should result in lower bid prices. The intent is to have projects completed by the end of the following construction season or within one year of letting.

Currently, contract periods fall into four categories: Specified Start Date, Approximate Start Date, Late Start Date and Completion Date, these four categories of contract periods are defined in Article 1108.02 of the Standard Specifications.

Specified Start Date

A specified starting date is used when the site will be available and it is necessary for the contractor to start on that date. This type of contract period is also used for projects of exceptionally long duration. For these projects it is not the type of contract period that controls, but the duration of the contract.

The most common uses of specified starting date contracts are for projects that have critical closures of the roadway or if completion is necessary to facilitate the construction of subsequent projects.

Approximate Start Date

An approximate start date is used when the site may not be available until that date. The contractor can reasonably assume that work could commence on or near that date, although it may require coordination with other contractors. The proposal form should indicate the conditions that do not allow the contract to start immediately.

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The approximate starting date contract also allows the contracting authority the opportunity to delay starting work should a conflict arise with scheduling due to uncompleted work by other contractors or the availability of a detour.

Late Start Date

A Late Start Date is used when the site is available anytime after the letting, but completion of the project is not required until a later date. The late start date is defined as a calendar day shown on the proposal form specifying the latest date that a contractor is to commence work. Usually, the assumed completion date for a late start date contract should not exceed the letting date by more than one construction season or calendar year.

A Late Start Date should be utilized on the majority of all contracts. This type of contract period allows the contractor the most flexibility in scheduling work crews. It should be set as late as reasonably possible to allow the contractor to better schedule their projects and order supplies. It has been agreed between the Iowa AGC and the Iowa DOT that bridge projects will normally have a Late Start Date 60 days after the letting or later.

Completion Date Contracts

A completion date type contract is available for projects that are not normal highway projects. These projects would not normally be impacted by the weather. Charging of working days and winter work will not apply. Liquidated damages will be assessed for each calendar day beyond the Completion Date that the contract remains uncompleted. Typical completion date contracts include building renovations, rest area building improvements and any other type improvements where weather does not impact the project.

Intermediate Contract Periods

Another requirement that may be applied to contracts is the use of an intermediate contract period. Common uses of intermediate periods are:

- Early completion of bridge berms by a grading contractor to enable the bridge contractor to start
- Starting or completing critical stages of a project due to high traffic volumes
- Early completion of certain culverts on a multiple culvert project to allow the placement of fill by the grading contractor

Field Input

An important element of standardized contract periods is to have policy that is uniform across the state. While uniformity is the key, the process to be used must also be flexible. Local conditions must be considered when they impact traffic volume, staging and project agreements. Input from the office that will administer the contract is necessary to ensure that the contract period is compatible with local conditions. Unique local conditions and administrative limitations or concerns should be addressed when the plans are turned in to the Office of Contracts for letting.

Approximately eight (8) weeks prior to the letting, the Office of Contracts sends a listing of projects scheduled for the letting to the District Engineers, Assistant District Engineers, District Construction Engineers, Local Systems Engineers and the Resident Construction Engineers to review. This listing states the contract period, the number of working days and any intermediate contract periods assigned to each project. These engineers should review the constructibility of the project in relation to the proposed contract period. They should identify any unusual or unique conditions that may affect the proposed contract time and determine if the proposed contract time conforms to all project requirements. Responses are requested within one week. On complex projects, requests and concerns should be submitted by the plan turn-in date (ten weeks prior to letting).

Contract period and working day requests from county and city administered projects are submitted to the Office of Local Systems with the plans. The requests are forwarded to the Office of Contracts upon concurrence by Local Systems. If the request from the county or city differs substantially from the standardized contract period, appropriate justification may be required.

Tier System

It is recognized that the arrival of cooler weather in the fall is not a simultaneous occurrence across the state. For the establishment of contract periods the following table can be used as a general guideline for completion dates:

	PCC Paving	ACC Paving & Resurfacing	Structures
Northern three tiers of counties	Mid October	Third week in October	Beg. of November
Center three tiers of counties	End of October	Last Week in October	First week in November
Southern three tiers of counties	Mid November	First week in November	Mid November

When work is allowed late into the fall the issue of winter free time needs to be addressed. It is also important to note whether it is intended to allow or require the contractor to work over the winter.

Critical Path Method (CPM) Scheduling

Projects that involve complex staging or have critical time restraints should utilize CPM scheduling. CPM scheduling will be used on all projects utilizing Incentive/Disincentive for Early Completion.

Incentive/Disincentive for Early Completion

Incentive/Disincentive should be considered on highway construction projects where traffic movements are adversely affected causing undue delay and operating costs. Critical closure periods may include but are not limited to the following conditions:

- Periods of head-to-head traffic on multi-lane divided highways
- Periods of lane closure on multi-lane divided highways with average daily traffic exceeding 14,000 VPD
- Periods when through traffic on a non-divided highway is directed to an off -site detour with average daily traffic exceeding 7,000 VPD
- Periods of lane closure on a non-divided highway with average daily traffic exceeding 7,000 VPD
- Periods when through traffic is directed to an off -site detour with an out-of distance travel exceeding 10 miles
- Locations that cause severe economic hardship for a local community.

Early completion may be specified for an entire project or for designated portions of a project. Projects on which I/D provisions apply will have the I/D daily rates, the work or portion of the work intended for I/D, the late start date of the designated work, the number of closure days allowed (critical closure period), the total work days for the project and the maximum incentive payment shown in the proposal. The number of closure days will be calculated with consideration of average weather days. A closure day will be counted for each calendar day during the critical closure period. The incentive/disincentive rate starts at $2500.00 and is increased in $2500.00 increments.

Lane rental with Incentive/Disincentive

Lane Rental with Incentive/Disincentive is used to encourage contractors to minimize impacts to the road user during construction. It should be considered on highway construction projects where traffic movements are adversely affected causing undue delay and operating costs. The contractor is assessed a rental rate for each lane and/or shoulder closure. The rental rate will be based on an hourly and/or calendar day basis. The allowed time, rental rate, and maximum incentive will be determined by the contracting authority and stated in the proposal. The rental rate is based on the estimated cost of delay or inconvenience to the road user during the rental period for the area closed to traffic.

Lane Rental with Incentive/Disincentive should primarily be used when traffic will be restricted but still travelling through a construction site. The incentive portion allows the contractor to obtain extra compensation for accelerating the work in the specified area.

For more information refer to the Supplemental Specifications for Lane Rental with Incentive/Disincentive.

No Excuse Road Opening Bonus

The No Excuse Road Opening Bonus is an innovative contracting method to provide the contractor a predetermined lump sum incentive for re-opening the roadway to traffic a specified calendar date. A No Excuse Road Opening Bonus is intended to compensate the contractor for their additional cost to overcome any delays, regardless of any reason (weather, additional work, utility delays, etc). The rules for the application of a No Excuse Road Opening Bonus are as follows:

- Use of incentive rather than the threat of liquidated damages to get timely opening on roadways (e.g. the carrot rather than the stick approach).
- Use of the No Excuse Road Opening Bonus should be reserved for special projects. Typical use would be for re-opening sections of roadways, which have been closed and must be available for traffic by a specified date.
- The specified date for opening the roadway should be set so any reasonable contractor would be able to achieve the No Excuse Road Opening Bonus.
- The No Excuse Road Opening Bonus should be used as a bonus, and not be used as a Calendar Completion Date for work or as a method to accelerate the contract!
- The size of the bonus should be a large enough incentive to entice the contractor to expend extra effort to open by the specified date.
- Use of this bonus incentive is unlikely to increase the contract amount. All of the competitive bidders will likely assume they will be receiving this bonus and reduce their bid on other items a similar amount in order to submit a competitive bid.
- Use of the No Excuse Road Opening Bonus should only be used when adequate bidding competition is anticipated.
- The Bid Item for the No Excuse Road Opening Bonus is in section 2528 and is a predetermined Lump Sum amount.

The calendar date specified for the No Excuse Road Opening Bonus should be a catastrophic date where if the roadway is not opened, the intent of the contract is not achieved. This date would normally be a calendar date that the traveling public would be severely impacted even if the roadway is opened a day later. Typical dates would be the Thursday before Labor Day, the Tuesday before Thanksgiving, or the Friday before a major traffic generating event (e.g. State Fair, first day of classes at a school on the project, etc.).

The amount of the No Excuse Road Opening Bonus should be between 1.0% and 2.0% of the project estimate (in $10,000 increments), with $20,000 as the lowest bonus. Generally we should not use the No Excuse Road Opening Bonus on projects less than $1 million.

A note in the proposal should be included such as "The contractor will be paid the Lump Sum amount shown on the Schedule of Prices for "No Excuse Road Opening Bonus" for opening the roadway to traffic on or before the calendar date shown". The proposal note should state clearly what is considered as the roadway open to traffic (e.g. the number of lanes, if lane daytime lane closure will be allowed, etc.) Any delays due to weather, change orders, overruns of quantities, utility delays, or any other delays will not be considered as justification to modify the calendar date. (NOTE: Any change order should address the cost for the contractor to accelerate the work to ensure the project is not delayed.) The intent of the Bonus is to offer the contractor an incentive to open the road by the calendar date specified, and help defray some of these unexpected costs.

Specifications / Restrictions Impacting Contract Periods

Following are some specifications that have a significant impact on contract periods:

Hot Mix Asphalt Mixtures (Article 2303.03C):
Air and base temperature must be at or above those listed for the applicable final lift thickness.

Bituminous Surface Treatment (Seal Coat) (Article 2307.04K):
No work after September 1st for primary projects.
No work after September 15th for other projects.

Thin Bonded PCC Overlay (Article 2310.07):
The overlay must be placed when the air and surface temperatures are above 40°F / 4°C.

Cold-in-Place Asphalt Cement Concrete Recycling (Article 2318.05)
The work must be performed between May 1st and October 1st.

Slurry Leveling, Slurry Wedge and Strip Slurry Treatment (Article 2319.07)
Slurry mixture shall not be placed after October 1.

Bridge Deck Overlay (Article 2413.10):
Temperature restrictions must be adhered to and the work must be performed between April 1st and October 1st.

Crack and Joint Cleaning and Sealing (HMA 2541.05 / PCC 2542.06)
Work must be completed prior to September 30th and when the air and surface temperatures are above 40°F / 4°C.

Seeding (Permanent) (Article 2601.04):
The work must be performed between March 1st and May 31st and also between August 10th and September 30th.

Overseeding (Article 2601.04K):
The work must be performed between March 1st and April 1st.

Seeding (Stabilized) (Article 2601.05):
The work must be performed between March 1st and September 30th.

Plantings (Article 2610.03):
The work must be performed for:

	Evergreens	Deciduous
Between:	March 1st and April 30th	March 1st and May 15th
Between:	September 1st and 30th	October 1st & November 30th

Steel products will require a lot of lead-time for ordering of materials. Signal poles and light poles will normally take two to four months while structural steel members will normally take four to six months. This required lead-time has taken up to two additional months because of increased demand for materials.

12. Type of Work - Subletting of Contract

In 1993, a task force, consisting of the Offices of Road Design, Program Management, Advanced Planning, Construction, Transportation Inventory, Maintenance, Project Scheduling, Audit, FHWA, Bureau of Information Services, Bureau of Support Services, Transportation Safety, and Contracts, developed a list of major work type categories. Trns•port, the Office of Contracts computer system, has used these new work type codes since the January 1994 letting. The Bid Item Descriptions, English and Metric contain an updated list of work types.

Assigning Work Types and Call Groups

The work type on the title sheet of the plan should match the type of work contained in the plan. The designer may need to change the work type on the title sheet if the work type is obviously incorrect. The work type assigned at the project level in Trns•port PES should match as closely as possible to the work type shown on the title sheet of the plan.

The work type assigned at the proposal level in Trns•port PES (which would cause the proposal to be assigned to a call group) should be the work type that represents the type of contractor who would be qualified to bid the proposal. For example, a proposal for Grade and PCC Pavement would end up in the PCC Paving call group. Therefore, a contractor prequalified in P1 (PCC paving) should be able to prime the project. However, the proposal should be assigned Grading if only contractors prequalified in G1 (Grading) could perform the required amount (normally 50%) and would be allowed to bid on the project.

Subletting of Contract

Section 1108 addresses the issue of prosecution and progress of work under contract. Specifically at issue is the subletting of portions of the work under contract by the prime contractor.

Section 1108.01 of the Standard Specification for Highway and Bridge Construction stipulates the conditions under which subcontracting may be done by the prime. One of two modifications to Section 1108.01 may be applicable if it is found that the prime contractor will have difficulty meeting the specification. These modifications are proposal specific and can be found in the proposal form in the Proposal special Provisions Text.

Use of the 30%/70% Subcontract Note (670.12)

The primary reason to use the 30%/70% subcontract note is to ensure there is a group of contractors who can easily perform the required percentage of the contract with their own organization. Increasing competition in areas where we typically do not get competition is a secondary reason for use of this note.

The 30%/70% subcontract note should be added to any proposal that meets *either one* of the following two criteria:

1. No Work type Classification Can Easily Perform 50% of the Contract

The 30%/70% subcontract note should be added to any proposal where it appears no prequalification work type would normally perform 50% of the contract amount. The bidders may bid the proposal differently than our estimate or the bidder may have to subcontract a portion of the major work items to DBE firms. Therefore the "easily perform" test is when there is at least one prequalification work type which should be able to perform at least 60% of the contract with their own organization. This would include the items for that work type, plus mobilization and other items (e.g. subbase work, shoulders, etc.) that the prime contractor would normally be able to perform with their own organization. If it appears no work type would normally perform 60% of the contract, then the 30%/70% subcontract note should be added to the proposal.

2. Insufficient Number of Contractors

At least four (4) contractors should be expected to bid on the proposal. Even though one prequalification work type should easily be able to perform over 50% of the contact amount, the 30%/70% subcontract note should be added to the proposal allowing other prequalification work types the opportunity to bid if another prequalification work type would be able to perform 30% of the contract amount, and we think adding the 30%/70% proposal note would increase the likelihood of getting at least four bidders on the proposal.

670.12

*** SUBLETTING OF CONTRACT ***

REPLACE THE FIRST PARAGRAPH OF STANDARD SPECIFICATIONS ARTICLE 1108.01 WITH THE FOLLOWING:
THE CONTRACTOR SHALL PERFORM AT LEAST 30% OF THE CONTRACT AMOUNT WITH HIS/HER OWN ORGANIZATION. ON THIS PROJECT ONLY, THE CONTRACTOR MAY SUBCONTRACT UP TO 70% OF THE CONTRACT AMOUNT.

THE BIDDERS SHOULD BE AWARE THAT THIS PROJECT REQUIRES SEVERAL TYPES OF WORK. PURCHASING OF MATERIALS FOR SUBCONTRACTORS WILL NOT BE AN ACCEPTABLE METHOD FOR THE PRIME CONTRACTOR TO MEET THE 30% REQUIREMENT.

ITEMS DESIGNATED AS SPECIALTY ITEMS MAY BE PERFORMED BY SUBCONTRACT, AND THE COST OF ANY SPECIALTY ITEMS SO PERFORMED BY SUBCONTRACT MAY BE DEDUCTED FROM THE TOTAL COST BEFORE COMPUTING THE AMOUNT OF WORK REQUIRED TO BE PERFORMED BY THE CONTRACTOR WITH HIS/HER OWN ORGANIZATION.

Use of the Subcontract Note 670.13

The note 670.13 allows any portion of a project to be sublet so long as the prime contractor meets the requirements shown in the note. This note should only be used on contracts that are normally done by a project manager, such as building construction or renovation projects.

670.13

REPLACE ARTICLE 1108.01 OF THE STANDARD SPECIFICATIONS WITH THE FOLLOWING:

THE CONTRACTOR MAY REQUEST TO SUBCONTRACT ANY PORTION OF THE CONTRACT. WRITTEN CONSENT OF THE CONTRACTING AUTHORITY IS REQUIRED FOR ALL PORTIONS OF THE CONTRACT TO BE SUBLET, ASSIGNED, OR OTHERWISE DISPOSED OF, EXCEPT FOR THE FURNISHING AND TRANSPORTATION OF MATERIALS. REQUESTS

FOR PERMISSION TO SUBLET, ASSIGN, OR OTHERWISE DISPOSE OF ANY PORTION OF THE CONTRACT SHALL BE SUBMITTED IN WRITING TO THE CONTRACTING AUTHORITY PROPOSAL SPECIAL PROVISIONS ON "SUBCONTRACT REQUEST AND APPROVAL (FORM 830231). THE CONTRACTING AUTHORITY WILL FORWARD ALL REQUESTS WITH RECOMMENDATIONS TO THE APPROPRIATE IDOT DISTRICT OFFICE FOR FINAL DISPOSITION. EACH REQUEST SHALL BE ACCOMPANIED BY A SHOWING THAT THE ORGANIZATION WHICH WILL PERFORM THE WORK IS PARTICULARLY EXPERIENCED AND EQUIPPED FOR SUCH WORK. CONSENT TO SUBLET, ASSIGN, OR OTHERWISE DISPOSE OF ANY PORTION OF THE CONTRACT SHALL NOT BE CONSTRUED TO RELIEVE THE CONTRACTOR OF ANY RESPONSIBILITIES UNDER THE CONTRACT.

THE CONTRACTOR SHALL DESIGNATE A PROJECT MANAGER WHO SHALL DIRECT ALL OF THE WORK ON THIS CONTRACT. THE PROJECT MANAGER SHALL BE AVAILABLE WHENEVER WORK IS IN PROGRESS AND SHALL HAVE AUTHORITY TO:

1. ENSURE ALL SUBCONTRACTORS HAVE COMPLIED WITH THE EEO/AA REQUIREMENTS OF THE CONTRACT.

2. ENSURE ALL EEO/AA REQUIRED POSTINGS ARE VISIBLE TO ALL PERSONS WORKING ON THE PROJECT.

3. ENSURE THAT NON-SEGREGATED FACILITIES ARE PROVIDED FOR ALL PERSONS WORKING ON THE PROJECT.

4. COORDINATE AND DIRECT THE ACTIVITIES OF ALL SUBCONTRACTORS TO ENSURE TIMELY COMPLETION OF THE PROJECT.

5. NEGOTIATE CHANGE ORDERS AND EXTRA WORK ORDERS.

13. Flaggers and Pilot Cars

From 1986 to 1990, the contractor bid the daily unit prices for flaggers and pilot cars. Contractors were unbalancing their bids to take advantage of potential quantity overruns or underruns. In 1991, the department decided to set a predetermined price for flaggers and pilot cars. The calculated price for flaggers is based on the statewide Davis-Bacon wage rate for flaggers. A twelve-hour workday with a 35% overhead cost is assumed. The calculated price for pilot cars will be 150% of the calculated price for flaggers. The predetermined contract price for flaggers and pilot cars will be the calculated price rounded to the nearest $5.00 increment.

The Davis-Bacon wage rates normally change in January of each year. Therefore, all work let in a calendar year would usually have the same unit prices for flaggers and pilot cars.

Established Contract Price for Flaggers and Pilot Cars

Predetermined unit prices for flaggers and pilot cars are reviewed, recalculated, and adjusted, if necessary, whenever a new Davis-Bacon wage rate is issued. Effective after the January 14, 1997 letting, predetermined unit prices for flaggers and pilot cars are not changed for a specific letting if a new Predetermined Wage Spec is issued by addendum. The new predetermined unit prices will be in assigned and in effect with the next scheduled letting. Effective with the October 03, 2000 letting, any project that is in Scott County (in whole or in part) will use the predetermined units prices based on the Scott County Wage Rate. All other projects will use the predetermined unit prices based on the 'statewide' Wage Rate. The predetermined wage rate specifications and the predetermined unit prices used for flaggers and pilot cars are shown in the estimating proposal form.

14. Issuing Bidding Documents

Advertising for Bids

The state uses *The Des Moines Register* to advertise for bids because it has the widest circulation of any newspaper in Iowa. The official advertising is on the fifth Monday prior to the letting date.

In addition to the newspaper advertisement, the state publishes a *Weekly Letting Report*. This report includes a notice to bidders and itemizes the major quantities of work as they will appear in the proposals. Section B of the *Weekly Letting Report* gives a detailed listing of projects to be let. Section D of the report has a Request for Proposal Form which can be used to order plans, estimating proposals or bidding proposals. The *Weekly Letting Report* can be ordered by obtaining a subscription form from the Office of Contracts, telephone 515-239-1414 or from the DOT Office Supplies, telephone 515-239-1324.

Issuing Proposals, Plans and Specifications

The estimating proposal may be requested from the Office of Contracts either by telephone, FAX, mail or in person. It lists the contract period, schedule of prices, supplemental specifications and special provisions that apply to each project.

Plans may be requested from the Office of Contracts either by telephone, facsimile (fax 515-239-1325), in person or by mailing in the request form in the *Weekly Letting Report*. There is no charge for the first two sets of plans.

The bidding documents may be requested by submitting the request form and Work Under Contract form found in the *Weekly Letting Report*. The contractor lists all incomplete work the applicant has under contract, both inside and outside of Iowa on the work under contract form. Upon receipt by the Office of Contracts of the contractor's request, an analysis is made of the contractor's potential bidding capacity (maximum qualification minus incomplete contracts equals potential bidding capacity). The contractor's request for

proposal forms is then reviewed for the experience, equipment and financial capacity to do the projects requested and approved for submittal of the bidding documents to the contractor.

When a request is honored, the Office of Contracts gives the prospective bidder documents consisting of a bidding document with an estimating proposal, supplemental specifications, special provisions, and an envelope in which to return the bid. The Office of Contracts places the name and identification number of the bidder on the bidding document.

A contractor may join with another contractor to request to bid a project as a joint venture. Each of the contractors must be pre-qualified with the Iowa DOT. A joint venture's bidding capacity will be the sum of each contractor's maximum qualification minus the sum of each contractor's incomplete contracts. In a joint venture, a letter should be sent to the Office of Contracts requesting the joint venture and designating one contractor as the lead contractor. All contract documents will be sent to the lead contractor. For joint ventures, both contractors must sign the bidding document and bid bond.

Electronic preparation of the bid is allowed, but must be done with the electronic bid system (Expedite) software furnished by the Office of Contracts. Interested parties should contact the Office of Contracts for more information about this software.

To be valid for bidding, the Proposal Schedule of Prices form included with the Estimating Proposal or a computer generated Expedite Schedule of Prices must be included with a Bidding Document.

Pre-Bid Meetings

Occasionally, the Office of Contracts will hold a pre-bid meeting to help clarify some of the requirements and details of the project. Usually these meetings are for projects where there are complex staging requirements or unusual work in which there is a high likelihood of questions or concerns about the contract documents.

These meetings are not only for the interested contractors and the designers of the project but representatives from other departments within the Iowa DOT are encouraged to attend the pre-bid meeting. Possible participants are: Specifications, Materials, Construction, Design, Local Systems, Bridges and Structures, Districts, Resident Construction Engineers, City and County representatives.

The pre-bid meeting takes place about two weeks before the project is let and, if necessary, held near the project site. The announcement for the pre-bid meeting will normally be given in the contract proposal as well as in the Weekly Letting Report.

Publishing of Potential Bidders

Under the Iowa DOT's present policy, the list of contractors holding bidding documents is public starting two weeks prior to the letting. However, a written list will not be mailed or faxed. The information is available by telephoning the Office of Contracts; posted at a Des Moines Hotel, usually the Marriott Hotel or Embassy Suites, on the night prior to the letting; and posted on Bid Express. If a contractor wishes to remain anonymous prior to letting, they must make this request when ordering bidding documents.

Proposal Guarantees

A contractor must submit a proposal guarantee with each bid. This is discussed in Article 1102.12 of the Standard Specification Book. The amount of the guarantee is shown on the bidding proposal. A proposal guarantee can be submitted in the form of a certified check, credit union certified share draft, cashier's check, bank draft on a solvent bank or credit union, or a contractor's bid bond on a form provided by the Iowa DOT. The Iowa DOT contractor's bid bond form is available from the Office of Contracts.

Proposal guarantees are returned by mail to the unsuccessful bidder after the approval for award of contract has been made. Proposal guarantees are returned to the successful bidder after the filing of the contract documents.

Bid Openings

Bids are received and time stamped until 9 a.m. the day of the letting at the Iowa DOT Office of Contracts in Ames or at a Des Moines hotel, usually the Marriott Hotel or Embassy Suites in Des Moines. A paid guard or representative of the Contracts Office receives bids at the hotel until 9 a.m. From the hotel, all bids are placed in a locked box and transported to the Iowa DOT Central Office in Ames.

After opening, all bids are reviewed for accuracy prior to being read. If the bid is incomplete or irregular, the bid is not read and the reason that it is not read is given at the letting. A letter follows this up to the contractor explaining why the bid was not read. To help prevent contractors from submitting an incomplete bid, the bid envelope has a checklist to remind them to do such things as sign the proposal, enclose the proposal guarantee, bid all items, etc.

15. D.B.E. Goal Setting Criteria/Responsiveness

DBE Goal Setting Committee

Seven weeks prior to the letting a DBE goal setting meeting is held. Those persons attending the goal setting may be the EEO Section Administrator, the Proposal Engineers, the DBE Consultant, DBE contractors and members of the Associated General Contractors. On occasion, representatives from FHWA and Materials Suppliers attend.

Criteria for Setting Project Goals

The following criteria is used as a general guide in setting DBE goals on individual federal-aid projects:

- The average DBE commitments for the year to date should exceed the annual goal.
- The total dollar goal on a project should exceed $10,000 such as structures, paving, asphalt, and grading.
- Attempt to maintain a balance of DBE goal work between industries such as structures, paving, asphalt, and grading.
- Attempt to maintain a balance of DBE goal work between county, city, and state projects.

- Attempt to maintain a balance of DBE goal work across the state so all geographic locations share in the DBE Program.
- Identify items of each project that prime contractors would normally subcontract.
- Consider availability of local DBE contractors who could quote on the project.
- Identify items to allow the bidders several options by which they could meet the goal. If several options cannot be identified, consideration will be given if at least three DBE firms could quote the contract items available to the contractor.
- No DBE goals less than 2.5% will be set. DBE goals will be in 2.5% increments. 15% should be considered the upper limit.

Good Faith Effort Determination in awarding contracts

Please call the Office of Contracts at 515-239-1422 to obtain more information on how good faith effort is determined.

16. Addenda Criteria

A priority of the Office of Contracts is to limit the number of addenda that are issued each letting. A risk taken on every addendum issued is that all contractors may not receive the addendum. If there is no verification that each addendum is received prior to the letting, the project must be withdrawn from the letting. A second risk is when we add bid items by addendum and a contractor neglects to bid the added bid item.

Any proposed change to the contract documents after printing of the plans and specifications would require an addendum. All requests for addenda shall be submitted to the Office of Contracts in writing to assure the accuracy of the request. Addenda written from these requests shall be reviewed and approved by the Proposal Engineer, the assistant Contracts Engineer, or the Contracts Engineer. Addendum information received during the week prior to the letting will be evaluated for need of an addendum versus potential withdrawal of a project if an addendum is issued but not received by all contractors. This week should be reserved to process addenda and allow time for addenda to reach the contractor.

Any project withdrawn after the Order of Opening Bids has been advertised shall have an addendum written to withdraw it. If possible, the addendum should list the intended date the project will be relet.

Addenda are only routinely sent to prime contractors holding bidding documents. The Office of Contracts verifies that every prime contractor holding bidding documents has received an addendum. Other contractors, sub-contractors and suppliers may request that an addendum be sent to them.

The Office of Contracts is often asked why an addendum is issued at one time but not issued at other times. The following criteria are what are considered before an addendum is written.

Yes No

___ ___ 1. Can the project be bid as it is presently shown in the contract documents?
___ ___ 2. Can the project be built as it presently shown in the contract documents?
___ ___ 3. Is the bidding process fair to all bidders (i.e., Do all contractors have the same information)?
___ ___ 4. Is it possible to make the corrections after the letting?
___ ___ 5. Can the changes be made after the letting without changing the scope of the project?
___ ___ 6. Can the changes be made after the letting without a substantial greater cost than if we make the change by addendum?
___ ___ 7. Is it preferable to let the project as it is presently shown rather than withdraw the project, make changes, and reschedule the project for another letting?

If ***any*** of the above seven are answered NO, then it needs to be considered if there is enough time to process the addendum. To write an addendum, ***all*** of the following conditions must be answered YES. If ***any*** of the following questions are answered NO, then the project should be withdrawn.

Yes No

___ ___ 1 Is the remaining time before the letting long enough that there will be sufficient time for us to process the addendum and verify the receipt of the addendum to all bidders?
___ ___ 2. Is the remaining time before the letting long enough that a bidder would have sufficient time to prepare a bid for the addendum?
___ ___ 3. Can a short concise addendum be written which all bidders will easily understand?

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When the Office of Contracts withdraws a project from the letting a reason for the withdrawal will normally be given with the addendum. Following are some standard reasons for withdrawing a project.

1. Errors in Contract Documents.
2. Projects to be repackaged for a future letting.
3. Inconsistencies in project quantities or tabulations.
4. Project plans are to be changed.
5. Right of Way will not be available for construction.
6. All approvals/permits have not been obtained.

17. Identical Bid Policy

Identical bids occur when two or more contractors bid to do the same project for the same total project price. If this occurs, the procedure to award the project is done by the following priority order:

1. If one of the tie bidders had the previous contract, at the same location, that bidder would be awarded the contract.
2. If none of the bidders had the previous contract, the recommendation award will be determined by "lot".

18. Award Procedures

Analyzing Bids and Approval for Award

The Office of Contracts shall determine the lowest responsive bid for each contract being offered. Each bid shall be examined to determine if the unit bid prices are within reasonable conformance with the engineer's estimate. Factors considered in the analysis to determine whether to recommend the award or reject all bids shall include the following:

1. Number of bids submitted on the project(s).
2. Distribution and range of bids received.
3. Urgency of the project(s).
4. Any unbalancing of unit bid items that may be detrimental to the contacting authority.
5. Current market conditions and workloads within the contracting industry.
6. Potential savings if the project(s) were re-advertised for another contract letting.
7. Potential changes to the project(s) or contract period that could affect the bid price.
8. Comparison of the low bidder to the bid prices of the other bidders on the project(s).
9. Comparison of bid prices with similar projects in the contract letting.
10. Justification for significant bid price differences.

The Office of Contracts shall prepare an "Approval for Award" Staff Action listing the lowest responsive bid for each contract being offered. The Staff Action shall include a recommendation for award or rejection for projects estimated by the Office of Contracts. Bids that exceed the engineer's estimate shall not be recommended for an award unless one of the following criteria is met:

1. There is adequate competition. Adequate competition is based on the following criteria:
   A competitive bid is any bid that is less than 120 percent of the low bid.
   A bid from an affiliate will not be considered a competitive bid.

   The Federal Highway Administration's Technical Advisory T 5080.4 (December 29, 1980) shall be used to determine when acceptable competition exists. The following guidelines shall be used to determine whether there is adequate competition.

Number of Competitive Bids	Competition Considered Adequate When The Low Bid Does Not Exceed:
5 or more	120% of engineer's estimate
4	115% of engineer's estimate
3	110% of engineer's estimate
2	105% of engineer's estimate
1	the engineer's estimate

2. The project(s) is essential and deferral would be contrary to public interest.
   This may include the following:
   a. Safety projects where an extremely hazardous condition exists.
   b. Projects that close a gap in a corridor.
   c. Projects that are critical to other staged projects in a corridor.
3. Re-advertising the project(s) would not likely result in a lower bid.
4. An error was made in the engineer's estimate, and the error, if corrected, would result in a bid below the engineer's estimate.

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The Iowa DOT policy is to award to the lowest responsible bidder within 30 days of the letting or reject all bids on the project. For DOT contracts, the contracts are mailed to the successful bidder with instructions to return the contract to the Office of Contracts for further processing. For county contracts (let by the Iowa DOT), the contracts are mailed to the successful bidder with instructions to return the contract to the affected County for further processing. For City contracts, the contracts are mailed to the affected City Clerk for further consideration and processing by the City.

Confidential Information

As per Iowa DOT Policy & Procedure Manual Policy No. 500.11, the following applies to releasing information about construction/maintenance contract lettings:

a. Before and after the letting, the engineer's estimate is confidential.
b. The names of the contractors who have an award limit are publicly read before the public reading of the bids. The amount of the award limit is confidential.
c. The Office of Contracts shall return to the bidder bids received for projects that have been withdrawn and bids received after the deadline for receipt of bids.
d. Bids determined to be non-responsive shall not be read. The bid totals and the bid tabulations for these bids are confidential.
e. The Office of Contracts shall provide a list of "corrected bid totals" after all the bid tabulations have been checked and entered into the Department's computer system.
f. The bid tabulations for contracts to be awarded shall be made public after the "Approval for Award" Staff Action has been approved.
g. When all bids for a project have been rejected, the bid tabulations for that project are confidential.
h. Reports and the analysis used by the Office of Contracts to determine whether a contract should be awarded or all bids rejected are confidential.

Performance Bond

A performance bond is required on all contracts of $25,000 or more. The bond is to be at least 100 percent of the contract sum. The bond is held to cover all work included in the contract, whether performed by the prime or a subcontractor.

Tabulation of Bids

The tabulation of bids is printed after each letting. Bid tabulations for all projects or for certain categories of work can be ordered. The subscription form is available from the Office of Contracts or from Iowa DOT Office Supplies

Table for Proposal Guaranty and Liquidated Damages per Day

Effective date - October 2000

Estimated Size of Contract	Proposal Guaranty	Liquidated Damages per day
Less than $5,000	$250	$250
$5,000 - $10,000	$250 / $500	$250
$10,000 - $20,000	$500 / $1,000	$250
$20,000 - $40,000	$1,000 / $2,000	$250 / $500
$40,000 - $80,000	$2,000 / $4,000	$500
$80,000 - $125,000	$4,000 / $6,250	$500
$125,000 - $250,000	$6,250 / $12,500	$500
$250,000 - $500,000	$12,500 / $25,000	$500
$500,000 - $750,000	$25,000 / $37,500	$500
$750,000 - $1,000,000	$37,500 / $50,000	$500
$1,000,000 - $1,250,000	$50,000 / $62,500	$500
$1,250,000 - $1,500,000	$62,500 / $75,000	$500 / $1,200
$1,500,000 - $2,000,000	$75,000 / $100,000	$1,200
$2,000,000 - $2,500,000	$100,000 / $125,000	$1,200
$2,500,000 - $3,000,000	$125,000 / $150,000	$1,200
$3,000,000 - $3,500,000	$150,000 / $175,000	$1,200
$3,500,000 - $4,000,000	$175,000 / $200,000	$1,200
$4,000,000 - $5,000,000	$200,000 / $250,000	$1,200
$5,000,000 - $7,500,000	$250,000 / $375,000	$1,200
$7,500,000 - $10,000,000	$375,000 / $500,000	$1,200
$10,000,000 - $15,000,000	$500,000 / $750,000	$1,200
$15,000,000 - $20,000,000	$750,000 / $1,000,000	$1,200
$20,000,000 - $25,000,000	$1,000,000 / $1,250,000	$1,200
$25,000,000 - $30,000,000	$1,250,000 / $1,500,000	$1,200
$30,000,000 and above	$1,500,000	$1,200
Note: Liquidated Damages may be adjusted based on user costs such as delay or out of distance travel.		

SUGGESTED DAILY CONSTRUCTION RATES - ENGLISH

BID ITEM	UNIT	RATE/DAY
ACC Resurfacing	TON	1500
Backfill, Selected	CY	1800
Backfill, Selected	TON	1200
Base Cleaning and Preparation	MILE	1.5
Bridge Approach	SY	200
Bridge Construction - Driving Piling	LF	250
Bridge Construction - Reinforcing Steel	LB	5000
Bridge Construction - Structural Concrete	CY	22
Bridge Floor Overlay	SY	1000
Bridge Floor Repair (Class A)	SY	20
Clearing and Grubbing	UNIT	400
Clearing and Grubbing	ACRE	1-2
Cold-In-Place Recycling	SY	12000
Compaction with Moisture Density Control	CY	2000
Concrete Barrier Rail	LF	60
Concrete Open Rail	LF	50
Cracking and Seating	HEAD START	5 DAYS
Cracks 1,2,3,4,5	LF	5000
Culvert Pipe	LF	150
Curb and Gutter	LF	275
Delineators	EACH	50
Earth Shoulder Construction	STA	100
Embankment-In-Place	CY	950
Erosion control - Seeding	ACRE	7.5
Erosion control - Sodding	SQ	150
Erosion control - Wood Excelsior Mat	SQ	90
Excavation Class 10, Bridges	CY	200-400 *
Excavation Class 10, Roadway and Borrow	CY	CHART 2
Excavation Class 12	CY	100 *
Excavation Class 20, Bridges	CY	50 *
Excavation Class 20, RCB	CY	200 *
Excavation Class 20, RCB Extensions	CY	50 *
Fence - Chain Link	STA	5
Field Fence - Type 47	STA	10
Gabions	CY	25
Guardrail, Cable	LF	350

Increase the Rate per Day when the quantities become unusually large

SUGGESTED DAILY CONSTRUCTION RATES - ENGLISH

BID ITEM	UNIT	RATE/DAY
Guardrail, Steel Beam	LF	175
Guardrail, Steel Beam (Structures)	LF	100
Intakes	EACH	1.5
Joints - Pressure Relief	LF	30
Lighting - Poles	EACH	0.5
Longitudinal Joint Repair	LF	3000
Longitudinal Subdrain	LF	3000
Micro Surfacing	MILE	2.5 @ 1 LANE
Mowing	ACRE	15
Patches, Full Depth by Area	SY	110
Pavement Markings	MILE	10
Pavement Scarification	TON	1150
Paving Notch	EACH	2-6 DAYS
PCC, Rural	SY	4000
PCC, Urban	SY	Review Staging
Removal of Pavement < 20000	SY	1000
Removal of Pavement > 20000	SY	4000
Rip- Rap (larger amounts)	TON	400-500
Rip-Rap	TON	200
Salvage and Demo	EACH	1-5 DAYS
Seal Coat	MILE	5 @ 1 LANE, 2.5 @ 2 LANE
Sealing Water Wells	EACH	2
Shoulders, Granular	TON	1500
Sign Footings	EACH	4
Sign Posts	EACH	10
Signs - Large	EACH	5
Signs - Small	EACH	10
Steel Reinforcing (Bridge Floor Repair)	LB	1000
Storm Sewer	LF	150
Structural Concrete - Bridge Floor Repair	CY	3
Structural Concrete - RCB Extension, w/ steel	CY	5.5
Structural Concrete - Single RCB, w/ steel	CY	11.5
Structural Concrete - Triple RCB, w/ steel	CY	11.5
Structural Concrete - Twin RCB, w/ steel	CY	12.5
Structural Plate Pipe Culvert	LF	30
Topsoil Strip, Salvage and Spread	CY	1400
Traffic Signals	EACH	30 for 1st, +10 for additional
Trees and Shrubs < 200	EACH	25
Trees and Shrubs > 200	EACH	50-100
Watering (3500 gal/tank x 4)	MGAL	14

SUGGESTED DAILY CONSTRUCTION RATES - METRIC

BID ITEM	UNIT	RATE/DAY
ACC Resurfacing	MG	1300
Backfill, Selected	M3	1350
Backfill, Selected	MG	1100
Base Cleaning and Preparation	KM	2.5
Bridge Approach	M2	200
Bridge Construction - Driving Piling	M	75
Bridge Construction - Reinforcing Steel	KG	2300
Bridge Construction - Structural Concrete	M3	16
Bridge Floor Overlay	M2	800
Bridge Floor Repair (Class A)	M2	15
Clearing and Grubbing	UNIT	400
Clearing and Grubbing	HA	.5-1
Cold-In-Place Recycling	M2	10000
Compaction with Moisture Density Control	M3	1500
Concrete Barrier Rail	M	20
Concrete Open Rail	M	15
Cracking and Seating	HEAD START	5 DAYS
Cracks 1,2,3,4,5	M	1500
Culvert Pipe	M	50
Curb and Gutter	M	80
Delineators	EACH	50
Earth Shoulder Construction	M	3000
Embankment-In-Place	M3	700
Erosion control - Seeding	HA	3
Erosion control - Sodding	M2	1400
Erosion control - Wood Excelsior Mat	M2	900
Excavation Class 10, Bridges	M3	150-300 *
Excavation Class 10, Roadway and Borrow	M3	CHART 2
Excavation Class 12	M3	75 *
Excavation Class 20, Bridges	M3	40 *
Excavation Class 20, RCB	M3	150 *
Excavation Class 20, RCB Extensions	M3	40 *
Fence - Chain Link	M	150
Field Fence - Type 47	M	300
Gabions	M3	20
Guardrail, Cable	M	100
Guardrail, Steel Beam	M	60
Guardrail, Steel Beam (Structures)	M	30
Intakes	EACH	1.5

* Increase the Rate per Day when the quantities become unusually large

SUGGESTED DAILY CONSTRUCTION RATES - METRIC

BID ITEM	UNIT	RATE/DAY
Joints - Pressure Relief	M	10
Lighting - Poles	EACH	0.5
Longitudinal Joint Repair	M	1000
Longitudinal Subdrain	M	1000
Micro Surfacing	KM	4 @ 1 LANE
Mowing	HA	6
Patches, Full Depth by Area	M2	90
Pavement Markings	M	15000
Pavement Scarification	MG	1050
Paving Notch	EACH	2-6 DAYS
PCC, Rural	M2	3400
PCC, Urban	M2	Review Staging
Removal of Pavement < 16000	M2	800
Removal of Pavement > 16000	M2	3400
Rip- Rap (larger amounts)	MG	400
Rip-Rap	MG	150
Salvage and Demo	EACH	1-5 DAYS
Seal Coat	KM	8 @ 1 LANE, 4 @ 2 LANES
Sealing Water Wells	EACH	2
Shoulders, Granular	MG	1300
Sign Footings	EACH	4
Sign Posts	EACH	10
Signs - Large	EACH	5
Signs - Small	EACH	10
Steel Reinforcing (Bridge Floor Repair)	KG	500
Storm Sewer	M	50
Structural Concrete - Bridge Floor Repair	M3	2
Structural Concrete - RCB Extension, w/ steel	M3	4
Structural Concrete - Single RCB, w/ steel	M3	9
Structural Concrete - Triple RCB, w/ steel	M3	9
Structural Concrete - Twin RCB, w/ steel	M3	9.5
Structural Plate Pipe Culvert	M	10
Topsoil Strip, Salvage and Spread	M3	1050
Traffic Signals	EACH	30 for 1st, +10 for additional
Trees and Shrubs < 200	EACH	25
Trees and Shrubs > 200	EACH	50-100
Watering (13250 L/tank x 4)	KL	53

ORIGINATOR Director, Bureau of Highway Construction		PROCEDURE 19-10-30
CHAPTER 19	Plans, Specifications, and Estimates	
SECTION 10	P.S. & E. Transmittal and Composition	
SUBJECT 30	Contract Time for Completion	

General

A completed Contract Time for Completion (Form E-D-510) is required for all contracts let to bid. An example is included as Figure 1 of this procedure. Due to the operational nature of Agreed Unit Price Contracts, Service and Supply Contracts they do not need a contract time analysis as part of the P.S. & E.

Contract Time

The contract should be analyzed in sufficient detail to determine a reasonable contract time.

Contract time can be set up on the basis of working days, calendar days, or by specifying a completion date. In any case, a minimum of four weeks is estimated between the letting date and contract execution.

Calendar day. Every day shown on the calendar, Sundays and holidays included. This is one of the preferred methods of establishing contract time when an Interim Liquidated Damages provision is included in the contract.

Contract time expressed in calendar days is arrived at by estimating the number of work days needed to prosecute the contract work. To this are added Saturdays, Sundays, Holidays, and the influence of anticipated weather conditions as expressed in terms of probable working days. (See Figure 2 to determine probable working days.)

Contract time shall be rounded to the nearest five days. Contract time suspensions ordered by the engineer and/or the days required for certain excluded work operations are not included within this total.

Working day. A calendar day except Saturdays, Sundays and specified legal holidays, on which weather and conditions not under the control of the contractor will permit construction operations to proceed for at least eight hours of the day with the normal working force engaged in performing the controlling item of work which would be in progress at this time. The controlling item is that item which must be partially or wholly completed to permit progress essential to complete the contract within the number of working days allowed. See Standard Specification 108.12 for construction details related to working day contracts.

Working days is the preferred method of establishing contract time for a normal construction project. Working day contracts equitably provide for those projects where relatively minor weather changes greatly influence work progress, or where there are frequent delays occasioned by other contracts, material delivery, or operations beyond the contractor's effective control.

Contract time shall be rounded to the nearest five days.

Completion date. The calendar date shown in the proposal on or before which the work contemplated in the contract shall be completed. No time extension allowances are made for normal delays or lack of progress.

A completion date is preferred when an Incentive/Disincentive provision is used in the contract.

A completion date contract should be considered in any of the following situations:

1. When stage construction contracts must closely follow one another to meet a desired open-to-traffic date.
2. When the timing of a special event is the critical factor in determining the desired completion date.
3. When the contract work is expected to extend over multiple construction seasons.
4. When the Interim Liquidated Damages provision is included in the contract.

Designers should avoid requiring unjustifiably high rates of operation progress through improper selection of an early completion date. The normal procedure is to select the completion date from a working day type time analysis, taking into consideration the desired reasons for specifying the use of a completion date.

Factors Influencing Contract Time

Holidays shall be New Years Day, Martin Luther King Jr. Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas Eve Day, Christmas Day and New Year's Eve Day.

Probable working days in a month are the possible weekdays available for work multiplied by a percentage factor based on past experience for the major construction operation being performed. A percentage factor chart is included as Figure 2 of this procedure. It may be used directly or with minor modification to reflect regional weather conditions. The possible working days in a month are the total number of calendar days minus any Saturdays, Sundays and holidays that occur during that month.

Production Rates. The production rates should be tailored to meet the conditions of each individual contract. Consideration should be given to the size of work areas, time of year constructed, congestion due to traffic, etc. See Figure 3 for estimated average production rates.

Utility and railroad adjustments are usually planned to be made prior to construction operations to avoid interfering with the contractor's construction schedule. Occasionally, utility or railroad facility adjustments must be performed during construction operations. If there is good reason to believe that these adjustments may delay the contractor, time should be added to the contract time for completion. The district utility or railroad coordinator should be consulted as necessary.

Temporary structures. When a temporary structure is required to keep the highway open to traffic, a sufficient amount of time should be included in the contract time for the construction of the temporary structure. This time should be shown on the contract time chart.

Exclusion From Contract Time Charge

Operations excluded from the contract time charges are those occurring prior to and following the major operations of the contract, as detailed in Procedure 11.3.1.3 of the Construction and Materials Manual. A brief listing of these is as follows:

1. Construction Staking, Initial Layout before grading work begins.
2. Move-in of equipment by the contractor.
3. Clearing, grubbing, stripping and subsequent final clean-up of aggregate pits or quarries, borrow or subbase pits.
4. Delivery, installation and removal of temporary traffic control devices.
5. Exploratory digging of test holes.
6. Construction, maintenance and subsequent obliteration of access roads to pits or quarries.
7. Setting up and dismantling of crushing, asphaltic or concrete batching or mixing plants.
8. Preliminary blasting or crushing for test samples.
9. Watering sod, when performed after completion of all sod replacement and all other construction work is completed. The 10-day watering requirement remains in effect, however.
10. The production of aggregate stockpiles when no other work is in progress nor has been ordered to start.
11. Repairs to equipment performed at the work site prior to the start of work during official suspension or after contract work is completed.
12. Curing and protection of concrete after all other construction work is suspended or completed. ★

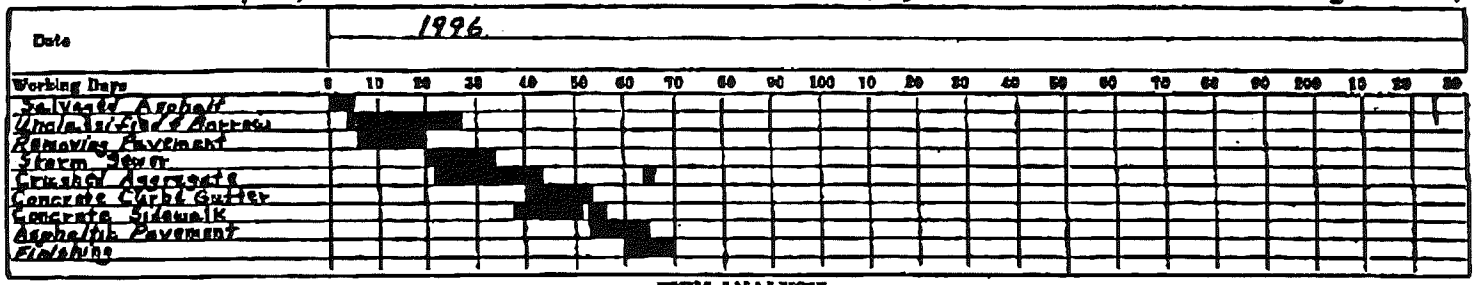
Wisconsin Department of Transportation
E-D-510-68

3061-01-71
3061-00-71

CONTRACT TIME FOR COMPLETION

Project 3061-02-71 Cont. No. Type Grading, Base, Asphalt; USH 51-Columbus; Park Ave & Ludington St; Columbus-USH 151 Road

Date of Letting January 19, 1996 Probable Date of Beginning May 3, 1996 Columbia & Dodge County



ITEM ANALYSIS

Item	Contract Quantity	Unit	Amount Per Working Day	Working Days
Salvaged Asphalt	10,000	Ton	2,000	5
Unclassified & Borrow	28,500	C.Y.	1,200	25
Removing Pavement	37,000	S.Y.	2,500	15
Storm Sewer	4,225	L.F.	300	14
Crushed Aggregate	40,000	Ton	1,700	24
Concrete Curb & Gutter	20,000	L.F.	1,500	13
Concrete Sidewalk	81,000	S.F.	5,000	16
Asphaltic Pavement	22,900	Ton	2,000	11
Finishing	—	—	—	10

Month	Days Month	Days Total	Saturday	Sunday	Holiday	Possible Working Days	Probable Work. Days Month	Probable Work. Days Total
May	31	31	4	4	1	22	17	17
June	30	61	4	4	—	22	17	34
July	31	92	5	4	1	21	18	52
August	31	123	4	5	—	22	18	70

REMARKS

Total Contract Time 70 Working Calendar Days

Prepared by M.A.V. July 31 1995

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PERCENTAGE FACTORS FOR PROBABLE WORKING DAYS

$$\frac{\text{Probable Working Days}}{\text{Possible Working Days}} = \_\_ \%$$

MONTH	Grading %	Bridge %	Base Course %	P.C.C. Pavement %	Asphaltic Concrete Pavement %	Painting %
January	58	61				
February	43	65				
March	58	65				
April	58	77	58			
May	80	80	80	80	68	64
June	80	80	80	80	81	69
July	85	85	85	85	85	69
August	85	85	85	85	85	77
September	76	80	72	72	70	60
October	77	73	73	72	27	
November	70	70	74	43		
December	58	58	58			

Estimated Production Rates for Computing Contract Time

Item	Unit		Est. Ave. Range Units/8 Hour Work Day	
	English	Metric	English	Metric
Removing Pavement	S.Y.	M2	1,000 - 4,000	800 - 3300
Shattering Pavement	S.Y.	M2	5,000 - 15,000	4200 - 13000
Unclassified and Common Excavation-Urban	C.Y.	M3	300 - 2,000	200 - 1500
Unclassified and Common Excavation-Rural	C.Y.	M3	1,000 - 7,000	800 - 5400
Marsh Excavation	C.Y.	M3	500 - 2,000	400 - 1500
Rock Excavation	C.Y.	M3	1,000 - 2,500	800 - 2000
Borrow Excavation (Scraper)	C.Y.	M3	1,000 - 7,000	800 - 5400
Borrow Excavation (Truck)	C.Y.	M3	500 - 2,000	400 - 1500
Crushed Aggregate Base Course (Rural Roadway)	Ton	Mg	1,000 - 3,000	900 - 2700
Crushed Aggregate Base Course (Urban Roadway)	Ton	Mg	800 - 2,000	700 - 1800
Crushed Aggregate Base Course (Shoulders)	Ton	Mg	800 - 2,000	700 - 1800
Asphaltic Concrete Pavement (Rural)	Ton	Mg	1,000 - 3,000	900 - 2700
Asphaltic Concrete Pavement (Urban/Misc.)	Ton	Mg	300 - 1,000	300 - 900
Concrete Pavement (Rural)	S.Y.	M2	4,000 - 10,000	3300 - 8400
Concrete Pavement (Urban)	S.Y.	M2	1,000 - 5,000	800 - 4200
Salvaged Asphaltic Pavement (Milling)	Ton	Mg	1,000 - 3,000	900 - 2700
Salvaged Asphaltic Pavement (Full Depth)	Ton	Mg	1,000 - 3,000	900 - 2700
Concrete Masonry, Bridges (Substructure)	C.Y.	M3	5 - 15	4 - 12
Concrete Masonry, Bridges (Superstructure)	C.Y.	M3	10 - 20	8 - 15
Concrete Masonry, Culverts	C.Y.	M3	5 - 15	4 - 12

Estimated Production Rates for Computing Contract Time

Item	Unit		Est. Ave. Range Units/8 Hour Work Day	
	English	Metric	English	Metric
Structural Steel Beams	Each	Each	6 - 12	6 - 12
Timber Piling	L.F.	M	200 - 800	60 - 250
Steel Piling	L.F.	M	200 - 800	60 - 250
Prestressed Girders	Each	Each	6 - 12	6 - 12
Concrete Curb and Gutter	L.F.	M	500 - 2,000	150 - 600
Concrete Sidewalk	S.F.	M2	800 - 3,000	100 - 300
Storm Sewer	L.F.	M	100 - 400	30 - 120
Inlets and Manholes	Each	Each	3 - 10	3 - 10
Steel Plate Beam Guard	L.F.	M	300 - 800	100 - 250
Woven Wire Fence	L.F.	M	500 - 2,000	150 - 600
Chain Link Fence	L.F.	M	300 - 1,5000	100 - 450
Seeding and Finishing	S.Y.	M2	5,000 - 20,000	4200 - 17000

SUBMITTAL	MINIMUM TIME IN ADVANCE OF LETTING
List of Projects Recommend for Letting (by district)	12 Weeks
Plans to Bureau of Design and Environment (by district)	11 Weeks

DISTRICT PLANNING SCHEDULE

Figure 66-2A

66-2.03 Construction Time Estimates

The contract duration is a very important part of the design data which accompanies plan submittals. It is essential that care be exercised in the determination of the working days or completion date. It must be remembered that a severe time requirement imposed upon a contractor will very probably be reflected in the bid prices, and the Department will pay a premium for that particular job when it may not be absolutely necessary. Also, with a provision for liquidated damages, it is extremely important that the designer arrive at a reasonable time limit to alleviate differences between the contractor and the Department.

To determine a feasible time limit, the designer must devote special attention to the sequence of construction operations to determine the order in which the work will progress. Also, sound engineering judgment is necessary to determine which construction operations will overlap to ascertain the days not affecting the total working days. The magnitude of the job is significant; i.e., the contractor for a small resurfacing job will use a much smaller work force than a contractor engaged in a large freeway project. Therefore, it is not probable that the contractor for the small job will be engaged in numerous operations at one time. Another consideration for the designer is the delivery of materials to the job site; e.g., in the case of a grade separation structure, it may be necessary to allow slack time between the completion of the substructure and initiating work on the superstructure due to the time required for fabrication and delivery of the structural steel. Although such determinations cannot always be made with absolute certainty, nevertheless, an estimate must be made to determine a reasonable time limit. If the contract will be placed on a completion date basis, the designer must devote special attention to construction operations that are limited by the *Standard Specifications.*

To determine the contract duration, the number of working days must be estimated. The "Estimate of Time Required," Form BD 220, is used to determine working days and should accompany the plan submittal. Copies of the form may be obtained from BDE. The number of days required for each item is obtained by dividing each quantity by its respective production rate. Figure 66-2B provides the production rates for

major items. The production rates shown in Figure 66-2B apply to an average eight-hour work day. Construction production rates in Figure 66-2B should be reviewed periodically and revisions made for any advancements in equipment output or construction techniques. Use the low rates on small projects and the higher rates on larger projects. For expedited contracts, it will be necessary to adjust the rates for longer working days. For items not contained in Figure 66-2B, the district may supplement rates from their own design or construction files. The production rates of a single improvement are not conclusive in establishing such rates. Extremely high rates are often reached on a particular project or on any given day in the normal highway improvement but using such rates for the entire project would materially affect the accuracy of the time estimate.

The designer determines the "total days required" and "days not affecting time limit" on Form BD 220. These can be ascertained more readily by using a bar diagram, particularly when it is anticipated that many operations will be performed simultaneously or intermittently therefore making them difficult to schedule. In assigning work days, the minimum number used is 15 days and the total number of days assigned are in multiples of five. The number of working days required must also be calculated for contracts which will be completion date contracts. This will ensure that the completion date is realistic and allow the estimator to make allowances in the unit costs for anticipated overtime and extra crews the contractor may need to meet the completion date. Completion date contracts must be approved by the Bureau of Design and Environment.

Where the major contract items require a tight completion date and it is not necessary for the minor items (e.g., seeding, clean-up) to be included in that date, the designer may use a completion date plus working days. The number of working days allowed after the completion date should be kept to a minimum and only allow minor work to be completed. The designer must clearly state in the Project Specific Special Provisions which items must be completed by the completion date and which items are involved in the working days. Completion date contracts with working days must be approved by the Bureau of Design and Environment.

MAJOR WORKTYPE	SUB WORKTYPE	DESCRIPTION	METRIC UNIT	LOW	HIGH
Bridge	Bridge	Bearing Assembly	each	5	10
Bridge	Bridge	Bridge Deck Concrete Overlay	square meter	175	425
Bridge	Bridge	Bridge Deck Grooving	square meter	425	675
Bridge	Bridge	Bridge Deck Scarification (Cold Milling)	square meter	300	850
Bridge	Bridge	Bridge Deck Scarification (Hydroblasting)	square meter	150	425
Bridge	Bridge	Concrete Structures	cubic meter	5	20
Bridge	Bridge	Concrete Superstructure	cubic meter	5	25
Bridge	Bridge	Clean & Paint Steel Bridge - SP 10	square meter	100	200
Bridge	Bridge	Clean & Paint Steel Bridge - SP 6	square meter	75	150
Bridge	Bridge	Clean & Paint Steel Bridge - SP 3	square meter	25	50
Bridge	Bridge	Cofferdam (Doesn't apply for major river bridges)	each	0.20	0.50
Bridge	Bridge	Concrete Removal	cubic meter	4	15
Bridge	Bridge	Deck Slab Repair (Full Depth)	square meter	8	20
Bridge	Bridge	Deck Slab Repair (Partial Depth)	square meter	20	40
Bridge	Bridge	Driving Piles	meter	75	150
Bridge	Bridge	Cofferdam Excavation	cubic meter	60	115
Bridge	Bridge	Formed Concrete Repair	square meter	5	10
Bridge	Bridge	Jacking & Cribbing (per beam)	each	5	10
Bridge	Bridge	Precast Concrete Beam Erection	meter	50	100
Bridge	Bridge	Precast Concrete Beams (Fabricate & Furnish)	calendar day	30	120
Bridge	Bridge	Precast Concrete Bridge Deck	square meter	50	75
Bridge	Bridge	Precast Deck Beams	square meter	90	275
Bridge	Bridge	Protective Shield	square meter	125	200
Bridge	Bridge	Reinforcement Bars (Substructure)	kilograms	1800	2700
Bridge	Bridge	Reinforcement Bars (Superstructure)	kilograms	4500	7000
Bridge	Bridge	Removal of Existing Concrete Deck	square meter	125	250
Bridge	Bridge	Removal of Existing Substructure	cubic meter	15	30
Bridge	Bridge	Removal of Existing Superstructure	square meter	80	200
Bridge	Bridge	Slope Wall	square meter	20	65
Bridge	Bridge	Structural Steel Erection	meter	45	75
Bridge	Bridge	Structural Steel (Fabricate & Furnish)	calendar day	60	270
Bridge	Bridge	Stud Shear Connectors	each	1000	2500
Bridge	Bridge	Temporary Sheet Piling	square meter	25	90
Bridge	Bridge	Test Pile	each	0.5	1
Bridge	Bridge	Waterproofing Membrane System	square meter	80	210
Electrical	Electrical	Conduit in Trench	meter	20	100
Electrical	Electrical	Conduit (Pushed)	meter	10	25
Electrical	Electrical	Controller	each	0.5	1
Electrical	Electrical	Detector Loop	meter	45	90
Electrical	Electrical	Electric Cable	meter	450	900
Electrical	Electrical	Electrical Conductors in Conduit	meter	225	450
Electrical	Electrical	Foundations — Controller, Signal	meter	0.5	1.5
Electrical	Electrical	Foundations — Light Poles	meter	3	6
Electrical	Electrical	Foundations — Light Towers	meter	6	8
Electrical	Electrical	Handholes	each	2	4
Electrical	Electrical	Junction Box	each	2	5
Electrical	Electrical	Light Pole	each	4	6
Electrical	Electrical	Light Tower	each	1	2
Electrical	Electrical	Luminaire	each	5	10
Electrical	Electrical	Mast Arm Assembly & Pole	each	2	4
Electrical	Electrical	Raceway for Magnetic Detectors	meter	30	60
Electrical	Electrical	Relocate Existing Traffic Signal Posts	each	2	4
Electrical	Electrical	Service Installation	each	0.5	1

CONSTRUCTION DAILY PRODUCTION RATES

Figure 66-2B

66-2(5)

MAJOR WORKTYPE	SUB WORKTYPE	DESCRIPTION	METRIC UNIT	LOW	HIGH
Electrical	Electrical	Signal Head	each	5	10
Electrical	Electrical	Signal Post (wood or metal)	each	4	8
Electrical	Electrical	Trench & Backfill	meter	25	105
Electrical	Electrical	Unit Duct	meter	165	210
Electrical	Electrical	Unit Duct/without Cable	meter	45	105
Landscape	Landscape	Evergreens	each	20	40
Landscape	Landscape	Excelsior Blanket	square meter	825	3350
Landscape	Landscape	Intermediate Trees	each	20	40
Landscape	Landscape	Seeding	hectare	2	4
Landscape	Landscape	Seedling Trees	each	2000	3000
Landscape	Landscape	Shade Trees	each	20	40
Landscape	Landscape	Shrubs	each	200	400
Landscape	Landscape	Sodding	square meter	825	1250
Landscape	Landscape	Straw Mulch	ton	9	18
Landscape	Landscape	Vines	each	1000	2000
Landscape	Landscape	Weed Control Spraying	hectare	20	40
Roadway	Aggregate	Granular Backfill	cubic meter	230	460
Roadway	Aggregate	Granular Embankment Special	ton	725	1360
Roadway	Aggregate	Gravel or Crushed Stone Base Course	ton	635	1100
Roadway	Aggregate	Gravel or Crushed Stone Shoulders	ton	450	1100
Roadway	Aggregate	Gravel or Crushed Stone Surface Course	ton	635	1100
Roadway	Aggregate	Porous Granular Embankment	cubic meter	305	765
Roadway	Aggregate	Subbase Granular Materials	ton	635	1800
Roadway	Drainage	Adjust Frames & Grates	each	5	10
Roadway	Drainage	Catch Basins	each	2	5
Roadway	Drainage	Concrete Box Culverts	cubic meter	6	12
Roadway	Drainage	Concrete Headwalls	cubic meter	2	6
Roadway	Drainage	Concrete Gutter	meter	120	425
Roadway	Drainage	Curb & Gutter	meter	90	365
Roadway	Drainage	End Sections (Pipe Culvert & Storm Sewer)	each	5	10
Roadway	Drainage	Inlets	each	2	5
Roadway	Drainage	Manholes	each	2	4
Roadway	Drainage	Paved Ditch	meter	60	120
Roadway	Drainage	Pipe Culverts (Depending on size and depth)	meter	30	90
Roadway	Drainage	Pipe Underdrains	meter	450	2250
Roadway	Drainage	Precast Box Culverts	meter	20	75
Roadway	Drainage	Reinforcement Bars (Culverts)	kilogram	1350	2275
Roadway	Drainage	Riprap	square meter	80	170
Roadway	Drainage	Storm Sewers (Dependent on size and depth)	meter	20	90
Roadway	Drainage	Trench Backfill	cubic meter	75	150
Roadway	Drainage	Exploration Trench	meter	75	300
Roadway	Excavation	Embankment	cubic meter	375	7650
Roadway	Excavation	Borrow Excavation	cubic meter	750	7650
Roadway	Excavation	Channel Excavation	cubic meter	150	375
Roadway	Excavation	Earth Excavation (Shoulders & Widening)	cubic meter	375	750
Roadway	Excavation	Earth Excavation	cubic meter	575	7650
Roadway	Excavation	Rock Excavation (Ripping or Blasting)	cubic meter	375	1500
Roadway	Excavation	Excavation (Special)	cubic meter	375	750
Roadway	Excavation	Excavation (Topsoil)	cubic meter	375	750
Roadway	Excavation	Process Lime Modified Soil	square meter	1675	5400
Roadway	Excavation	Process Lime Stabilized Soil	square meter	1675	5400
Roadway	Excavation	Topsoil Placement	square meter	4000	21 000

CONSTRUCTION DAILY PRODUCTION RATES

Figure 66-2B
(Continued)

66-2(6)

MAJOR WORKTYPE	SUB WORKTYPE	DESCRIPTION	METRIC UNIT	LOW	HIGH
Roadway	Miscellaneous	Chain Link Fence	meter	90	150
Roadway	Miscellaneous	Concrete Barrier	meter	60	120
Roadway	Miscellaneous	Delineators	each	75	150
Roadway	Miscellaneous	Furnishing and Erecting Row Markers	each	10	30
Roadway	Miscellaneous	Noise Abatement Wall	square meter	75	100
Roadway	Miscellaneous	Steel Plate Beam Guardrail	meter	90	180
Roadway	Miscellaneous	Steel Plate Beam Guardrail Removal	meter	150	250
Roadway	Miscellaneous	Temporary Concrete Barrier Wall	meter	150	450
Roadway	Miscellaneous	Woven Wire Fence	meter	150	300
Roadway	Patching	Class A	square meter	40	80
Roadway	Patching	Class B	square meter	40	80
Roadway	Patching	Class C & D	square meter	80	125
Roadway	Paving	Bituminous Concrete Base Course Widening	square meter	400	1675
Roadway	Paving	Bituminous Concrete Binder & Surface Course—Class I	ton	450	1450
Roadway	Paving	Bituminous Materials	liter	13 600	37 850
Roadway	Paving	Bituminous Pavement Removal & Replacement	square meter	40	80
Roadway	Paving	Bituminous Shoulders	square meter	1250	3750
Roadway	Paving	Bridge Approach Pavement	square meter	40	80
Roadway	Paving	Continuously Reinforced Concrete Pavement	square meter	1675	5850
Roadway	Paving	Bituminous Concrete Pavement (Full depth)	square meter	825	2925
Roadway	Paving	Level Binder	ton	45	1450
Roadway	Paving	Median Surface (Concrete)	square meter	70	185
Roadway	Paving	Pavement Fabric	square meter	1000	5000
Roadway	Paving	Pavement Reinforcement	square meter	1250	4200
Roadway	Paving	PC Concrete Base Course	square meter	1250	5000
Roadway	Paving	PC Concrete Base Course Widening	square meter	625	2000
Roadway	Paving	PC Concrete Driveways	square meter	80	125
Roadway	Paving	PC Concrete Pavement	square meter	1250	5000
Roadway	Paving	PC Concrete Pavement (Hinge Joint)	square meter	1250	5000
Roadway	Paving	PC Concrete Sidewalks	square meter	90	140
Roadway	Paving	PCC Shoulders	square meter	1000	5000
Roadway	Paving	Protective Coat	square meter	2500	5850
Roadway	Paving	Stabilized Subbase 100 mm	square meter	2500	8400
Roadway	Paving	Strip Reflective Crack Control	meter	3000	6000
Roadway	Pvt Mk	Paint Pavement Marking (Hand)	meter	150	300
Roadway	Pvt Mk	Paint Pavement Marking (Truck)	meter	3000	6000
Roadway	Pvt Mk	Raised Reflective Pavement Markers	each	100	200
Roadway	Pvt Mk	Thermoplastic Pavement Marking Symbol	square meter	40	80
Roadway	Pvt Mk	Thermoplastic Pavement Marking (Hand)	meter	150	300
Roadway	Pvt Mk	Thermoplastic Pavement Marking (Truck)	meter	3000	6000
Roadway	Removal	Bituminous Surface Removal	square meter	1675	8400
Roadway	Removal	Curb & Gutter Removal	meter	180	425
Roadway	Removal	Pavement Grinding	square meter	835	1675
Roadway	Removal	Pavement Removal	square meter	835	1675
Roadway	Removal	Sidewalk Removal	square meter	140	230
Roadway	Removal	Tree Removal	hectare	0.8	1.6
Roadway	Removal	Tree Removal (6 to 15 Units Diameter)	units	150	400
Roadway	Removal	Tree Removal (Over 15 Units Diameter)	units	100	300
Signing	Signing	Metal Post	meter	75	120
Signing	Signing	Overhead Sign Foundation	cubic meter	4	12
Signing	Signing	Overhead Sign Structure	meter	8	15
Signing	Signing	Sign Panel	square meter	45	185
Signing	Signing	Structural Steel Sign Support Non-Breakaway	kilogram	450	6800

CONSTRUCTION DAILY PRODUCTION RATES

Figure 66-2B
(Continued)

66-2(7)

66-2.04 Incentive/Disincentive Policy

The term Incentive/Disincentive describes a contract provision which compensates the contractor a prescribed amount of money for each day identified that critical work is completed ahead of schedule and assesses a deduction for each day the contractor overruns the schedule. The Incentive/Disincentive clause is used to motivate contractors to complete critical projects by an expedited work schedule on or before a specified date. The use of Incentive/Disincentive provisions should be restricted to those critical projects where it is highly desirable for traffic inconvenience and delays to be minimized. Before an Incentive/ Disincentive clause is included in a contract, prior approval must be obtained from the Bureau of Design and Environment. Unique cases not covered in Section 66-2.04(a) may be submitted for review and approval to the Bureau of Design and Environment.

66-2.04(a) Guidelines for Project Selection

Incentive/Disincentive clauses are intended for those projects where early completion would greatly benefit both the road user and the Department and where ramifications of not meeting the completion date are extreme. Use of Incentive/Disincentive clauses should be limited to projects which involve one or more of the following characteristics:

1. Adverse Effects. High-volume roads, high-volume truck traffic, and/or structures which involve high road user cost increases, extended inconveniences, and hazards to the motoring public, or severe disruption on adjacent business communities. Lower volume roads and river structures which involve long adverse travel and area economic impact also may be considered.

2. Timing. Projects which have a direct bearing on the start and/or interruption of progress on major freeways, arterials, or structures may be considered for Incentive/Disincentive (e.g., utility relocations). However, where late completion, not early completion, is the primary concern, the designer should consider adding a clause providing for higher liquidated damages based on other Department costs per the Code of Federal Regulations — Title 23 rather than using Incentive/ Disincentive clauses. A beam fabrication project is an example where late completion may be the primary concern.

3. Urban River Crossings. River structures in or adjacent to central business districts.

4. Night Time Construction. Night time construction (rehabilitation and/or resurfacing) on major urban freeways.

A. D. 114

INDIANA DEPARTMENT OF TRANSPORTATION

INDIANAPOLIS, INDIANA 46204-2249

INTER-DEPARTMENT COMMUNICATION

December 10, 1997

Memorandum 97-27

MEMORANDUM

TO: District Directors
District Construction Engineers
District Development Engineers
District Traffic Engineers
District Operations Engineers
Area Engineers

FROM: Timothy D. Bertram, Chief
Operations Support Division

RE: Guidelines for Setting Contract Time

Attached herewith are revised charts and specific examples of bridge work to be used as a guide for setting contract time. Setting contract time is not an exact science. Many things must be taken into account when time is set for contract completion.

Outlined below are several steps to be considered when determining time on a contract:

1. A general review of the plans and contract provisions is made to determine type of construction, length of job, number of bridges, traffic features, urban or rural site, magnitude, and any special features of the project.

2. If possible the person setting contract time should visit the site to get a feel for the extent that utilities or other features might impact construction.

3. Determine if a commitment has been made by others to complete the contract, unrestrict lanes, open a road etc., by a certain time.

4. How are schools, businesses, local festivals, farmers, rush hour traffic, other contracts in the area, etc., affected by the contract?

5. Review plans to determine controlling operations.

6. Decide if contract can be completed in one or two construction seasons.

7. Determine how letting date may affect the controlling operations, starting times, completion times, etc.

8. Determine how adjacent contracts, existing or future, any affect detours, restrictions, access on this contract.

9. Using the Itemized Proposal, determine when each item can be done. Certain items control other items while some items can be done simultaneously. Use the controlling items to set the time. Normally the time is set in work days and if a completion date is desired, attached charts will convert work days to calendar days depending on letting dates.

10. Determine in any intermediate times need to be addressed in the contract so that certain roads, bridges, entrances, ramps, etc., are put back into normal use by certain times.

11. Some contracts have items involving specific materials that takes considerable time to obtain. Delivery time for mast arm poles, strain poles, and hi mast poles is about 10 to 12 weeks. Material delivery times should be considered when setting contract time. Delivery time for structural steel is a minimum of three months unless singular members are being used. Singular members delivery time is three weeks. Delivery time for concrete structural members is about six weeks.

12. Because of the construction staffing, certain holidays, or other influencing factors, some contracts can require delayed starting times specified in the contract provisions. Delayed starting times are normally used on resurface or maintenance type contracts but they might be considered for other types of contracts.

13. Permit restrictions can have a major effect on construction schedules. They often control time on bridge contracts. Therefore they should be addressed when time is set for a contract.

14. Once contract time is established an incentive/disincentive clause might be considered. These types of clauses are normally only used on special contracts that involve high traffic volumes. User costs are used to establish time costs and one way to quickly determine a reasonable time cost is to use the following formula:

$$\text{Cost to restrict one lane of traffic during peak lane closure period} = \frac{\text{A.A.D.T.}\ (1 + 2 \times \%\text{Trucks})}{\text{Number of Lanes}}$$

The non-peak lane closure period = 1/3 of peak lane closure period

This formula could also be used as a basis for specifying higher liquidated damages for restriction or closed times/dates.

15. Adjusting the time to fit contract circumstances should always be considered.

16. Last keep your work sheets in a file for future reference.

As stated earlier, setting time is not an exact science. The above information and attached sheets are to serve as a guide only when setting contract time. It should always be kept in mind that because of the tremendous impact construction contracts have on traffic, particularly on high volume roads, the focus of our customer's (the traveling public) satisfaction or dissatisfaction is ever increasing.

A + B contract bidding might be considered for some high profile/traffic jobs such as major interstate reconstruction. B times and B time costs are to be coordinated through Operations Support Division.

Further, if a contract does not sell or many revisions are added, the contract time should be reconsidered to see how the letting date or revision might affect the work.

TDB:pl

NOTE: These rates are just a general or average guide to be used when setting time. Large quantity items may increase these rates and small contracts may reduce them. Each project is unique and must be looked at closely prior to setting time.

ITEM DESCRIPTION	UNIT	METRIC UNIT	RATE PER DAY	METRIC UNIT	RATES PER DAY FOR INTERSTATE TYPE CONTRACTS	METRIC UNIT	RATES FOR A+B	METRIC UNIT
Aggregate Shoulder	Tons	Mg	800	725	1600	1450	2000	1825
Bituminous Patching	Tons	Mg	60	55	200	180	300	270
Bituminous Widening	Tons	Mg	900	815	2000	1825	2500	2270
Bituminous Wedge & Level	Tons	Mg	500	455	1000	905	1500	1360
Bituminous Base	Tons	Mg	800	725	2000	1825	3000	2720
Bituminous Binder	Tons	Mg	800	725	2000	1825	3000	2720
Bituminous Surface	Tons	Mg	1000	905	2000	1825	3000	2720
Bituminous Shoulders	Tons	Mg	700	635	1500	1360	2000	1825
Bituminous Approach	Tons	Mg	200	180	500	455	700	635
Catch Basins	Ea	Ea	5	5	10	10	15	15
Chain Link Fence	Lft	m	1200	365	2500	760	3500	1065
Class "A" Concrete in STR's	Cys	m^3	150	115	300	230	400	305
Class "B" Concrete in STR's	Cys	m^3	100	75	200	155	300	230
Combination Curb & Gutter	Lft	m	300	90	600	180	1000	305
Concrete Driveways	Sys	m^3	180	150	400	335	600	500
Concrete Gutter	Lft	m	500	150	1000	305	1500	455
Concrete Patching	Sys	m^2	100	85	200	165	300	250
Concrete Pavement	Sys	m^2	2500	2100	5000	4175	6000	5025

ITEM		UNIT	DAY	UNIT	FOR INTERSTATE TYPE CONTRACTS	UNIT	FOR A+B	UNIT
Concrete Sidewalk	Sys	m^2	1000	1680	1500	2520	2000	3360
Curb & Gutter	Lft	m	300	90	600	180	1000	305
Drilled Holes	Ea	Ea	250	250	500	500	700	700
Embankment	Cys	m^3	2200	1680	5000	3825	8000	6115
Excavation:								
Borrow Large Areas	Cys	m^3	2500	1910	5000	3825	8000	6115
OR Common Small Areas			500	380	1000	765	2000	1530
Channel	Cys	m^3	650	495	1500	1145	2000	1530
Rock	Cys	m^3	1000	765	2000	1530	2500	1910
Unclassified	Cys	m^3	3000	2300	5000	3825	8000	6125
Ground or Crushed Stone	Tons	Mg	800	725	1800	1635	2500	2270
Granular Backfill	Cys	m^3	300	230	500	385	1000	765
Guardrail	Lft	m	400	120	1000	305	1500	455
Inlet	Ea	Ea	5	5	6	6	9	9
Laying Signal Conduit	Lft	m	200	60	500	150	1000	305
Manholes	Ea	Ea	3	3	6	6	9	9
Paved Side Ditch	Lft	m	350	105	1000	305	1200	365
Pipes:								
Culverts	Lft	m	200	60	300	90	400	120
Underdrains	Lft	m	1000	305	2000	610	3000	915
Removal:								
Curb & Gutter	Lft	m	800	245	1500	455	2000	610
Pavement (Conc.)	Sys	m^2	800	675	1500	1250	2000	1675

ITEM DESCRIPTION	UNIT	UNIT	DAY	UNIT	FOR INTERSTATE TYPE CONTRACTS	UNIT	FOR A+B	UNIT
Removal (cont.)								
Sidewalk	Sq.Ft.	m^2	1500	140	3000	280	4000	370
Surface(Milling)	Sys	m^2	10,000	8350	20,000	16,725	30,000	25,075
Rip-Rap	Sys	m^2	200	165	400	335	600	500
Seeding	Acres	ha	10	4	15	6	20	8
Sodding	Sys	m^2	900	750	2000	1675	3000	2500
Subbase	Tons	Mg	800	725	1600	1450	2500	2270
Thermoplastic Pavement:								
Markings	Lft	m	6000	1825	12,000	3650	18,000	5475
Underseal	Tons	Mg	40	36	60	55	80	73
Crack & Seating Pvmt.	Sys	M^2	6000	5000	10,000	8350	13,400	6700
Rubblizing Pavement	Sys	M^2	3000	2510	4000	3345	6000	5015
Excavating for Subgrade Treatment	Cys	M^3	1000	765	2000	1530	2500	1910
Peat Excavation	Cys	M^3	800	610	1000	765	1500	1145
Jacked Pipe	Lft	m	50	15	80	25	100	30
Temp. Conc. Barrier	Lft	m	2400	730	3600	1100	6000	1830
Temp. Crossovers	Ea	Ea	1/5	1/5	1/4	1/4	1/3	1/3
Paved Side Ditch	Lft	m	300	90	450	140	600	180
Concrete Median Barrier	Lft	m	800	245	1000	305	1500	455
Soil Stabilization	Cys	M^3	4500	3440	5870	4500	8000	6100
Sidewalk Curb Ramps	Sys	M^2	20	17			40	34

DISTRIBUTION OF WORKING DAYS
BY MONTHS, THRU 100 W.D. YEAR
CUMULATIVE TOTALS PER MONTH.

MEDIUM & HEAVY GRADING

JAN.		FEB.										
FEB.			MAR.									
MAR				APR.								
APR	4	4	4	4	MAY							
MAY	17	17	17	17	13	JUN.						
JUN	32	32	32	32	28	15	JUL.					
JUL	48	48	48	48	44	31	16	AUG.				
AUG	65	65	65	65	61	48	33	17	SEPT.			
SEP	80	80	80	80	76	63	48	32	15	OCT.		
OCT	95	95	95	95	91	78	63	47	30	15	NOV.	
NOV	100	100	100	100	96	83	68	52	35	20	5	DEC
DEC												
JAN												
FEB												
MAR												
APR	104	104	104	104	100	87	72	56	39	24	9	
MAY	117	117	117	117	113	100	85	69	52	37	22	
JUN	132	132	132	132	128	115	100	84	67	52	37	
JUL	148	148	148	148	144	131	116	100	83	68	53	
AUG	165	165	165	165	161	148	133	117	100	85	70	
SEP	180	180	180	180	176	163	148	132	115	100	85	
OCT	195	195	195	195	191	178	163	147	130	115	100	
NOV	200	200	200	200	196	183	168	152	135	120	105	
DEC												
JAN												
FEB												
MAR												
APR	204	204	204	204	200	187	172	156	139	124	109	
MAY	217	217	217	217	213	200	185	169	152	137	122	
JUN	232	232	232	232	228	215	200	184	167	152	137	
JUL	248	248	248	248	244	231	216	200	183	168	153	
AUG	265	265	265	265	261	248	233	217	200	185	170	
SEP	280	280	280	280	276	263	248	232	215	200	185	
OCT	295	295	295	295	291	278	263	247	230	215	200	
NOV	300	300	300	300	296	283	268	252	235	220	205	
DEC												
JAN												
FEB												
MAR												
APR	304	304	304	304	300	287	272	256	239	224	209	
MAY	317	317	317	317	313	300	285	269	252	237	222	
JUN	332	332	332	332	328	315	300	284	267	252	237	
JUL	348	348	348	348	344	331	316	300	283	268	253	
AUG	365	365	365	365	361	348	333	317	300	285	270	
SEP	380	380	380	380	376	363	348	332	315	300	285	
OCT	395	395	395	395	391	378	363	347	330	315	300	
NOV	400	400	400	400	396	383	368	352	335	320	305	
DEC												

DISTRIBUTION OF WORKING DAYS
BY MONTHS, THRU 110 W.D. YEAR
CUMULATIVE TOTALS PER MONTH.

LIGHT GRADING & URBAN

	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEPT.	OCT.	NOV.	DE
JAN												
FEB.												
MAR												
APR	4	4	4	4	13							
MAY	17	17	17	17	13	17						
JUN	34	34	34	34	30	17	18					
JUL	52	52	52	52	48	35	18	18				
AUG	70	70	70	70	66	53	36	18	18			
SEP	88	88	88	88	84	71	54	36	18	17		
OCT	105	105	105	105	101	88	71	53	35	17	5	
NOV	110	110	110	110	106	93	76	58	40	22	5	
DEC												
JAN												
FEB												
MAR												
APR	114	114	114	114	110	97	80	62	44	26	9	
MAY	127	127	127	127	123	110	93	75	57	39	22	1
JUN	144	144	144	144	140	127	110	92	74	56	39	3
JUL	162	162	162	162	158	145	128	110	92	74	57	5
AUG	180	180	180	180	176	163	146	128	110	92	75	7
SEP	198	198	198	198	194	181	164	146	128	110	93	8
OCT	215	215	215	215	211	198	181	163	145	127	110	10
NOV	220	220	220	220	216	203	186	168	150	132	115	1
DEC												
JAN												
FEB												
MAR												
APR	224	224	224	224	220	207	190	172	154	136	119	11
MAY	237	237	237	237	233	220	203	185	167	149	132	12
JUN	254	254	254	254	250	237	220	202	184	166	149	14
JUL	272	272	272	272	268	255	238	220	202	184	167	15
AUG	290	290	290	290	286	273	256	238	220	202	185	18
SEP	308	308	308	308	304	291	274	256	238	220	203	19
OCT	325	325	325	325	321	308	291	273	255	237	220	2
NOV	330	330	330	330	326	313	296	278	260	242	225	2
DEC												
JAN												
FEB												
MAR												
APR	334	334	334	334	330	317	300	282	264	246	229	2
MAY	347	347	347	347	343	330	313	295	277	259	242	3
JUN	364	364	364	364	360	347	330	312	294	276	259	2
JUL	382	382	382	382	378	365	348	330	312	294	277	
AUG	400	400	400	400	396	383	366	348	330	312	295	
SEP	418	418	418	418	414	401	384	366	348	330	313	3
OCT	435	435	435	435	431	418	401	383	365	347	330	2

BRIDGE

DISTRIBUTION OF WORKING DAYS
BY MONTHS, THRU 135 W.D. YEAR
CUMULATIVE TOTALS PER MONTH.

		JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEPT.	OCT.	NOV.
	JAN.	0	0	0	14	16	18	19	18	18	17	15
	FEB.	0	0	0	14	34	37	37	36	35	32	29
	MAR	0	14	14	30	53	55	55	53	50	46	45
	APR	14	30	30	48	71	73	72	68	64	62	63
6	MAY	30	48	48	67	89	90	87	82	80	80	82
8	JUN	48	67	67	85	106	105	101	98	98	99	100
9	JUL	67	85	85	103	121	119	117	116	117	117	118
18	AUG	85	103	103	120	135	135	135	135	135	135	135
18	SEP	103	120	120	135	151	151	154	153	153	152	150
17	OCT	120	135	135	149	165	165	172	171	170	167	164
15	NOV	135	149	149	165	183	183	188	188	188	181	180
0	DEC											
0	JAN											
0	FEB											
0	MAR											
14	APR	149	149	149	149	135	119	101	82	64	46	29
16	MAY	165	165	165	165	151	135	117	98	80	62	45
18	JUN	183	183	183	183	169	153	135	116	98	80	63
19	JUL	202	202	202	202	188	172	154	135	117	99	82
18	AUG	220	220	220	220	206	190	172	153	135	117	100
18	SEP	238	238	238	238	224	208	190	171	153	135	118
17	OCT	255	255	255	255	241	225	207	188	170	152	135
15	NOV	270	270	270	270	256	240	222	203	185	167	150
	DEC											
0	JAN											
0	FEB											
0	MAR											
14	APR	284	284	284	284	270	254	236	217	199	181	164
16	MAY	300	300	300	300	286	270	252	233	215	197	180
18	JUN	318	318	318	318	304	288	270	251	233	215	198
19	JUL	337	337	337	337	323	307	289	270	252	234	217
18	AUG	355	355	355	355	341	325	307	288	270	252	235
18	SEP	373	373	373	373	359	343	325	306	288	270	253
17	OCT	390	390	390	390	376	360	342	323	305	287	270
15	NOV	405	405	405	405	391	375	357	338	320	302	285
0	DEC											
0	JAN											
0	FEB											
0	MAR											
14	APR	419	419	419	419	405	389	371	352	334	316	299
16	MAY	435	435	435	435	421	405	387	368	350	332	315
18	JUN	453	453	453	453	439	423	405	386	368	350	333
19	JUL	472	472	472	472	458	442	424	405	387	369	352
1	AUG	490	490	490	490	476	460	442	423	405	387	370
18	SEP	508	508	508	508	494	478	460	441	423	405	388

SETTING OF WORK DAYS FOR BRIDGE CONTRACTS

When setting days for bridge contracts, it is usually best to establish the time required to accomplish each project by assigning time for each controlling operation involved.

To illustrate this let's look at three different jobs, the first being an overlay project. This contract would be set up for calendar day restriction:

1. The first operation would be widening the shoulders. No time charged because this operation can be done without full time restriction.

2. Traffic control items - signals and barrier wall. Probably three to four days unless exceptionally long barrier wall.

3. Scarifying the deck - one day, if it takes longer because of size the next operation will overlap and control.

4. Placing or forming full depth patches - plus curing time - this item depends on quantity.

5. Handchipping and removals - usually two to three days per span.

6. Forming and pouring concrete rail - usually 24 to 36 lineal meter per day.

7. Sandblast and clean deck - usually one day operation.

8. Overlay - usually one day operation.

9. Curing of Overlay - three days.

10. Bituminous approach and installation of guardrail - normally two days operation, unless full depth approach dictates cooling time between lays.

11. Transferring traffic to next phase or removal of traffic control devices. - one day.

Another job used to illustrate the procedure is a three span steel beam contract using a temporary runaround. This job would be set on work days.

1. Construction temporary runaround. Depends on quantity of dirt and length of temporary structure. Use 300 to 500 M^3 of fill per day with structure construction overlap.

2. Removal of present structure - depends on size and type of structure. Consider structure removal phases, be reasonable, also consider phase overlap. (One day per bent, includes superstructure.)

3. Drive piles for bents - Five to 10 piles per day depending on driving conditions - look at boring and tip required.

4. Construction of end bents - 250 m^3/day for small quantities of fill, one day to core for piling if required - five to 10 piles per day.

5. Falsework and forms - usually two to three weeks.

6. Placing resteel - usually three to four days (9 metric tons/day).

7. Pouring deck - one day (380 M^3 or less in pour).

8. Backfill and place R.C. approach slab - 24' wide - two days each - three days cure before access to bridge.

9. Form and pour concrete rail - 24 to 36 lineal meters per day.

10. Bituminous approaches - based on quantities and cool time between lays.

11. Guardrail - based on quantities (see progress charts).

12. Cleanup- and traffic markings - usually five days.

13. Sodding and seeding - usually done concurrent with other operations.

After days are set, the considerations outlined previously should be evaluated. Are schools, businesses, farmers, other contracts, etc., affected? Will material procurement control job? How will permit restrictions control the schedule? Are there utility considerations?

Assume that only one crew will be used on small bridge jobs. Multiple operations can be used on larger bridges or possibly multiple bridges. Assume five day work week on state and county work. Assume six day work week on interstate work.

When setting days a) most LPA jobs use work days.
b) state jobs with temporary runaround use work days.
c) interstate restrictions are always calendar days.
d) all state highway closures are calendar days.
e) all state highway restrictions to one lane are calendar days.

Be lenient when possible but tight when necessary. The more you can encourage additional bidders, the better potential for lower bid prices.

Section 1.3

ESTABLISHING CONSTRUCTION CONTRACT DURATIONS

1.3.1 Purpose

To provide a uniform methodology for establishing contract durations on Department of Transportation construction contracts.

1.3.2 Authority

Sections 334.044(2) and 337.18, Florida Statutes

1.3.3 Background

The project duration is an integral part of every construction project let by the Department. In the past, the time was set based on historical information of how long it took to complete similar projects. The methodology and forms used were rather rigid and implied that tasks followed one behind the other with no opportunity for two or more tasks to be performed concurrently.

The Department has instituted philosophical changes that affect the establishment of the contract duration. These changes place emphasis on decreased project duration and the overall time required from concept of the improvement to completion of construction to decrease user costs and the cost of contract administration. This philosophical change is reflected in this procedure. The methods, outlined in this procedure, allow the District Construction Offices more flexibility in establishing the contract duration.

1.3.4 Definitions

Acquisition Period or Procurement Time: A number of calendar days allowed prior to the first day that time is charged to a contract. This period is to allow time for acquisition of some materials or specialized contracts.

Compressed Time or Time Priority: Compressed time is achieved by increasing the norma production rates. The contractor will have to make corresponding increases in the hours worked as wel as crew size and equipment to complete the project within the shortened time. Compressed time is used when projects must be completed by a certain date or there are special considerations relating to traffic congestion or high public visibility.

Contract Duration: The period of time, measured in calendar days, allowed for the completion of a contract. This duration does not include additional time for inclement weather.

CPM Schedule: A special provision for critical path scheduling is used for more complex projects. Witl large projects, compressed time, or incentive/disincentive projects the Department is looking fo assurance that the contractor will manage the project in a manner that will assure timely completion Management at this level of complexity is very difficult without a tool like CPM. The CPM schedule wil also provide additional documentation needed for negotiating contract changes and claims.

Flex Time: Flex time allows a contractor an additional amount of time after the notice to proceed to

begin work. The day the project is to be started is set by the contractor within a window of time established in the special provisions. The extra time allowed the contractor is used for scheduling materials, equipment, subcontractors and acquiring materials. When this special provision is used, the contractor is not given an additional material acquisition period. The contractors like the additional flexibility, and flex time jobs normally will have fewer overruns and time extensions. The negative side of flex time is that it pushes out the calendar date for the completion of the project.

Incentive/Disincentive: Incentive/disincentive is similar to compressed time above, with the added feature of providing special rewards and penalties to the Contractor for meeting specific time goals and added charges if the goals are not met. Only projects which have been established using "compressed time" shall be considered for incentive/disincentive special provisions.

Phase III Review: One of the last technical reviews of a set of roadway plans prior to being let to bid. At this review, all plan sheets are complete with the exception of the quantities for maintenance of traffic pay items. The only work remaining will be to reply to comments that result from the Phase III review which is also known as biddability review.

Production Rates: A ratio of units of work to a period of time; i.e., 1500 square yards/day or X yards/hour.

Special Working Hours: Construction may occur only during certain hours of the day or on limited days of the week. These limitations are usually site specific and can increase the duration of the construction contract.

1.3.5 General Considerations

The Department establishes a contract duration on each construction contract. Several factors must be considered when establishing contract duration, such as:

(1) Provide a time for the contractor to complete the project consistent with historical records of contractor performance on similar work.

(2) Importance of the project to the implementation of Department Work

(3) Emergency conditions.

(4) Minimize annoyances in residential areas.

(5) Minimize traffic disruption and delay in high traffic areas.

(6) Coordination with other activities.

(7) Political sensitivity and public awareness.

(8) Minimize cost of CEI activities.

Many of these factors can conflict with others and not all of them will have the same importance for each project.

The contract duration shall be established in conjunction with design's Phase III review. If there are quantity changes following the Phase III review, the contract duration may require revision. It must, any case, be firmly established in sufficient time for the Design Project Manager to calculate the

quantities for the maintenance of traffic pay items before the Phase IV review.

To assist the engineer establishing the contract duration, the Department has established guidelines for production rates. These guidelines will be periodically revised and improved. Questions regarding the setting of contract duration should be directed to the District Scheduling Engineer.

Every effort should be made to involve the Resident Office in the Phase Review and in establishing the contract duration.

1.3.6 Specifications

The first step in setting a duration for a contract is to determine if any special provisions apply. A person establishing the contract duration must be familiar with the project's specifications and may initiate the addition of others as needed. Examples of these are:

(1) Flex Time

(2) Compressed Time or Time Priority

(3) Incentive/Disincentive

(4) Special Working Hours

(5) Special Working Period

(6) CPM Schedule

(7) Time Plus Money

(8) Lane Rental

(9) No Excuse Bonus

(10) Liquidated Savings

1.3.7 Establishing Contract Durations

The ***Guidelines for Establishing Contract Duration*** contains a set of production rates for many of the activities that occur in highway/bridge construction projects. Production rates for all possible activities are not included nor are all production rates used in each construction job. The production rates may have to be supplemented with information from other sources and should be tempered with good engineering judgement and past experience with similar work. Establishing a project's duration will be accomplished with the following steps:

(1) Review the project plans and specifications with special emphasis on maintenance of traffic. If the project has more than one phase, determine what work can be done in each of the phases.

(2) List the required activities for each phase. These are listed on ***Estimate of Contract Time, Form No. 700-010-04, (Attachment 1-3-1)***. This list does not need to be exhaustive but does need to include all controlling items of work or activities on the critical path.

(3) List each quantity of the unit of work that will be used as a basis for estimating the duration of that activity; e.g., for storm sewers this would be the number of linear feet of pipe, etc.

On a project with more than one phase, use only that quantity associated with that phase. If the list of pay items shows, for instance, 10,000 cubic yards of excavation for a project, that has two phases, that have approximately the same amount on each phase, put 5000 cubic yards as the unit of work for excavation in Phase 1 and 5000 cubic yards as the unit of work for excavation in Phase 2. Extreme accuracy is not required. It is only necessary that the parts of a quantity of a pay item sum to the whole, but a percent or two of error on any phase will not affect the results. For a project with two phases, this may be a 50%-50% split for a particular pay item. This is just as accurate as using a 45%-55% split.

(4) Use the production rates and charts to convert the units of work into work days. Do this for each activity in each phase.

(5) Review Utility Relocation Agreements and estimate the effect utility delays will have on contract duration. This will usually be much less than the durations shown on the Utility Relocation Agreements. A delay occurs only if the prime contractor cannot work as a result of utility conflicts. Assume good cooperation between the utility and the contractor during the actual construction of the project. Utility delays should be handled as an activity if they will contribute to the project duration.

(6) Multiply each of the work days by a factor of 1.4 to convert them to contract days.

(a) The factor of 1.4 is based on 5 working days per week. Implicit in this factor is the assumption that the contractor will use "normal" crews and equipment, and will work a "normal" work day.

(b) If the time requirements of the project are modified by special provisions, then it may be appropriate to use another factor, either larger or smaller. For a project with incentive/disincentive, a factor of 1.0 or less could be used. This would be based on the assumption that the contractor would work 7 days per week with extended work hours. On the other hand, if the special provisions curtail the number of hours per day the contractor may work, the factor used may be larger than 1.4.

(c) When using a computerized scheduling software package, work days can be converted to calendar days using the calendar function in the program. Holidays, vacation time and other non-work days are entered into the project calendar. Depending on the time of year this may or may not replicate the 1.4 factor normally used for converting work days to calendar days.

(7) Drawing a Bar Chart

(a) Select a scale to draw the bar chart; i.e., if the project is about 200 days and fits on one form, make each block 10 days. More than one page may be used for long projects. Succeeding pages may be for later time periods.

(b) Put the first activity bar on the bar chart, beginning at day 1 and extending the line for the duration of that activity.

(c) Determine how many days after the beginning activity has started until the second can start. Use that contract day as the starting date of the second activity and extend the bar for the duration of the second activity.

For each succeeding activity, the scheduler must decide if its start is dependent or partially dependent on a activity. If so, then the beginning of the activity is placed to reflect this dependence.

(d) Repeat until all activities are completed on the chart. Use more than one form sheet if necessary.

(e) When all activities are on the chart, 15 days general time is normally added. Do not multiply the 15 days by a factor. The contract time is now established.

(f) Computerized scheduling programs may be used to establish contract times. The input into the computer is developed in the same manner as that used for the manual method. If utilizing a computerized scheduling program, substitute a report from that program in place of the manual bar chart form. The report(s) from the scheduling software and/or noncomputerized form should show, as a minimum, for each activity: name, units of work, production rate, duration, beginning contract day and ending contract day.

1.3.8 Documentation

(1) On each form used, complete the Federal Aid Participation (FAP) number, Financial Project ID, county name, the contract time, and the name and phone number of the person who established the contract duration.

(2) Schedules are considered a part of the "plans to Tallahassee package". Instructions for submitting the complete "plans to Tallahassee package" are included in ***Volumes 1*** and ***2*** of the ***Plans Preparation Manual, Topic Nos. 625-000-005*** and ***625-000-006***.

1.3.9 Prosecution

The contract duration is not final until the project is bid. Up to this point in time, the project duration can be influenced by changes in design or by external intervention. The designer (Project Manager) and the District Scheduling Engineer shall coordinate all changes that would affect the contract duration.

Attachment 1-3-1

ESTIMATE OF CONTRACT TIME

FORM NO. 700-010-04

[NOT AVAILABLE - 1 Page]

FLORIDA DEPARTMENT OF TRANSPORTATION

GUIDELINE FOR

ESTABLISHING CONTRACT

DURATION

May, 1994

BASIS OF PRODUCTION RATES:

ROW Preparations:

Clearing and grubbing(Acres): The removal of top soil, trees, minor physical objects and other vegetation from the construction site using mechanical equipment.

Excavation(C.Y.): The removal and transporting of in situ soils on the construction site using mechanical equipment.

Embankment(C.Y.): The placing and compaction of soil on the construction site using mechanical equipment.

Drainage Structures/Storm Sewers:

Storm Sewers(L.F.): The excavation, installation and backfilling of drainage or sewer pipes using manufactured pipe.

Box culverts(C.Y.): The excavation, forming, reinforcing, pouring, finishing, stripping, and backfilling of cast in place concrete box culverts on the construction site. If using precast units, then the units should be changed to L.F. and appropriate production rates substituted.

Inlets & manholes(Each): The installation of premanufactured inlets and manholes for drainage or sewer systems. Time is included in Pipe.

Bridge Structures: (Note: The production rates on several items appear low since they must include time for the total scope of activities necessary to complete an item.)

Cofferdams(S.Y.): The installation, dewatering and minor excavation associated with building a cofferdam system for a bridge construction site.

Sheet Piling(S.F.): The installation of sheeting for retaining walls and deep excavations. Do not add to cofferdams.

Piling(L.F.): The installation of piling for bridge foundations.

Footings(C.Y.): The layout, forming, reinforcing, placing, curing and removing forms for reinforced concrete bridge footings.

Columns, Caps & Bents(C.Y.): The layout, forming, reinforcing, placing, curing and removing forms for reinforced concrete bridge columns, caps and bents.

Wingwalls(S.F.): The layout, forming, reinforcing, placing, curing and removing forms for reinforced concrete wingwalls for bridges.

Bridge deck (total depth)(C.Y.): The layout, forming, reinforcing, placing, curing and removing forms for reinforced concrete bridge decks. The production rates have been set to include time for all components of the deck, including precast plank under slab, thus the full depth of the deck is used to calculate quantity.

Bridge curbs/walks(L.F.): The layout, forming, reinforcing, placing, curing and removing forms for reinforced concrete bridge curbs and walkways.

Bridge handrails(L.F.): The layout, forming, reinforcing, placing, curing and removing forms for cast in place reinforced concrete bridge handrails.

Retaining walls(S.F.): The layout, excavation, forming, reinforcing, placing, curing and removing forms for cast in place reinforced concrete retaining walls. The time for precast proprietary wall systems is included in embankment.

Base Preparations:

Stabilized Roadbed(S.Y.): The placement, mixing and compaction operations involved in the stabilization of subgrade soils.

Base material(S.Y.): The placement, mixing and compaction of flexible base material.

Hot mix asphalt base(Ton): The laydown and compaction of hot mix asphalt concrete base course material. The production rates are taken from the graph for plant mix.

Curb and gutter(L.F.): The layout and construction of new roadway curb and gutter using automated equipment or forms and hand finish.

Concrete pavement repair(S.Y.): The removal and replacement of sections of unsatisfactory or failed portland cement concrete pavement.

Milling/planing(S.Y.): The removal of the surface level of existing pavements using automated milling or planing equipment.

Plant mixed surfaces(Ton): The laydown and compaction of hot mix asphalt concrete surface course material. The production rate is taken from the graph for Plant Mix.

Asphalt Friction Course(1 course)(S.Y.): The laydown and compaction of asphalt concrete friction course material.

Cement Concrete paving (rebar + curing)(S.Y.): The layout, reinforcing, placing, curing and jointing of portland cement concrete pavement.

Precast traffic barriers(L.F.): The layout and installation of precast concrete traffic barriers. If barriers are to be cast in place, then the units should be changed to C.Y. and the production rates adjusted accordingly.

Permanent Signing and Traffic Signals:

Small signs(Each): The installation of small highway information and warning signs mounted on metal posts driven into soil along a highway.

Overhead signs(Each): The installation of large highway information and directional signs mounted on metal frames over a highway. It is assumed that the footings and poles that support the frames are already in place.

Major traffic signals(Each): The installation of automated traffic signals and their support systems at highway intersections.

Pavement markings(L.F.): The application of thermoplastic pavement marking materials to a highway pavement.

Raised Pavement Markers(RPM) (Ea.) - The application of adhesive and raise pavement markers.

Seeding(S.Y.): The seeding of grasses, application of fertilizer and mulch, and cutting into soil.

Final clean-up(Sta.): The removal of debris, dirt and other construction materials from a highway pavement and adjacent right of way at the end of a construction project. The time for this activity is included in "General Time".

Structure demolition(WKDAYS): The demolition and removal of the materials for large structures (multi-story buildings, retaining walls, towers underground tanks, etc.) from the right of way of new construction projects.

Remove old structures (small)(WKDAYS): The demolition and removal of the materials for small structures (Single-story wood buildings, storage sheds, fences, road signs, etc.) from the right of way of new construction projects. Time for this is included in Clearing and Grubbing.

Bridge demolition(WKDAYS): The demolition and removal of all materials for an existing bridge structure and related appurtenances (approaches, gates, signals, etc.).

Erect temporary bridge(WKDAYS): The layout and construction of a temporary bridge structure and related appurtenances for a highway construction project.

Remove temporary bridges(WKDAYS): The demolition and removal of all materials for a temporary bridges structure and related appurtenances for a highway construction project.

FLORIDA DEPARTMENT OF TRANSPORTATION

PRODUCTION RATES FOR ESTIMATING WORKING DAYS

ACTIVITY:	PRODUCTION RATE - PER WORKING DAY
CLEARING AND GRUBBING (.000023 Ac/Sq Ft)	1 to 10 Acres, depending on nature not to exceed 20 days
EXCAVATION/EMBANKMENT (Regular, Lateral Ditch, Subsoil, Convert grading Roadway to cubic yards for this purpose.	See graph for Earthwork Time
EXCAVATION/EMBANKMENT (Truck Haul) Less Than 100,000 cy 100,000-300,000 cy Greater Than 300,000 cy	 900 Cy 3800 Cy 7500 Cy
SHOULDER GRADING (Resurfacing)	1 mi.
STABILIZED ROADBED	6000 Sq Yd (Maximum 10 days)
BASE	See Chart for Production Rate
CEMENT CONCRETE PAVING	5,000 Sq. Yd.
MILLING EXISTING PAVEMENT	8,000 Sq. Yd. (5 days maximum) Maximum days may be limited by specification
PLANT MIXED SURFACES (in tons see conversion factors below)	See Chart for Production Rate
STORM SEWERS (time calculated for storm sewers includes time for pipe, inlets, manholes, etc.)	200 to 400 LF (< 5' deep, no dewatering) 100 to 200 LF (> 5' or dewatering) (large diameters decrease production rate)
BOX CULVERTS	20 - 80 CY
CURB AND GUTTER VALLEY GUTTER	400 to 800 LF
BARRIER WALL - PERMANENT	200 LF
SIDEWALK	300 Sq Yd

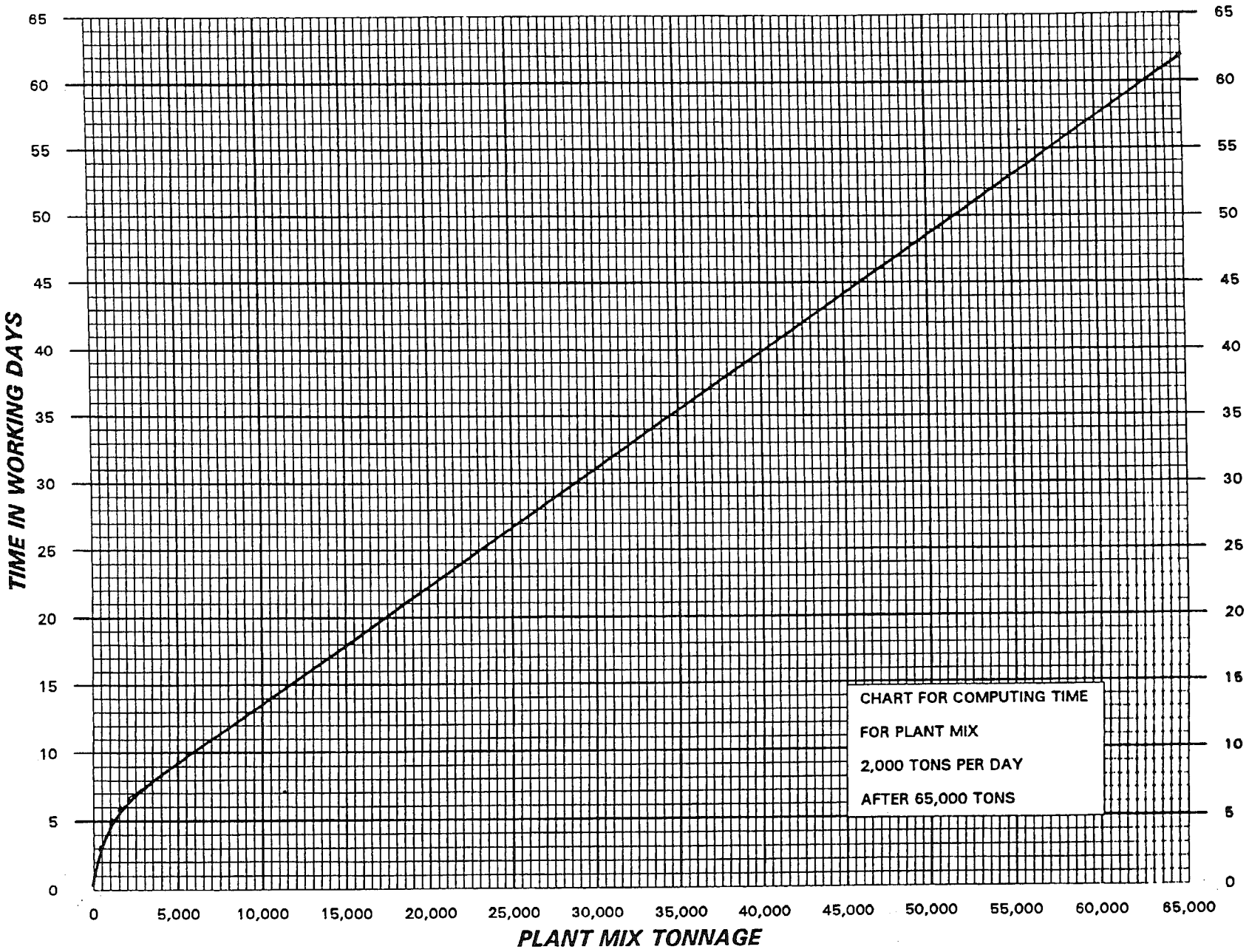
DITCH PAVING	200 Sq. Yd.
SODDING	1500 Sq Yd (3 days maximum)
SEEDING	23,500 Sq Yd (5 days maximum)
PLANT SHRUB TREE	30 EA
THERMOPLASTIC STRIPING	6.7 Mi.
REFLECTIVE PAVEMENT MARKERS	0 - 5000 Use 500 EA. 5001 + Use 1000 EA.
SURFACE TREATMENT	200 CY
GUARDRAIL (When a significant part of Contract)	1,500 LF
BREAKING AND COMPACTING EXISTING CONCRETE PAVEMENT(Re-seat Conc. Pave.)	5,000 SY
COMPRESSION SEAL REPLACEMENT	100 LF
UTILITY DELAYS Use only when construction for a utility company equals 50% of total contract.	See Utility Agreements and Specifications
SIGNALIZATION Use only on signalization contract.	15 Days / Intersection
HIGHWAY LIGHTING (Not high mast) Use only for lighting contract.	5 Standards
FENCE Use only where major portion of contract. Less Than 10,000 LF Greater Than 10,000 LF	 500 LF 1200 LF
COFFERDAMS	100 - 300 S.Y.
PILING	200 - 400 L.F.
FOOTINGS	20 - 40 C.Y.
COLUMNS, CAPS, & BENTS	4 - 10 C.Y.
WINGWALLS	100 - 200 S.F.

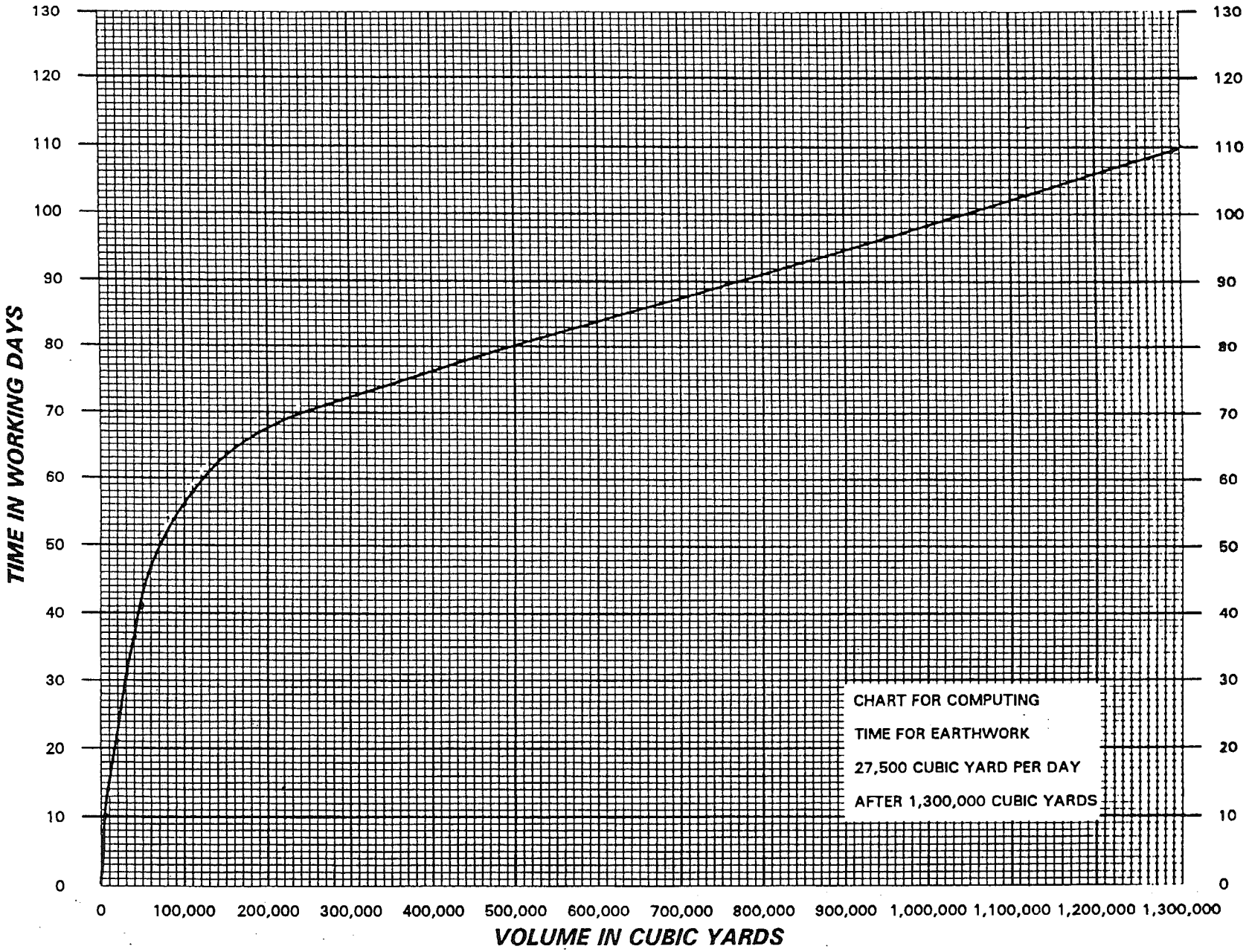
BEAM ERECTION	150 - 250 L.F.
BRIDGE DECK	6 - 14 C.Y.
BRIDGE HANDRAILS	150 - 300 L.F.
RETAINING WALLS (For proprietary systems time established for embankment do not add additional time)	100 - 200 S.F.
SHEET PILING	1000 S.F.
SIGN ONLY JOB:	
Small sign	10 - 30
Overhead sign	.2 - .7
GENERAL TIME (Moving in Preparatory to starting work, etc.)	15 Calendar Days
SPECIAL ACQUISITION PERIOD Calendar Days allowed prior to the first day of time charged to the contract. These are to allow time for special acquisition on specialized contracts.	
a. Resurfacing	
1-20,000 Tons	30 Days
20,001-60,000 Tons	60 Days
60,001+ Tons	90 Days
b. Signalization Use only when primary contract is signalization. Reconsider on jobs when "other work" exceeds 90 Days.	90 Days
c. Highway Lighting Use only when primary contract is lighting Reconsider on jobs when "other work" exceeds 120 Days.	120 Days
d. Highway Lighting Conversion Mercury vapor to high pressure sodium	90 Days

Sign structures 120 days
metal light standards.

Asphalt Tonnage Conversion Chart

5/8	" = 0.0313 X Sy		3	" = 0.1500 X Sy	
3/4	" = 0.0375 X Sy		3	1/2" = 0.1750 X Sy	
1	" = 0.0500 X Sy		4	" = 0.2000 X Sy	
1	1/4" = 0.0625 X Sy		4	1/2" = 0.2250 X Sy	
1	1/2" = 0.0750 X Sy		5	" = 0.2500 X Sy	
1	3/4" = 0.0875 X Sy		6	" = 0.3000 X Sy	
2	" = 0.1000 X Sy		7	" = 0.3500 X Sy	
2	1/4" = 0.1125 X Sy		8	" = 0.4000 X Sy	
2	1/2" = 0.1250 X Sy		9	" = 0.4500 X Sy	
2	3/4" = 0.1375 X Sy				


TIME IN WORKING DAYS
PLANT MIX TONNAGE
0
5
10
15
20
25
30
35
40
45
50
55
60
65
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
45,000
50,000
55,000
60,000
65,000
CHART FOR COMPUTING TIME
FOR PLANT MIX
2,000 TONS PER DAY
AFTER 65,000 TONS


130
120
110
100
90
80
70
60
50
40
30
20
10
0
TIME IN WORKING DAYS
CHART FOR COMPUTING
TIME FOR EARTHWORK
27,500 CUBIC YARD PER DAY
AFTER 1,300,000 CUBIC YARDS
0
100,000
200,000
300,000
400,000
500,000
600,000
700,000
800,000
900,000
1,000,000
1,100,000
1,200,000
1,300,000
VOLUME IN CUBIC YARDS

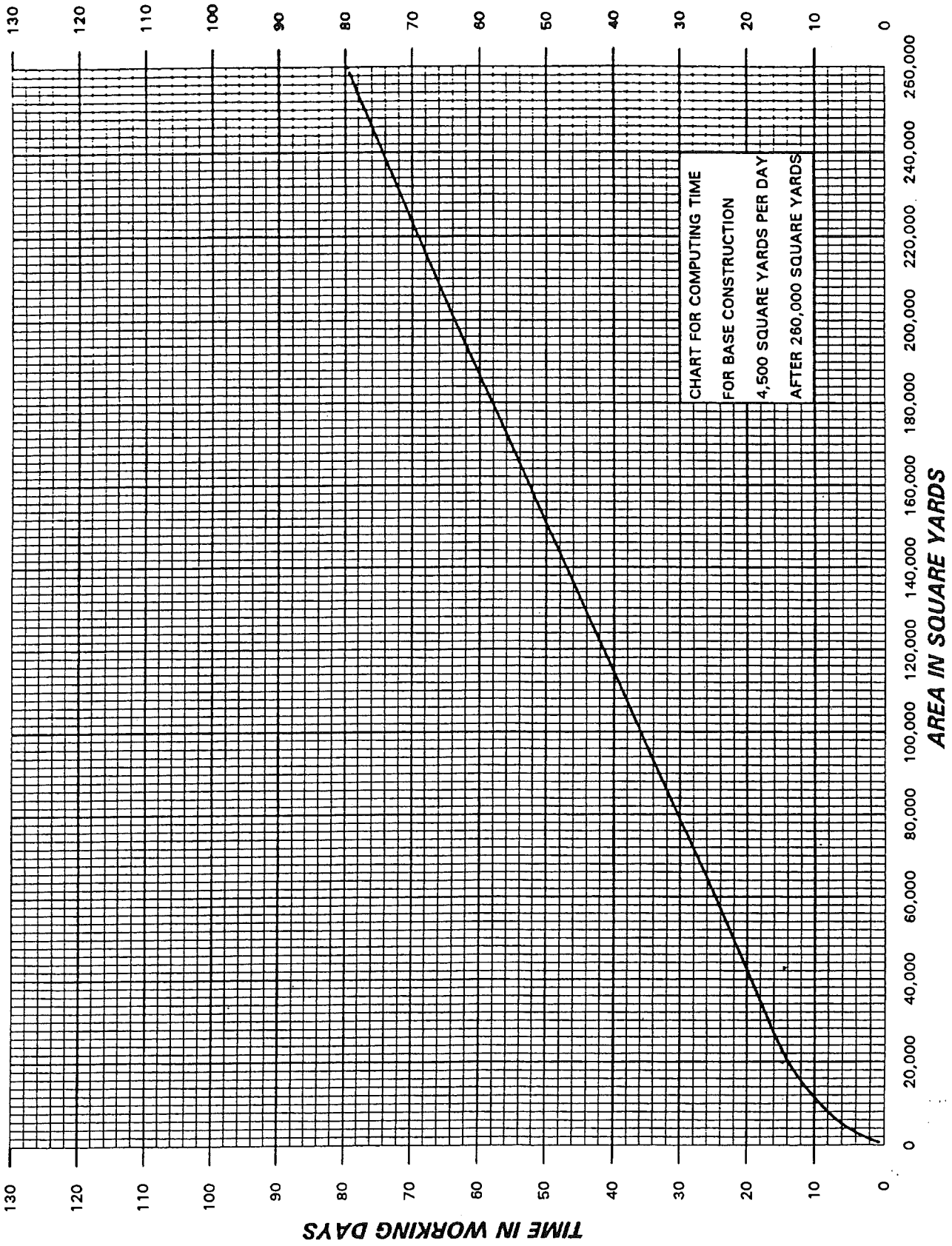
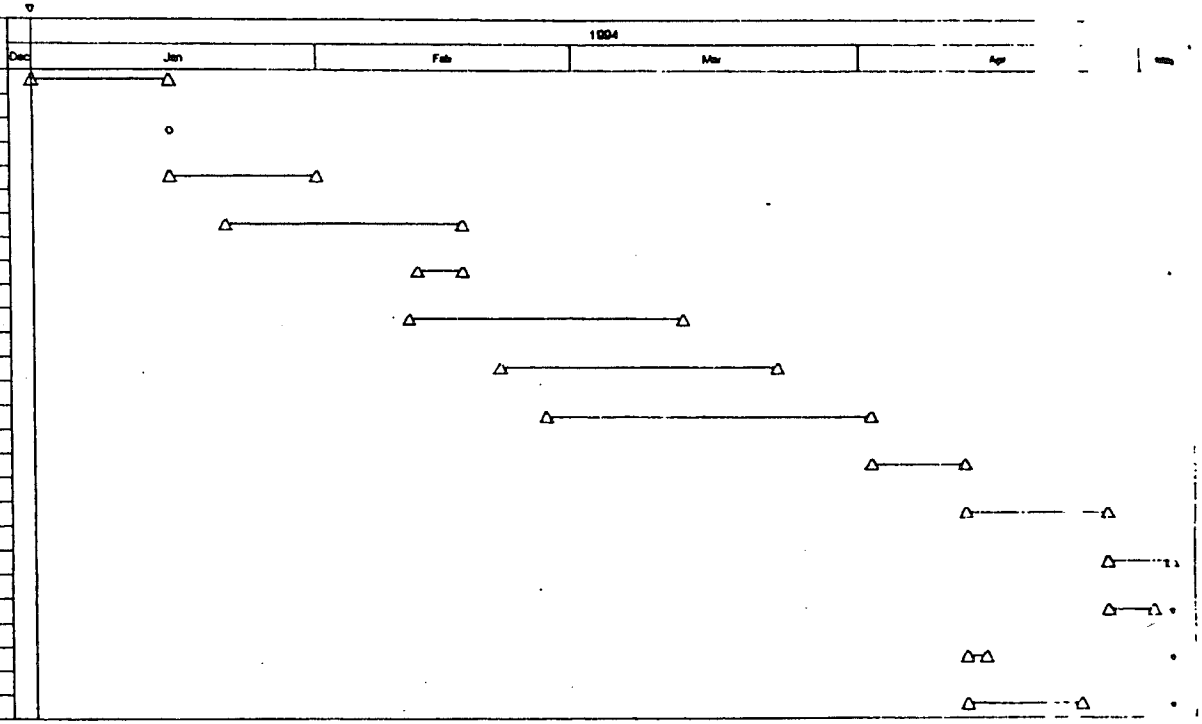


CHART FOR COMPUTING TIME
FOR BASE CONSTRUCTION
4,500 SQUARE YARDS PER DAY
AFTER 260,000 SQUARE YARDS
TIME IN WORKING DAYS
AREA IN SQUARE YARDS
0
10
20
30
40
50
60
70
80
90
100
110
120
130
0
20,000
40,000
60,000
80,000
100,000
120,000
140,000
160,000
180,000
200,000
220,000
240,000
260,000

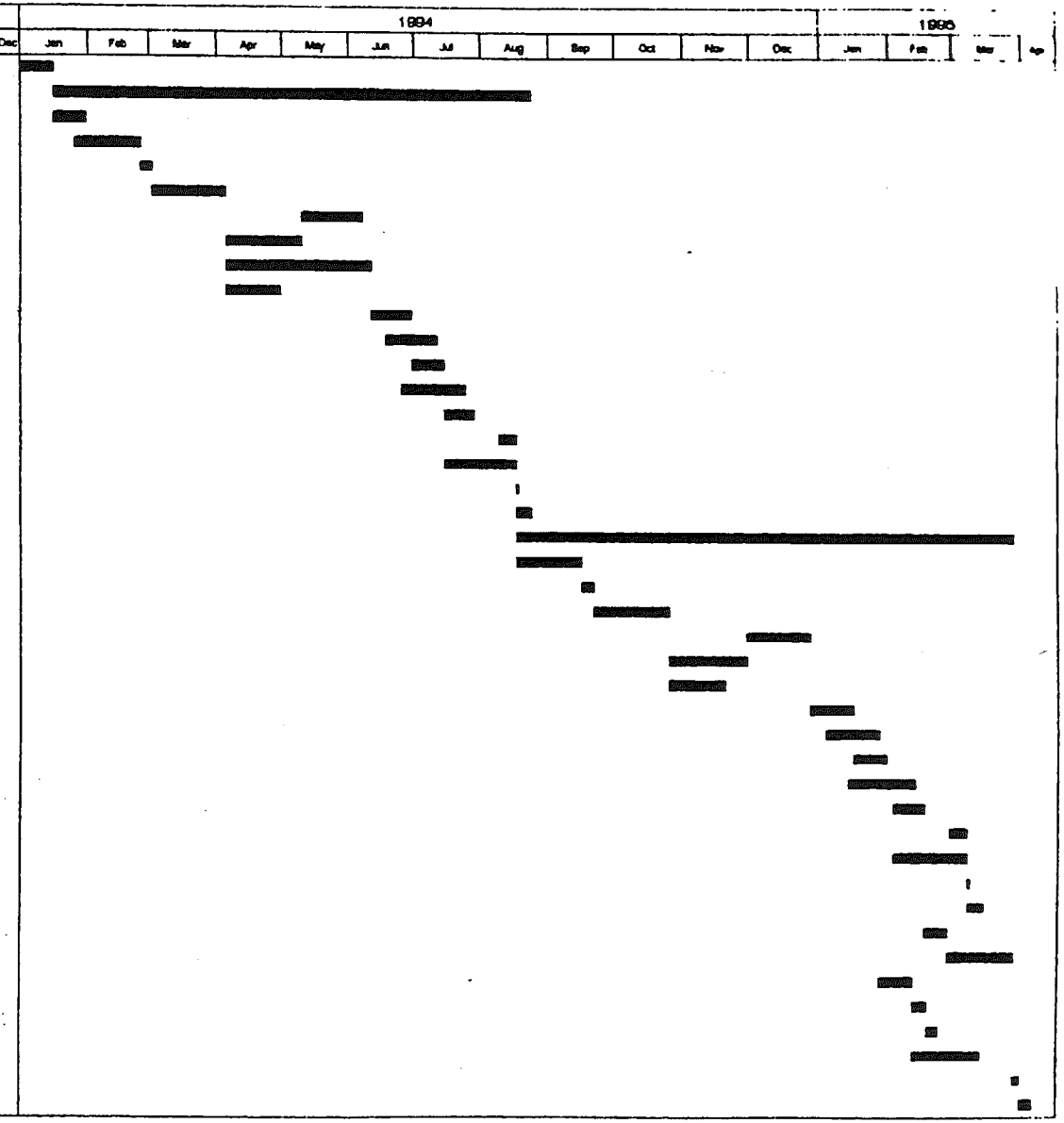
Job No. 26060 - 3501

Alachua County

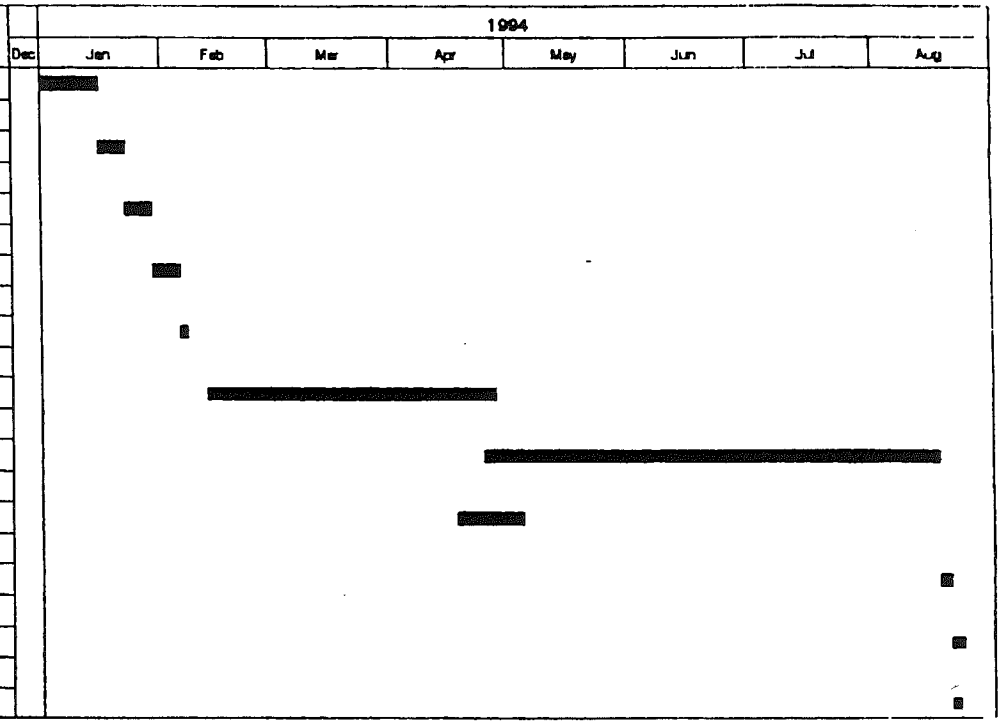
Task Name	Unit of Work	Prod Rate	Days	X 1.45
eneral Time				15
learing & Grubbing			5	7
ox Culvert	55 CY	5 CY	11	16
torm Sewer	3697 CY	200 LF	18	26
urb & Gutter	1103 LF	400 LF	3	5
ase	36145 SY	Chart	20	30
illing/Planing	172041 SY	8000 SY	20	30
sphalt Structural	23381 TN	Chart	24	35
houlder Rework	102280 SY	15000 SY	7	10
sphalt Friction	6343 TN	Chart	10	15
triping	32 MI	6.7 MI	5	7
PMs	1483	500	3	5
idewalk	74 SY	300 SY	1	2
odding	12082 SY	1500 SY	8	12



Task Name	Unit of Work	Prod Rate	Days	X 1.48
ıral Time				15
e I				15
aring and Grubbing	24.4 AC	max	10	15
avation Borrow	49778	2500 CY	20	30
et Piling	1972 SF	640 SF	3	5
ncrete Retaining Walls	348 CY	15 CY	23	34
m Sewers	7868 LF	400 LF	19	28
avation Subsoil	32523 CY	Chart	23	34
avation - Lt Ditch	80118 CY	Chart	48	67
avation Regular	25545 CY	Chart	17	25
bilization	65510 SY	5000 SY	13	38
b & Gutter	13295 LF	800 LF	16	24
ffic Separator	31985 LF	300 LF	10	15
erock Group 9	58023 SY	Chart	21	30
halt Structural	18251 TN	1000 TN	9	14
ndrail	1467 LF		5	8
ewalk	8474 SY	300 SY	22	33
ding	9748 SY	27500 SY		1
ding	3730 SY	1500 SY	5	7
e II				15
avation Borrow	49778	2500 CY	20	30
et Piling	1972 SF	640 SF	3	5
ncrete Retaining Walls	348 CY	15 CY	23	34
m Sewers	7868 LF	400 LF	19	28
avation Subsoil	32523 CY	Chart	23	34
avation Regular	25545 CY	Chart	17	25
bilization	65510 SY	5000 SY	13	38
b & Gutter	13295 LF	800 LF	16	24
ffic Separator	31985 LF	300 LF	10	15
erock Group 9	58023 SY	Chart	21	30
halt Structural	18251 TN	1000 TN	9	14
ndrail	1467 LF		5	8
ewalk	8474 SY	300 SY	22	33
ding	9748 SY	27500 SY		1
ding	3730 SY	1500 SY	5	7
halt FC	8450 TN	1000 TN	7	10
e FC				30
Arm Foundation	11 EA	3	4	6
End for Mast Arms	11 EA	3	4	6
Mast Arms	11 EA	4	3	5
l Intersection	11 EA	5	20	30
ng	12.3 MI	6.7 MI	2	3
	2056	500	4	6



Task Name	Unit of Work	Prod Rate	Days	X 1.46
ieral Time				
er Test Pile				
e Test Pile				
er Production Pile				
duction Pile	5700 LF	400 LF	15	21
Caps	302.78 CY	6 CY	51	74
k	785.72 CY	10 CY	79	115
m Placement	2803 LF	250 LF	11	17
ier Wall	405 LF	200 LF	2	3
drail	4053 LF	200 LF	2	3
k Grooving			1	2



APPENDIX C: PROCEDURE TO LINK OR IMPORT FIELDMANAGER DATA INTO MICROSOFT ACCESS

On a computer with FieldManager installed and containing the contract files you wish to analyze, follow the steps below to import or link FieldManager data tables into Microsoft Access

To Import:

1. Click **File, New**, select **Database** and give the database a suitable name and file location.
2. Click on **File, Get External Data, Import** In the dialog box that opens, click on the down arrow next to *Files of Type*, select **ODBC Databases**
3. Click on **Machine Data Source**, click on **FieldManager**
4. Click to highlight on the tables you wish to import. Click **OK.**
5. If a box appears that says "Select Unique Record Identifier", click **Cancel**, continue this step if necessary

To Link:

1. Click **File, New**, select **Database** and give the database a suitable name and file location.
2. Click on **File, Get External Data, Link** In the dialog box that opens, click on the down arrow next to *Files of Type*, select **ODBC Databases**
3. Click on **Machine Data Source**, click on **FieldManager**
4. Click to highlight on the tables you wish to link. Click **OK.**
5. If a box appears that says *Select Unique Record Identifier*, click **Cancel**, continue this step if necessary

Note: Any database program that is ODBC compatible and located on the same PC as FieldManager should be able to link or import FieldManager data, though the procedure may differ from that described above.

APPENDIX D: ACTION QUERIES

Note: Before running any action query, it is recommended that the user create a backup copy of the original database file under a new name and/or location to prevent any loss of data that may unintentionally occur.

❖ Append Queries

To append new data into an existing table within a MS Access database, follow the procedure below. The procedure is written for the situation in which the user desires to update the data in the ITEMPROG table by importing new data available from the contracts active in FieldManager. It also assumes that no duplicate information is contained in the FieldManager data from that currently in the Access database (i.e. the same contract is not in both Access and FieldManager)

To Append:

1. Follow the procedure from Appendix B under "To Import" and select ITEMPROG as the table you wish to link.
2. Since there already exists a table in the database called DBA_ITEMPROG, Access will automatically name the linked table DBA_ITEMPROG1
3. Create a new query in design view, then select the SQL view and paste the following text into the entry box:

```
INSERT INTO DBA_ITEMPROG
SELECT DBA_ITEMPROG1.*
FROM DBA_ITEMPROG1
WHERE (((DBA_ITEMPROG1.CONTID)=[Input ContractID]));
```

4. Save this query under a name you will recognize, such as "Append ITEMPROG from ITEMPROG1". When the query is run, it will prompt you to input the full contract ID number you wish to append that data for into Access.
5. When the user runs this query, Access will display a warning that "You are about to run an append query that will modify the data in your table. Are you sure you want

to run this type of action query?". Click **Yes** if you are sure you will achieve the desired result.

6. Open the ITEMPROG table and ensure that the correct data was appended. Filtering the data to show only the ContractID that you attempted to append is a useful method to complete this check.
7. To append the data for the table PROJITEM, follow the steps above, but substitute the name PROJITEM and PROJITEM1 where appropriate. Substitute the following text where appropriate in Step 3:

```
INSERT INTO DBA_PROJITEM
SELECT DBA_PROJITEM1.*
FROM DBA_PROJITEM1
WHERE (((DBA_PROJITEM1.CONTID)=[Input ContractID]));
```

8. To append the data for the table CONTRACT, follow the steps above, but substitute the name CONTRACT and CONTRACT1 where appropriate. Substitute the following text where appropriate in Step 3:

```
INSERT INTO DBA_CONTRACT
SELECT DBA_CONTRACT1.*
FROM DBA_CONTRACT1
WHERE (((DBA_CONTRACT1.CONTID)=[Input ContractID]));
```

❖ Delete Queries

To delete old or unwanted data from an existing MS Access database, follow the procedure below. The procedure is written for the situation in which the user desires to delete data in the ITEMPROG table by selecting a particular ContractID number.

To Delete:

1. Create a new query in design view, then select the SQL view and paste the following text into the entry box:

```
DELETE DISTINCTROW DBA_ITEMPROG.CONTID, DBA_ITEMPROG.*
FROM DBA_ITEMPROG
WHERE (((DBA_ITEMPROG.CONTID)=[Input ContractID]));
```

2. Save this query under a name you will recognize, such as "Delete ITEMPROG". When the query is run, it will prompt you to input the full contract ID number you wish to delete that data for in Access.

3. When the user runs this query, Access will display a warning that "You are about to run a delete query that will modify the data in your table. Are you sure you want to run this type of action query?". Click **Yes** if you are sure you will achieve the desired result.
4. Open the ITEMPROG table and ensure that the correct data was deleted. Filtering the data to show only the ContractID that you attempted to append is a useful method to complete this check.
5. To delete data for the table PROJITEM, follow the steps above, but substitute the name PROJITEM and PROJITEM1 where appropriate. Substitute the following text where appropriate in Step 1:

```
DELETE DBA_PROJITEM.CONTID, DBA_PROJITEM.*
FROM DBA_PROJITEM
WHERE (((DBA_PROJITEM.CONTID)=[Input ContractID]));
```

6. To delete data for the table CONTRACT, follow the steps above, but substitute the name CONTRACT and CONTRACT 1 where appropriate. Substitute the following text where appropriate in Step 1:

```
DELETE DBA_CONTRACT.*, DBA_CONTRACT.CONTID
FROM DBA_CONTRACT
WHERE (((DBA_CONTRACT.CONTID)=[Input ContractID]));
```

APPENDIX E: QUERY INFORMATION

Following is a listing of the SQL code from MS Access 2000 used for each relevant query discussed for this research project.

Production Rate

```
SELECT DBA_PROJITEM.IDESCR AS Description, DBA_ITEMPROG.CONTID,
DBA_PROJITEM.PIITEM, DBA_ITEMPROG.DDDATE,
Sum(DBA_ITEMPROG.IPQTY) AS [Sum], Count(DBA_ITEMPROG.DDDATE) AS [#
Postings], DBA_PROJITEM.IUNITS
FROM DBA_PROJITEM INNER JOIN DBA_ITEMPROG ON (DBA_PROJITEM.PCN =
DBA_ITEMPROG.PCN) AND (DBA_PROJITEM.CN = DBA_ITEMPROG.CN) AND
(DBA_PROJITEM.PILINENO = DBA_ITEMPROG.PILINENO) AND
(DBA_PROJITEM.PITYPE = DBA_ITEMPROG.PITYPE) AND
(DBA_PROJITEM.CMOD = DBA_ITEMPROG.CMOD)
GROUP BY DBA_PROJITEM.IDESCR, DBA_ITEMPROG.CONTID,
DBA_PROJITEM.PIITEM, DBA_ITEMPROG.DDDATE, DBA_PROJITEM.IUNITS
ORDER BY DBA_PROJITEM.IDESCR, DBA_ITEMPROG.CONTID,
DBA_ITEMPROG.DDDATE;
```

Production Rate Statistics

```
SELECT [Production Rate].Description, [Production Rate].PIITEM, Avg([Production
Rate].Sum) AS [Avg], Min([Production Rate].Sum) AS [Min], Max([Production Rate].Sum)
AS [Max], Count([Production Rate].Sum) AS [Count], StDev([Production Rate].Sum) AS
StDev, [StDev]/[Avg] AS COV, [Production Rate].IUNITS AS Units
FROM [Production Rate]
GROUP BY [Production Rate].Description, [Production Rate].PIITEM, [Production
Rate].IUNITS;
```

Nonnegative Production Rate

```
SELECT DBA_PROJITEM.IDESCR AS Description, DBA_ITEMPROG.CONTID,
DBA_PROJITEM.PIITEM, DBA_ITEMPROG.DDDATE,
Sum(DBA_ITEMPROG.IPQTY) AS [Sum], Count(DBA_ITEMPROG.DDDATE) AS [#
Postings], DBA_PROJITEM.IUNITS
FROM DBA_PROJITEM INNER JOIN DBA_ITEMPROG ON (DBA_PROJITEM.CMOD
= DBA_ITEMPROG.CMOD) AND (DBA_PROJITEM.PITYPE =
DBA_ITEMPROG.PITYPE) AND (DBA_PROJITEM.PILINENO =
DBA_ITEMPROG.PILINENO) AND (DBA_PROJITEM.CN = DBA_ITEMPROG.CN)
AND (DBA_PROJITEM.PCN = DBA_ITEMPROG.PCN)
GROUP BY DBA_PROJITEM.IDESCR, DBA_ITEMPROG.CONTID,
DBA_PROJITEM.PIITEM, DBA_ITEMPROG.DDDATE, DBA_PROJITEM.IUNITS
HAVING (((Sum(DBA_ITEMPROG.IPQTY))>0))
ORDER BY DBA_PROJITEM.IDESCR, DBA_ITEMPROG.CONTID,
DBA_ITEMPROG.DDDATE;
```

Nonnegative Production Rate Statistics

SELECT [Production Rate].Description, [Production Rate].PIITEM, Avg([Production Rate].Sum) AS [Avg], Min([Nonnegative Production Rate].Sum) AS [Min], Max([Production Rate].Sum) AS [Max], Count([Production Rate].Sum) AS [Count], StDev([Production Rate].Sum) AS StDev, [StDev]/[Avg] AS COV, [Production Rate].IUNITS
FROM [Nonnegative Production Rate] INNER JOIN [Production Rate] ON ([Nonnegative Production Rate].PIITEM = [Production Rate].PIITEM) AND ([Nonnegative Production Rate].Description = [Production Rate].Description)
GROUP BY [Production Rate].Description, [Production Rate].PIITEM, [Production Rate].IUNITS;

Filtered Jobs

SELECT DBA_CONTRACT.CONTID AS [Contract ID], DBA_CONTRACT.CNMNGOFF, DBA_CONTRACT.UNITSYS, DBA_CONTRACT.CNDESCR, DBA_CONTRACT.CNDTCBEG AS [Construction Begin Dat], DBA_CONTRACT.FBRESENG AS [Resident Engineer], DBA_CONTRACT.FBPRJENG AS [Project Engineer], DBA_CONTRACT.CNDTNTP AS [Notice to Proceed]
FROM DBA_CONTRACT
ORDER BY DBA_CONTRACT.CNDESCR;

Filtered Production Rate

SELECT DBA_PROJITEM.IDESCR AS Description, DBA_ITEMPROG.CONTID, DBA_PROJITEM.PIITEM, DBA_ITEMPROG.DDDATE, Sum(DBA_ITEMPROG.IPQTY) AS [Sum], Count(DBA_ITEMPROG.DDDATE) AS [# Postings], DBA_PROJITEM.IUNITS
FROM [Filtered Jobs] INNER JOIN (DBA_PROJITEM INNER JOIN DBA_ITEMPROG ON (DBA_PROJITEM.CMOD = DBA_ITEMPROG.CMOD) AND (DBA_PROJITEM.PITYPE = DBA_ITEMPROG.PITYPE) AND (DBA_PROJITEM.PILINENO = DBA_ITEMPROG.PILINENO) AND (DBA_PROJITEM.CN = DBA_ITEMPROG.CN) AND (DBA_PROJITEM.PCN = DBA_ITEMPROG.PCN)) ON [Filtered Jobs].[Contract ID] = DBA_ITEMPROG.CONTID
GROUP BY DBA_PROJITEM.IDESCR, DBA_ITEMPROG.CONTID, DBA_PROJITEM.PIITEM, DBA_ITEMPROG.DDDATE, DBA_PROJITEM.IUNITS
ORDER BY DBA_PROJITEM.IDESCR, DBA_ITEMPROG.CONTID;

Filtered Production Rate Statistics

SELECT [Production Rate].Description, Avg([Production Rate].Sum) AS [Avg], Min([Production Rate].Sum) AS [MIN], Max([Production Rate].Sum) AS [Max], Count([Production Rate].Sum) AS [Count], StDev([Production Rate].Sum) AS StDev, [StDev]/[Avg] AS COV, [Production Rate].IUNITS AS Units
FROM [Filtered Jobs] INNER JOIN [Production Rate] ON [Filtered Jobs].[Contract ID] = [Production Rate].CONTID
GROUP BY [Production Rate].Description, [Production Rate].IUNITS;

APPENDIX F: PROCEDURE TO CALCULATE CONFIDENCE INTERVALS FOR THE MEAN

To calculate confidence intervals in Microsoft (MS) Excel for the mean of daily production rates calculated in MS Access, follow the steps below. The procedure is written with reference to the "Production Rate Statistics" query in MS Access described in Chapter 5. Since the standard deviation of the population is not known, the t statistic is used as the test statistic to calculate the confidence intervals. The following formulas were utilized to calculate the Lower Limit (LL) and Upper Limit (UL) for the two-sided 95% confidence interval:[1] Because of the varied number of observations for each item, the *t* distribution was utilized to accommodate samples of less than 30 observations.

$$\text{Lower Limit} = \overline{X} - t_{\alpha/2}\left(\frac{S}{\sqrt{n}}\right)$$

Where S is the sample standard deviation, n is the number of observations, α is the significance level, which corresponds to 0.05 for the 95% confidence interval, and $t_{\alpha/2}$ is the value of a random variable with a t distribution with $\nu = n - 1$.

$$\text{Upper Limit} = \overline{X} + t_{\alpha/2}\left(\frac{S}{\sqrt{n}}\right)$$

Where S is the sample standard deviation, n is the number of observations, α is the significance level, which corresponds to 0.05 for the 95% confidence interval, and $t_{\alpha/2}$ is the value of a random variable with a t distribution with $\nu = n - 1$.

1. Begin by running the query "Production Rate Statistics" in MS Access.
2. Click **File, Export**. Select the location and name you wish to save the file to. In the dialog box that opens, click on the down arrow next to *Files of Type,* select **Microsoft Excel 97-2000.**
3. Open MS Excel and select **File, Open.** Chose the file that you named in step 2.
4. Click on the top row in column D. Select **Insert, Columns.** Repeat.
5. Enter a label of LL in cell D1, and a label of UL in cell E1.

---

[1] Referenced from *Probability, Statistics, & Reliability for Engineers*, by Bilal M. Ayyub and Richard H. McCuen (1997)

6. Click on cell D2. Type the following text:

   =$C2-TINV(0.05,($H2-1))*($I2/($H2^0.5)).

7. Click on cell D2 and drag the mouse to highlight cell E2. Click **Edit, Fill, Right.**
8. Click on cell E2. change the first minus (-) sign to a plus (+) sign. The text should now read

   =$C2+TINV(0.05,($H2-1))*($I2/($H2^0.5)).

9. Click on cell D2 and drag the mouse to highlight cell E2, then drag the mouse down so that all the rows you wish to calculate the confidence intervals for are highlighted.
10. Click **Edit, Fill, Down.**

APPENDIX G: STATISTICAL RESULTS

Description	PIITEM	Avg	LL	UL	Min	Max	Count	StDev	COV	IUNITS
_	1037060	5851.92	#NUM!	#NUM!	5851.92	5851.92	1			dlr
_	1097060	41618.94	#NUM!	#NUM!	41618.94	41618.94	1			dlr
_	1207060	1.00	#NUM!	#NUM!	1.00	1.00	1			dlr
_	1507051	1.00	#NUM!	#NUM!	1.00	1.00	1			LS
_	2047060	1.00	#NUM!	#NUM!	1.00	1.00	1			dlr
_	2047102	480.00	#NUM!	#NUM!	480.00	480.00	1			m
_	2047110	962.07	775.28	1148.86	13.00	4119.00	55	690.96	0.718	m2
_	2057051	1.00	#NUM!	#NUM!	1.00	1.00	1			LS
_	2057102	372.88	254.69	491.08	9.00	1186.00	33	333.34	0.894	m
_	2057120	130.38	#NUM!	#NUM!	130.38	130.38	1			m3
_	2087050	420.00	#NUM!	#NUM!	420.00	420.00	1			ea
_	2087102	769.00	#NUM!	#NUM!	769.00	769.00	1			m
_	3027110	3671.25	-1060.32	8402.82	552.73	6936.00	4	2973.54	0.810	m2
_	3027120	640.00	#NUM!	#NUM!	640.00	640.00	1			m3
_	3057110	10940.33	-10136.08	32016.74	3492.00	20176.00	3	8484.39	0.776	m2
_	3057120	77.31	-19.24	173.86	25.23	263.41	6	92.00	1.190	m3
_	3077110	2958.75	-4137.75	10055.25	583.00	9641.00	4	4459.77	1.507	m2
_	4017050	2.34	1.70	2.98	0.16	9.00	30	1.72	0.736	ea
_	4017102	39.11	10.72	67.49	1.00	136.00	12	44.67	1.142	m
_	4017120	11.10	7.25	14.95	0.65	84.11	51	13.69	1.233	m3
_	4027102	605.54	#NUM!	#NUM!	605.54	605.54	1			m
_	4037050	2.11	0.37	3.85	1.00	8.00	9	2.26	1.071	ea
_	4037051	1.00	#NUM!	#NUM!	1.00	1.00	1			LS
_	4037102	1.56	0.10	3.01	0.40	2.63	4	0.91	0.586	m
_	4067102	3575.60	1504.37	5646.83	1040.00	5597.00	5	1668.11	0.467	m
_	5017060	1190.02	-8152.25	10532.28	454.76	1925.27	2	1039.81	0.874	dlr
_	5017131	1330.38	1015.12	1645.65	34.72	2282.34	23	729.05	0.548	t
_	5027051	1.00	1.00	1.00	1.00	1.00	2	0.00	0.000	LS
_	5027102	576.02	301.41	850.63	67.00	2260.00	26	679.88	1.180	m
_	5027110	48548.55	-156394.30	253491.41	484.60	143810.66	3	82500.54	1.699	m2
_	5027131	2790.44	#NUM!	#NUM!	2790.44	2790.44	1			t
_	5047051	1.00	#NUM!	#NUM!	1.00	1.00	1			LS
_	5047110	1107.00	#NUM!	#NUM!	1107.00	1107.00	1			m2
_	6027050	1.00	#NUM!	#NUM!	1.00	1.00	1			ea
_	6027051	1.00	#NUM!	#NUM!	1.00	1.00	1			LS
_	6037050	2.00	#NUM!	#NUM!	2.00	2.00	1			ea

Description	PIITEM	Avg	LL	UL	Min	Max	Count	StDev	COV	IUNITS
_	7127050	27.00	0.44	53.56	10.00	48.00	4	16.69	0.618	ea
_	7127102	8.05	#NUM!	#NUM!	8.05	8.05	1			m
_	7157050	14.00	#NUM!	#NUM!	14.00	14.00	1			ea
_	7157051	2.00	#NUM!	#NUM!	2.00	2.00	1			LS
_	8027050	5.33	2.46	8.20	4.00	6.00	3	1.15	0.217	ea
_	8027102	325.00	#NUM!	#NUM!	325.00	325.00	1			m
_	8037110	37.52	#NUM!	#NUM!	37.52	37.52	1			m2
_	8057102	190.00	#NUM!	#NUM!	190.00	190.00	1			m
_	8077050	71.00	-76.66	218.66	1.00	583.00	9	192.09	2.706	ea
_	8077051	1.00	#NUM!	#NUM!	1.00	1.00	1			LS
_	8077150	2.25	0.73	3.77	1.00	3.00	4	0.96	0.426	ea
_	8097060	1.00	#NUM!	#NUM!	1.00	1.00	1			dlr
_	8107102	32.85	-103.74	169.44	22.10	43.60	2	15.20	0.463	m
_	8117050	1.00	#NUM!	#NUM!	1.00	1.00	1			ea
_	8117051	1.00	1.00	1.00	1.00	1.00	2	0.00	0.000	LS
_	8117102	192.40	#NUM!	#NUM!	192.40	192.40	1			m
_	8127050	31.20	7.56	54.84	2.00	93.00	10	33.05	1.059	ea
_	8127051	2.00	-0.15	4.15	1.00	5.00	5	1.73	0.866	LS
_	8127110	39.60	#NUM!	#NUM!	39.60	39.60	1			m2
_	8137110	100.36	#NUM!	#NUM!	100.36	100.36	1			m2
_	8157050	4.00	#NUM!	#NUM!	4.00	4.00	1			ea
_	8167050	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
_	8167110	1534.78	660.00	2409.56	544.00	2500.00	5	704.52	0.459	m2
_	8197051	1.00	#NUM!	#NUM!	1.00	1.00	1			LS
_	8217050	5.00	-0.20	10.20	1.00	15.00	7	5.63	1.125	ea
_	8217060	997.89	#NUM!	#NUM!	997.89	997.89	1			dlr
_	8507050	11.00	#NUM!	#NUM!	11.00	11.00	1			ea
_	8507060	985.49	#NUM!	#NUM!	985.49	985.49	1			dlr
_	9217060	5158.23	#NUM!	#NUM!	5158.23	5158.23	1			dlr
_	9217102	25.50	6.44	44.56	24.00	27.00	2	2.12	0.083	m
_	9307120	27648.97	#NUM!	#NUM!	27648.97	27648.97	1			m3
_	9727102	5.00	#NUM!	#NUM!	5.00	5.00	1			m
_	9747150	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Acer Rubrum, 50 mm	8150061	3.50	-15.56	22.56	2.00	5.00	2	2.12	0.606	ea
Adhesive Anchoring of Vertical Bar, 13	7120032	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Adhesive Anchoring of Vertical Bar, 19	7120034	80.00	#NUM!	#NUM!	80.00	80.00	1			ea

Description	PIITEM	Avg	LL	UL	Min	Max	Count	StDev	COV	IUNITS
Aggregate Base	3020001	394.45	200.64	588.27	5.52	8839.45	99	971.77	2.464	t
Aggregate Base, 100 mm	3020010	633.46	-221.22	1488.14	55.45	2185.00	7	924.13	1.459	m2
Aggregate Base, 160 mm	3020016	4914.63	3561.08	6268.18	7.60	19319.30	58	5147.82	1.047	m2
Aggregate Base, 200 mm	3020020	3480.33	2222.04	4738.62	14.00	15016.00	39	3881.67	1.115	m2
Aggregate Base, 240 mm	3020024	9314.00	-85435.76	104063.76	1857.00	16771.00	2	10545.79	1.132	m2
Aggregate Base, 260 mm	3020026	6759.83	1711.86	11807.81	564.00	10369.90	6	4810.19	0.712	m2
Aggregate Base, 300 mm	3020030	158.77	70.17	247.37	9.20	483.40	13	146.62	0.924	m2
Aggregate Base, LM	3020002	105.59	37.07	174.12	11.50	464.85	13	113.40	1.074	m3
Aggregate, 6A, LM	2050026	105.60	-954.09	1165.29	22.20	189.00	2	117.95	1.117	m3
Approach, Cl I	3070001	93.58	61.91	125.24	7.05	346.03	24	75.00	0.801	t
Approach, Cl I, 160 mm	3070009	927.59	-6201.45	8056.63	366.52	1488.66	2	793.47	0.855	m2
Approach, Cl I, LM	3070003	70.60	44.12	97.09	6.10	381.00	39	81.71	1.157	m3
Approach, Cl II	3070021	110.65	69.87	151.42	0.04	606.74	48	140.42	1.269	t
Approach, Cl II, 100 mm	3070026	85.00	46.88	123.12	82.00	88.00	2	4.24	0.050	m2
Approach, Cl II, 160 mm	3070029	472.20	270.80	673.60	379.20	528.00	3	81.08	0.172	m2
Approach, Cl II, LM	3070023	67.76	48.14	87.38	8.00	259.74	54	71.88	1.061	m3
Approach, Cl III, 160 mm	3070049	248.00	#NUM!	#NUM!	248.00	248.00	1			m2
Backfill, Structure, CIP	2060002	343.75	-702.50	1390.00	12.50	1330.00	4	657.51	1.913	m3
Backfill, Swamp	2050001	1397.61	1180.08	1615.13	123.70	12680.17	125	1228.76	0.879	m3
Band, Sign	8100105	7.67	-12.57	27.90	2.00	17.00	3	8.14	1.062	ea
Barricade, Type I, Lighted, Furn	8120019	9.00	#NUM!	#NUM!	9.00	9.00	1			ea
Barricade, Type III, Lighted, Furn	8120036	3.63	-0.15	7.40	1.00	30.00	16	7.09	1.956	ea
Barricade, Type III, Lighted, Oper	8120037	3.21	-0.15	6.56	0.72	30.00	18	6.74	2.102	ea
Beam Plate, Seal Perimeter	7130025	161.00	#NUM!	#NUM!	161.00	161.00	1			m
Bit Approach	5020200	121.12	99.93	142.31	0.02	1061.00	145	129.10	1.066	t
Bit Base Crushing and Shaping	3050001	10128.79	8969.81	11287.78	6.00	33960.33	121	6439.03	0.636	m2
Bit Mixture for Patching, Temp	5030001	77.24	-27.96	182.45	5.82	439.69	9	136.87	1.772	t
Bit Mixture, 13A	5020066	1501.33	1339.53	1663.14	5.54	4536.15	87	759.19	0.506	t
Bit Mixture, 3 E 1	5020168	1777.95	1473.87	2082.04	0.43	2643.68	24	720.14	0.405	t
Bit Mixture, 3 E 3	5020169	1037.37	803.38	1271.36	212.76	2002.98	23	541.10	0.522	t
Bit Mixture, 3C	5020057	1214.07	101.35	2326.79	208.71	1826.16	4	699.28	0.576	t
Bit Mixture, 4 E 03	5020174	500.30	247.55	753.06	1.00	1005.83	10	353.33	0.706	t
Bit Mixture, 4 E 1	5020175	1434.75	1247.03	1622.47	0.20	3185.77	76	821.49	0.573	t
Bit Mixture, 4 E 3	5020176	1229.70	1100.33	1359.07	0.02	2464.03	102	658.66	0.536	t
Bit Mixture, 4C	5020059	693.12	275.40	1110.84	50.00	1178.84	6	398.04	0.574	t
Bit Mixture, 5 E 1	5020182	1424.25	1162.82	1685.68	22.08	2797.90	44	859.89	0.604	t

Description	PITEM	Avg	LL	UL	Min	Max	Count	StDev	COV	IUNITS
Bit Mixture, 5 E 3	5020183	1186.72	1065.68	1307.76	42.64	2433.29	76	529.71	0.446	t
Bit Patch, Rem	5020007	175.17	#NUM!	#NUM!	175.17	175.17	1			m2
Bit Quality Assurance Testing	5010003	3059.87	1683.95	4435.80	5.00	56622.78	111	7314.83	2.391	t
Bit Quality Initiative	5010001	45218.44	30439.17	59997.72	598.33	107178.00	23	34177.04	0.756	dlr
Bit Surface, Rem	5020006	632.94	223.81	1042.06	67.98	5401.74	29	1075.57	1.699	m2
Bolt, Adhesive Anchored, 16 mm	7120041	47.00	#NUM!	#NUM!	47.00	47.00	1			ea
Bolt, Adhesive Anchored, 19 mm	7120042	27.00	-2.29	56.29	17.00	40.00	3	11.79	0.437	ea
Bridge Barrier Railing, Type 4	7110022	31.00	11.94	50.06	29.50	32.50	2	2.12	0.068	m
Bridge Deck Surface Construction	7060325	51.33	-29.02	131.69	15.00	77.00	3	32.35	0.630	m2
Bridge Ltg, Furn and Rem	7060403	1.00	#NUM!	#NUM!	1.00	1.00	1			LS
Bridge Ltg, Oper and Maintain	7060402	59.25	-458.53	577.03	18.50	100.00	2	57.63	0.973	m3
Bridge Railing, Thrie Beam Retrofit	7110006	20.32	-1.54	42.18	15.24	30.48	3	8.80	0.433	m
Clearing	2010001	2954.74	2079.36	3830.12	1.00	14258.90	54	3207.15	1.085	m2
Cold Milling Bit Surface	5020004	505.91	163.74	848.07	14.34	939.00	7	369.97	0.731	t
Cold Milling Bit Surface	5020005	9687.42	7960.22	11414.62	117.10	25099.70	74	7455.05	0.770	m2
Conc Barrier, Temp, Adjusted	8120040	116.00	#NUM!	#NUM!	116.00	116.00	1			m
Conc Barrier, Temp, Furn	8120041	289.61	81.92	497.30	116.00	396.00	4	130.52	0.451	m
Conc Barrier, Temp, Oper	8120042	289.61	81.92	497.30	116.00	396.00	4	130.52	0.451	m
Conc Barrier, Temp, Relocated	8120043	21.00	#NUM!	#NUM!	21.00	21.00	1			m
Conc Pavt, Misc, Reinf, 260 mm	6020160	60.68	4.27	117.08	0.77	108.00	5	45.43	0.749	m2
Conc Pavt, Reinf, 240 mm	6020109	58.00	-41.67	157.67	0.36	143.64	4	62.64	1.080	m2
Conc Quality Assurance	6050100	121.29	-20.47	263.05	45.88	249.50	4	89.09	0.735	m3
Conc Quality Initiative	6050101	350.98	#NUM!	#NUM!	350.98	350.98	1			dlr
Conc, Bridge Deck Overlay	7060320	8.50	8.50	8.50	8.50	8.50	2	0.00	0.000	m3
Conc, Grade D	7060007	4.50	3.23	5.77	4.40	4.60	2	0.14	0.031	m3
Conc, Grade S2	7060004	11.79	2.12	21.47	0.15	59.40	14	16.76	1.421	m3
Contractor Staking	1040001	0.27	0.17	0.38	0.02	2.00	53	0.38	1.379	LS
Controller, TS	8200336	1.00	#NUM!	#NUM!	1.00	1.00	1			ea
Culv Bedding	4011100	10.42	7.76	13.08	0.70	45.20	60	10.31	0.990	m3
Culv End Sect, 300 mm	4011000	1.40	0.72	2.08	1.00	2.00	5	0.55	0.391	ea
Culv End Sect, 375 mm	4011001	2.20	1.46	2.94	1.00	4.00	10	1.03	0.469	ea
Culv End Sect, 450 mm	4011002	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Culv End Sect, 600 mm	4011004	1.56	1.00	2.11	1.00	3.00	9	0.73	0.467	ea
Culv End Sect, 900 mm	4011006	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Culv End Sect, Conc, 1200 mm	4011030	1.00	1.00	1.00	1.00	1.00	4	0.00	0.000	ea
Culv End Sect, Conc, 1500 mm	4011032	1.33	-0.10	2.77	1.00	2.00	3	0.58	0.433	ea

Description	PIITEM	Avg	LL	UL	Min	Max	Count	StDev	COV	IUNITS
Culv End Sect, Conc, 2100 mm	4011036	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Culv End Sect, Conc, 300 mm	4011020	1.50	0.58	2.42	1.00	2.00	4	0.58	0.385	ea
Culv End Sect, Conc, 375 mm	4011021	2.33	1.00	3.67	1.00	8.00	12	2.10	0.901	ea
Culv End Sect, Conc, 450 mm	4011022	2.36	1.70	3.02	1.00	10.00	39	2.05	0.867	ea
Culv End Sect, Conc, 600 mm	4011025	1.63	1.41	1.85	1.00	4.00	41	0.70	0.427	ea
Culv End Sect, Conc, 750 mm	4011027	1.22	1.01	1.43	1.00	2.00	18	0.43	0.350	ea
Culv End Sect, Conc, 900 mm	4011028	1.24	1.01	1.46	1.00	2.00	17	0.44	0.354	ea
Culv End Sect, Grate	4010990	208.00	107.35	308.65	122.00	420.00	7	108.83	0.523	kg
Culv End Sect, Metal, 300 mm	4011040	2.00	2.00	2.00	2.00	2.00	3	0.00	0.000	ea
Culv End Sect, Metal, 375 mm	4011041	3.33	-2.40	9.07	2.00	6.00	3	2.31	0.693	ea
Culv End Sect, Salv, 750 mm or less	4011060	1.50	0.87	2.13	1.00	3.00	8	0.76	0.504	ea
Culv End, Rem	2030005	3.74	3.15	4.32	1.00	12.00	88	2.76	0.737	ea
Culv, Cl 1, 1050 mm	4010006	24.00	#NUM!	#NUM!	24.00	24.00	1			m
Culv, Cl 1, 300 mm	4010000	9.73	-0.45	19.92	5.00	12.20	3	4.10	0.421	m
Culv, Cl 1, 375 mm	4010001	24.38	#NUM!	#NUM!	24.38	24.38	1			m
Culv, Cl 1, 450 mm	4010002	22.04	4.79	39.29	8.54	32.60	4	10.84	0.492	m
Culv, Cl 1, 600 mm	4010003	21.19	11.61	30.76	4.88	38.00	9	12.45	0.588	m
Culv, Cl 1, Conc, 1200 mm	4010207	8.48	3.75	13.21	2.44	26.84	11	7.04	0.830	m
Culv, Cl 1, Conc, 1500 mm	4010209	8.50	#NUM!	#NUM!	8.50	8.50	1			m
Culv, Cl 1, Conc, 300 mm	4010200	6.30	#NUM!	#NUM!	6.30	6.30	1			m
Culv, Cl 1, Conc, 375 mm	4010201	125.90	#NUM!	#NUM!	125.90	125.90	1			m
Culv, Cl 1, Conc, 450 mm	4010202	12.87	8.08	17.67	2.40	48.80	28	12.36	0.960	m
Culv, Cl 1, Conc, 600 mm	4010203	9.86	7.72	11.99	1.20	32.94	68	8.82	0.895	m
Culv, Cl 1, Conc, 750 mm	4010204	8.49	5.16	11.83	1.83	34.14	26	8.26	0.973	m
Culv, Cl 1, Conc, 900 mm	4010205	6.89	4.35	9.43	2.40	34.16	26	6.29	0.913	m
Culv, Cl 1, CSP, 600 mm	4010403	23.10	-115.40	161.60	12.20	34.00	2	15.41	0.667	m
Culv, Cl 1, CSP, 900 mm	4010405	16.50	#NUM!	#NUM!	16.50	16.50	1			m
Culv, Cl 2, 450 mm	4010032	12.20	#NUM!	#NUM!	12.20	12.20	1			m
Culv, Cl 2, Conc, 1200 mm	4010237	24.40	#NUM!	#NUM!	24.40	24.40	1			m
Culv, Cl 2, Conc, 2100 mm	4010243	6.10	-68.87	81.07	0.20	12.00	2	8.34	1.368	m
Culv, Cl 2, Conc, 450 mm	4010232	4.84	-1.93	11.61	2.40	14.60	5	5.46	1.127	m
Culv, Cl 2, Conc, 600 mm	4010233	7.29	-7.89	22.47	1.20	13.42	3	6.11	0.839	m
Culv, Cl 2, Conc, 750 mm	4010234	9.51	-1.94	20.95	1.22	19.50	5	9.22	0.969	m
Culv, Cl 2, Conc, 900 mm	4010235	4.84	0.60	9.09	1.22	8.54	5	3.42	0.706	m
Culv, Cl 3, Conc, 1500 mm	4010269	9.76	9.76	9.76	9.76	9.76	2	0.00	0.000	m
Culv, Cl 4, Conc, 1200 mm	4010297	9.76	9.76	9.76	9.76	9.76	2	0.00	0.000	m

Description	PIITEM	Avg	LL	UL	Min	Max	Count	StDev	COV	IUNITS
Culv, Cl 5, 300 mm	4010120	2.44	#NUM!	#NUM!	2.44	2.44	1			m
Culv, Cl 5, 450 mm	4010122	22.38	15.69	29.07	12.80	34.20	7	7.23	0.323	m
Culv, Cl 5, 600 mm	4010123	19.30	-7.47	46.07	12.20	31.70	3	10.78	0.558	m
Culv, Cl 5, 750 mm	4010124	15.87	9.17	22.57	12.20	21.94	4	4.21	0.265	m
Culv, Cl 5, Conc, 300 mm	4010320	17.00	#NUM!	#NUM!	17.00	17.00	1			m
Culv, Cl 5, Conc, 375 mm	4010321	6.20	-10.32	22.72	4.90	7.50	2	1.84	0.297	m
Culv, Cl 5, Conc, 450 mm	4010322	14.78	10.29	19.26	1.22	40.60	23	10.37	0.702	m
Culv, Cl 5, Conc, 600 mm	4010323	18.42	9.45	27.39	3.00	50.25	10	12.54	0.681	m
Culv, Cl 5, Conc, 750 mm	4010324	13.00	9.56	16.44	12.20	14.60	3	1.39	0.107	m
Culv, Cl 5, Conc, 900 mm	4010325	4.88	#NUM!	#NUM!	4.88	4.88	1			m
Culv, Cl 6, 300 mm	4010150	9.09	2.10	16.08	1.83	21.00	6	6.66	0.733	m
Culv, Cl 6, 375 mm	4010151	10.10	6.51	13.69	2.50	26.50	18	7.22	0.715	m
Culv, Cl 6, 450 mm	4010152	25.75	21.60	29.89	2.40	130.00	134	24.25	0.942	m
Culv, Cl 6, 600 mm	4010153	10.25	6.13	14.38	1.20	17.00	9	5.37	0.524	m
Culv, Cl 6, 750 mm	4010154	8.50	#NUM!	#NUM!	8.50	8.50	1			m
Culv, Cl 6, Conc, 300 mm	4010350	2.44	#NUM!	#NUM!	2.44	2.44	1			m
Culv, Cl 6, Conc, 450 mm	4010352	19.74	9.36	30.13	2.44	61.00	17	20.21	1.023	m
Culv, Cl 6, Conc, 600 mm	4010353	6.94	2.83	11.06	4.88	14.70	6	3.92	0.565	m
Culv, Cl 6, Conc, 900 mm	4010355	8.57	-1.30	18.43	2.44	17.20	4	6.20	0.724	m
Culv, Cl 6, CSP, 300 mm	4010550	53.74	#NUM!	#NUM!	53.74	53.74	1			m
Culv, Cl 6, CSP, 375 mm	4010551	10.73	-14.99	36.46	3.00	22.50	3	10.36	0.965	m
Culv, Cl 6, CSP, 450 mm	4010552	16.00	7.90	24.10	2.40	36.00	10	11.33	0.708	m
Culv, Other Than Pipe, Rem	2040023	1.00	1.00	1.00	1.00	1.00	2	0.00	0.000	ea
Culv, Rem	2030004	1.68	1.36	1.99	0.50	14.00	109	1.66	0.991	ea
Culv,CSP Arch,1.63 mm,530 mm by 380 mm	4011405	29.20	#NUM!	#NUM!	29.20	29.20	1			m
Culv,End Sect,Arch,1:4,530X380,Longit	4010811	4.00	#NUM!	#NUM!	4.00	4.00	1			ea
Culv,End Sect,Arch,1:6,530X380,Longit	4010853	5.40	1.42	9.38	2.00	9.00	5	3.21	0.594	ea
Culv,End Sect,Ellip,1:4,1345X855,Transv	4010926	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Culv,End Sect,Ellip,1:4,575X365,Longit	4010900	1.88	0.93	2.82	1.00	4.00	8	1.13	0.601	ea
Culv,End Sect,Ellip,1:4,575X365,Transv	4010920	4.00	#NUM!	#NUM!	4.00	4.00	1			ea
Culv,End Sect,Ellip,1:4,770X490,Longit	4010901	1.29	0.83	1.74	1.00	2.00	7	0.49	0.380	ea
Culv,End Sect,Ellip,1:4,770X490,Transv	4010921	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Culv,End Sect,Ellip,1:4,960X610,Transv	4010923	1.50	-4.85	7.85	1.00	2.00	2	0.71	0.471	ea
Culv,Prec Conc Box,ASTM C 789M,1200X1200	4012004	6.41	-5.22	18.03	5.49	7.32	2	1.29	0.202	m
Culv,Reinf Conc Ellip,Cl HE 1,575 X 365	4010620	6.77	2.25	11.29	2.44	19.52	10	6.32	0.933	m
Culv,Reinf Conc Ellip,Cl HE 1,770 X 490	4010621	3.36	2.30	4.41	2.44	4.88	8	1.26	0.376	m

Description	PIITEM	Avg	LL	UL	Min	Max	Count	StDev	COV	IUNITS
Culv,Reinf Conc Ellip,Cl HE 1,960 X 610	4010623	3.66	-11.84	19.16	2.44	4.88	2	1.73	0.471	m
Culv,Slp End Sect,1:4,1050 mm,Transv	4010727	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Culv,Slp End Sect,1:4,1200 mm,Transv	4010728	2.43	1.38	3.48	1.00	4.00	7	1.13	0.467	ea
Culv,Slp End Sect,1:4,450 mm,Longit	4010701	2.17	1.13	3.20	1.00	4.00	6	0.98	0.454	ea
Culv,Slp End Sect,1:4,450 mm,Transv	4010721	1.83	0.98	2.68	1.00	5.00	12	1.34	0.729	ea
Culv,Slp End Sect,1:4,600 mm,Transv	4010723	1.96	1.67	2.25	1.00	5.00	52	1.05	0.534	ea
Culv,Slp End Sect,1:4,750 mm,Transv	4010725	1.21	1.03	1.38	1.00	2.00	24	0.41	0.343	ea
Culv,Slp End Sect,1:4,900 mm,Transv	4010726	1.95	1.32	2.58	1.00	6.00	20	1.36	0.696	ea
Culv,Slp End Sect,1:6,375 mm,Longit	4010740	1.67	0.23	3.10	1.00	2.00	3	0.58	0.346	ea
Culv,Slp End Sect,1:6,450 mm,Longit	4010741	4.88	4.21	5.54	1.00	26.00	155	4.19	0.860	ea
Culv,Slp End Sect,1:6,600 mm,Longit	4010743	2.15	1.67	2.63	1.00	6.00	26	1.19	0.552	ea
Culv,Slp End Sect,1:6,600 mm,Transv	4010763	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Culv,Slp End Sect,1:6,750 mm,Longit	4010745	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Culv,Slp End Sect,1:6,900 mm,Longit	4010746	1.50	-4.85	7.85	1.00	2.00	2	0.71	0.471	ea
Curb and Gutter, Bridge Approach	8020009	16.00	5.35	26.65	7.00	26.00	5	8.57	0.536	m
Curb and Gutter, Conc, Det B2	8020018	64.97	54.82	75.12	20.10	150.20	41	32.15	0.495	m
Curb and Gutter, Conc, Det C2	8020023	43.42	13.96	72.88	13.90	84.00	6	28.07	0.647	m
Curb and Gutter, Conc, Det C4	8020025	33.75	-0.74	68.24	3.20	54.40	4	21.67	0.642	m
Curb and Gutter, Conc, Det D2	8020030	93.79	33.77	153.81	7.28	302.60	11	89.34	0.953	m
Curb and Gutter, Conc, Det F4	8020038	48.10	-227.62	323.82	26.40	69.80	2	30.69	0.638	m
Curb and Gutter, Rem	2040006	71.70	42.03	101.37	8.00	310.00	29	78.00	1.088	m
Curb, Conc, Det E2	8020002	60.33	38.51	82.16	6.40	137.00	12	34.35	0.569	m
Curb, Rem	2040005	35.26	-17.76	88.28	7.30	109.00	5	42.70	1.211	m
Ditch Cleanout	2050006	240.89	141.54	340.23	8.20	1656.00	41	314.75	1.307	m
Ditch, Plain Cobble	8140001	222.53	163.71	281.34	16.32	758.28	34	168.57	0.758	m2
Ditching, Gradall	9210022	40.00	-5.23	85.23	8.00	74.00	4	28.43	0.711	m
Downspout Header, Conc	8020071	3.00	#NUM!	#NUM!	3.00	3.00	1			ea
Dr Marker Post	4011110	20.86	10.36	31.36	1.00	119.00	29	27.61	1.323	ea
Dr Str,Add Depth 1200 dia,2401-4500	4030006	1.62	#NUM!	#NUM!	1.62	1.62	1			m
Dr Str,Add Depth 1500 dia,2401-4500	4030011	0.38	0.13	0.63	0.36	0.40	2	0.03	0.074	m
Dr Str,Add Depth 1800 dia,2401-4500	4030014	0.86	0.02	1.70	0.40	1.31	4	0.53	0.616	m
Dr Structure Cover	4030042	363.80	256.87	470.73	91.00	1816.00	55	395.54	1.087	kg
Dr Structure Cover, Adj, Case 1	4030045	5.07	3.70	6.43	1.00	15.00	30	3.65	0.720	ea
Dr Structure Cover, Adj, Case 2	4030046	3.00	0.52	5.48	2.00	4.00	3	1.00	0.333	ea
Dr Structure, 1200 mm dia	4030005	1.18	1.06	1.29	1.00	2.00	45	0.39	0.328	ea
Dr Structure, 1500 mm dia	4030010	1.50	-4.85	7.85	1.00	2.00	2	0.71	0.471	ea

Description	PITEM	Avg	LL	UL	Min	Max	Count	StDev	COV	IUNITS
Dr Structure, 1800 mm dia	4030013	1.25	0.45	2.05	1.00	2.00	4	0.50	0.400	ea
Dr Structure, 600 mm dia	4030000	1.13	0.83	1.42	1.00	2.00	8	0.35	0.314	ea
Dr Structure, Abandon	2030010	1.33	-0.10	2.77	1.00	2.00	3	0.58	0.433	ea
Dr Structure, Adj, Add Depth	4030041	0.88	-7.07	8.82	0.25	1.50	2	0.88	1.010	m
Dr Structure, Adj, Additional Depth	4030041	0.90	-0.71	2.51	0.29	1.58	3	0.65	0.721	m
Dr Structure, Rem	2030011	1.17	0.74	1.60	1.00	2.00	6	0.41	0.350	ea
Dr Structure, Tap, 300 mm	4030054	1.00	#NUM!	#NUM!	1.00	1.00	1			ea
Dr Structure, Temp Lowering	4030049	7.17	3.99	10.35	1.00	17.00	12	5.01	0.699	ea
Drain Casting Assembly, Type 2	7170011	2.00	2.00	2.00	2.00	2.00	2	0.00	0.000	ea
Driveway Opening, Conc, Det M	8020049	32.63	-6.17	71.42	8.60	65.10	4	24.38	0.747	m
Driveway, Nonreinf Conc	8010002	7.09	2.83	11.35	4.70	10.90	4	2.68	0.378	m3
Driveway, Reinf Conc	8010001	2.58	#NUM!	#NUM!	2.58	2.58	1			m3
Dust Palliative, Applied, CaCl2	8120051	1.16	-10.99	13.30	0.20	2.11	2	1.35	1.169	t
Edge Trimming	5020011	4026.00	#NUM!	#NUM!	4026.00	4026.00	1			m
Embankment, CIP	2050010	671.55	417.04	926.07	4.00	15000.00	166	1660.84	2.473	m3
Embankment, LM	2050011	160.17	107.83	212.50	3.00	2684.78	164	339.42	2.119	m3
Erosion Control, Check Dam, Stone	2080001	16.44	8.81	24.08	1.00	72.20	24	18.08	1.100	m
Erosion Control, Check Dam, Temp	2080002	2.70	-6.19	11.59	2.00	3.40	2	0.99	0.367	m
Erosion Control, Filter Bag	2080011	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Erosion Control, Sediment Basin, LM	2080020	8.55	-60.70	77.80	3.10	14.00	2	7.71	0.901	m3
Erosion Control, Sediment Trap	2080022	1.76	1.15	2.38	1.00	5.00	17	1.20	0.680	ea
Erosion Control, Silt Fence	2080025	152.59	95.46	209.71	7.00	2053.70	114	307.85	2.018	m
Erosion Control,Sed Basin,Maint,LM	2080021	10.68	-1.63	22.99	6.00	28.40	5	9.92	0.928	m3
Excavation, Earth	2050015	1130.42	994.93	1265.92	2.00	11484.97	462	1482.02	1.311	m3
Excavation, Fdn	2060011	15.00	4.24	25.76	12.50	20.00	3	4.33	0.289	m3
Excavation, Peat	2050016	1380.10	1196.60	1563.61	17.17	7847.67	127	1044.96	0.757	m3
Excavation, Rock	2050017	84.51	17.63	151.39	0.72	807.30	34	191.68	2.268	m3
False Decking	7060029	139.73	-233.39	512.85	19.20	308.00	3	150.20	1.075	m2
Fence, Plastic, Temp	8080008	9.20	#NUM!	#NUM!	9.20	9.20	1			m
Fence, Protective	8080007	420.00	#NUM!	#NUM!	420.00	420.00	1			m
Fence, Rem	2040009	88.00	#NUM!	#NUM!	88.00	88.00	1			m
Fertilizer, Chemical Nutrient, Cl A	8160020	278.88	210.90	346.86	6.20	1813.54	80	305.49	1.095	kg
Fertilizer, Chemical Nutrient, Cl B	8160021	138.18	-157.41	433.78	1.35	217.40	3	118.99	0.861	kg
Field Office, Cl 2	8090002	3.50	0.74	6.26	2.00	6.00	4	1.73	0.495	mo
Field Office, Utility Fees	8090100	1271.44	-1397.13	3940.00	35.32	1978.99	3	1074.24	0.845	dlr
Flag Control	8120055	0.42	0.37	0.47	0.10	1.50	72	0.22	0.522	LS

Description	PIITEM	Avg	LL	UL	Min	Max	Count	StDev	COV	IUNITS
Geotextile Fabric	9260001	506.20	#NUM!	#NUM!	506.20	506.20	1			m2
Geotextile Separator	3030020	83.27	69.79	96.75	77.00	86.40	3	5.43	0.065	m2
Grade and Compact Existing Material	3010001	4392.75	1443.28	7342.23	348.00	13802.00	13	4880.87	1.111	m2
Guardrail Anch, Bridge, Det A2	8070036	4.00	4.00	4.00	4.00	4.00	3	0.00	0.000	ea
Guardrail Anch, Bridge, Det T2	8070041	3.00	1.85	4.15	2.00	4.00	6	1.10	0.365	ea
Guardrail Anch, Bridge, Det T3	8070042	1.00	#NUM!	#NUM!	1.00	1.00	1			ea
Guardrail Approach Terminal, Type 1B	8070061	4.07	3.26	4.89	1.00	13.00	55	3.01	0.739	ea
Guardrail Approach Terminal, Type 2B	8070091	3.30	1.22	5.38	1.00	10.00	10	2.91	0.881	ea
Guardrail Departing Terminal, Type B	8070063	1.40	0.96	1.84	1.00	5.00	20	0.94	0.672	ea
Guardrail Height, Adj	8070000	162.59	99.15	226.04	15.20	426.80	18	127.58	0.785	m
Guardrail Post, Furn, 2440 mm	8070079	112.00	17.35	206.65	33.00	329.00	7	102.34	0.914	ea
Guardrail Post,Furn & Install,2440 mm	8070077	393.00	#NUM!	#NUM!	393.00	393.00	1			ea
Guardrail Reflector	8070080	61.68	40.01	83.35	4.00	410.00	44	71.28	1.156	ea
Guardrail, Backed, Det G1	8070030	2.00	2.00	2.00	2.00	2.00	4	0.00	0.000	ea
Guardrail, Backed, Det G2	8070031	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Guardrail, Curved, Type B	8070026	12.39	8.46	16.33	3.80	38.00	21	8.65	0.698	m
Guardrail, Reconst, Type B	8070011	78.60	7.45	149.75	73.00	84.20	2	7.92	0.101	m
Guardrail, Rem	2040008	221.39	134.20	308.58	8.00	1405.06	41	276.22	1.248	m
Guardrail, Salv	8070074	265.07	167.02	363.13	0.90	610.61	17	190.72	0.719	m
Guardrail, Type B	8070002	224.69	163.31	286.06	0.13	1230.50	59	235.52	1.048	m
Hand Chipping, Other Than Deck	7120007	0.52	-0.65	1.69	0.06	1.00	3	0.47	0.904	m3
Hand Chipping, Shallow	7120003	4.78	-3.37	12.92	0.30	11.85	4	5.12	1.072	m2
Hand Patching	5020025	61.24	45.89	76.59	0.50	200.00	48	52.86	0.863	t
Hh, Heavy Duty Cover	8190340	1.00	#NUM!	#NUM!	1.00	1.00	1			ea
High Intensity Light, Type B, Furn	8120045	2.00	2.00	2.00	2.00	2.00	2	0.00	0.000	ea
High Intensity Light, Type B, Oper	8120046	2.00	2.00	2.00	2.00	2.00	2	0.00	0.000	ea
Hydrant, Relocate, Case 1	8210547	1.00	#NUM!	#NUM!	1.00	1.00	1			ea
Hydrodemolition, First Pass	7120076	77.00	77.00	77.00	77.00	77.00	2	0.00	0.000	m2
Hydrodemolition, Second Pass	7120077	4.46	-20.19	29.11	2.52	6.40	2	2.74	0.615	m2
Joint and Crack, Cleanout	5020017	359.09	319.02	399.15	288.00	426.00	8	47.93	0.133	m
Joint Repr, Longit	6030040	509.50	-2813.16	3832.16	248.00	771.00	2	369.82	0.726	m
Joint Waterproofing	7100001	5.97	2.97	8.97	1.97	20.32	12	4.73	0.792	m2
Joint, Expansion, E3	6020066	12.50	7.82	17.18	10.00	15.70	4	2.94	0.235	m
Lighted Arrow, Type C, Furn	8120013	1.70	1.53	1.87	1.00	4.00	53	0.61	0.358	ea
Lighted Arrow, Type C, Oper	8120014	1.65	1.48	1.82	0.72	4.00	55	0.62	0.377	ea
Luminaire	8190536	2.00	#NUM!	#NUM!	2.00	2.00	1			ea

Description	PIITEM	Avg	LL	UL	Min	Max	Count	StDev	COV	IUNITS
Masonry and Conc Structure, Rem	2040010	4.02	0.20	7.85	1.00	10.00	7	4.13	1.028	m3
Material,Surplus & Unsuitable,Rem,LM	3050045	248.68	172.51	324.84	0.48	1011.00	48	262.30	1.055	m3
Membrane, Preformed Waterproofing	7100008	50.56	7.36	93.76	35.00	112.80	5	34.79	0.688	m2
Minor Traf Devices	8120054	0.42	0.37	0.47	0.10	1.50	74	0.21	0.512	LS
Mobilization, Max. ____	1000001	0.43	0.37	0.49	0.25	1.50	74	0.26	0.613	LS
Monument Box	1070001	10.59	4.51	16.67	1.00	61.00	22	13.72	1.296	ea
Monument Box, Adj	1070003	1.60	0.49	2.71	1.00	3.00	5	0.89	0.559	ea
Monument Preservation	1070005	16.20	3.75	28.65	1.00	117.00	20	26.61	1.643	ea
Mulch	8160070	11838.12	8817.88	14858.36	135.00	64771.21	69	12572.50	1.062	m2
Mulch Anchoring	8160072	14144.76	11007.24	17282.29	270.00	64771.21	55	11605.93	0.821	m2
Mulch Blanket	8160077	2150.55	1561.23	2739.87	74.00	8930.00	43	1914.89	0.890	m2
Mulch Blanket High Velocity	8160071	375.37	218.90	531.84	185.00	504.81	5	126.02	0.336	m2
Mulch Blanket, Straw	8160078	4168.67	-769.35	9106.69	2400.00	6320.00	3	1987.82	0.477	m2
On the Job Training	1100000	1317.75	-10527.56	13163.06	385.50	2250.00	2	1318.40	1.000	hr
Patch, Forming	7120017	3.49	-0.08	7.07	0.30	8.00	5	2.88	0.825	m2
Patching Conc, LM, HE Mixture	7120020	0.74	-4.98	6.46	0.29	1.19	2	0.64	0.860	m3
Patching Concrete, LM	7120021	0.53	0.11	0.94	0.06	1.00	5	0.33	0.634	m3
Paved Ditch, Bit	8140014	191.47	-360.26	743.20	43.00	446.80	3	222.10	1.160	m2
Pavt for Butt Joints, Rem	5020010	308.49	108.55	508.42	36.00	677.40	7	216.18	0.701	m2
Pavt Joint and Crack Repr, Det 7	5020020	316.25	246.57	385.92	43.90	410.70	11	103.71	0.328	m
Pavt Joint and Crack Repr, Det 8	5020021	22.95	6.51	39.39	3.30	138.60	17	31.98	1.393	m
Pavt Mrkg, Overlay Cold Plastic, Only	8110367	4.00	4.00	4.00	4.00	4.00	3	0.00	0.000	ea
Pavt Mrkg, Overlay Cold Plastic, School	8110369	2.00	2.00	2.00	2.00	2.00	3	0.00	0.000	ea
Pavt Mrkg, Type R, 100 mm, Yellow, Temp	8120086	389.67	-563.84	1343.18	50.60	806.40	3	383.84	0.985	m
Pavt Mrkg, Waterborne, 100 mm, White	8110450	12929.34	8923.99	16934.68	28.08	39026.00	34	11479.37	0.888	m
Pavt Mrkg, Waterborne, 100 mm, Yellow	8110451	5753.87	4109.04	7398.70	3.00	19823.00	33	4638.75	0.806	m
Pavt Mrkg,Longit,125 or Less Width,Rem	8120135	1630.07	858.36	2401.79	5.00	7542.00	28	1990.19	1.221	m
Pavt Mrkg,Olay Cld Plas,Railroad Symb	8110368	2.00	2.00	2.00	2.00	2.00	3	0.00	0.000	ea
Pavt Mrkg,Olay Cld Plas,Thu,Lt Ar Sym	8110378	1.33	-0.10	2.77	1.00	2.00	3	0.58	0.433	ea
Pavt Mrkg,Olay Cld Plas,Thu,Rt Ar Sym	8110379	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Pavt Mrkg,Overlay Cold Plas,150,X-Walk	8110362	304.44	-434.35	1043.24	27.10	618.50	3	297.40	0.977	m
Pavt Mrkg,Overlay Cold Plas,300,X-Walk	8110363	122.18	-897.81	1142.16	41.90	202.45	2	113.53	0.929	m
Pavt Mrkg,Overlay Cold Plas,450,Stop Bar	8110360	17.30	-164.40	199.00	3.00	31.60	2	20.22	1.169	m
Pavt Mrkg,Overlay Cold Plas,600,Stop Bar	8110361	30.56	14.42	46.69	5.10	72.00	11	24.02	0.786	m
Pavt Mrkg,Overlay Cold Plas,Rt Turn Only	8110372	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Pavt Mrkg,Overlay Cold Plastic,Lt Ar Sym	8110376	2.00	#NUM!	#NUM!	2.00	2.00	1			ea

Description	PIITEM	Avg	LL	UL	Min	Max	Count	StDev	COV	IUNITS
Pavt Mrkg,Overlay Cold Plastic,Rt Ar Sym	8110375	3.33	-2.40	9.07	2.00	6.00	3	2.31	0.693	ea
Pavt Mrkg,Type NR,Paint,100mm,White,Temp	8120083	5138.33	2473.11	7803.54	474.90	33808.72	26	6598.57	1.284	m
Pavt Mrkg,Type NR,Paint,100mm,Yellow,Tmp	8120084	2013.73	1244.32	2783.14	64.00	10360.00	41	2437.62	1.210	m
Pavt Mrkg,Type NR,Tape,100 mm,White,Temp	8120087	157.52	93.64	221.40	21.00	407.00	12	100.54	0.638	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	8120088	222.04	163.32	280.75	9.00	3795.55	154	368.82	1.661	m
Pavt Mrkg,Waterborne,2nd Appl,100,White	8110470	19784.45	8642.99	30925.92	3965.00	48132.00	11	16584.27	0.838	m
Pavt Mrkg,Waterborne,2nd Appl,100,Yellow	8110471	6219.00	3817.94	8620.06	2403.00	13788.00	11	3574.03	0.575	m
Pavt, Cleaning	5020003	1.07	0.83	1.30	0.25	2.00	15	0.43	0.401	LS
Pavt, Rem	2040011	1001.52	767.27	1235.77	11.90	6909.45	100	1180.55	1.179	m2
Pinus Strobus, 1250 mm	8150692	5.00	#NUM!	#NUM!	5.00	5.00	1			ea
Plastic Drum, Lighted, Furn	8120026	56.00	43.15	68.85	1.00	350.00	87	60.29	1.077	ea
Plastic Drum, Lighted, Oper	8120027	54.83	42.44	67.23	3.00	350.00	89	58.83	1.073	ea
Post Hole Through Ex Conc for Steel Pole	8100098	1.00	#NUM!	#NUM!	1.00	1.00	1			ea
Post Hole Through Ex Conc for Wood Pole	8100099	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Post, Mailbox	8070090	7.29	-1.53	16.10	1.00	27.00	7	9.53	1.309	ea
Post, Steel, 4.5 kg	8100101	2.50	#NUM!	#NUM!	2.50	2.50	1			m
Post, Wood, 100 mm by 150 mm	8100106	28.33	-6.11	62.76	10.00	94.79	6	32.82	1.158	m
Post,Wood,100 X 150,Direct Embedment	8100108	44.58	28.05	61.12	0.04	77.70	12	26.02	0.584	m
Project Cleanup	2090001	1.40	0.29	2.51	1.00	3.00	5	0.89	0.639	LS
Quality Control Testing	5010002	2210.19	1431.46	2988.92	10.00	31982.26	108	4082.37	1.847	t
Quercus Palustris, 50 mm	8150751	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Quercus Rubra, 50 mm	8150741	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Raised Pavt Marker,Retrflec,Amb,Bidir	8110401	180.00	#NUM!	#NUM!	180.00	180.00	1			ea
Reinforcement, Steel	7060030	1103.79	-682.52	2890.11	51.00	3612.47	5	1438.64	1.303	kg
Reinforcement, Steel, Culv and Headwall	7060033	47.40	#NUM!	#NUM!	47.40	47.40	1			kg
Reinforcement, Steel, Epoxy Coated	7060031	966.07	-471.50	2403.65	1.50	10210.00	15	2595.92	2.687	kg
Ride Quality Measurement, Bit	5020251	32.59	11.25	53.93	1.28	97.81	11	31.77	0.975	lnkm
Ride Quality, Bit	5020250	76975.76	31570.47	122381.05	4340.65	154157.00	8	54311.23	0.706	m2
Riprap, Heavy	8130015	92.61	-766.39	951.60	25.00	160.21	2	95.61	1.032	m2
Riprap, Plain	8130011	80.82	40.34	121.29	4.00	614.10	41	128.24	1.587	m2
Riprap, Plain	8130014	1.00	-8.53	10.53	0.25	1.75	2	1.06	1.061	t
Scarifying	7120001	77.00	77.00	77.00	77.00	77.00	2	0.00	0.000	m2
Seeding, Mixture CR	8160015	45.40	#NUM!	#NUM!	45.40	45.40	1			kg
Seeding, Mixture TDS	8160005	73.20	-6.43	152.83	3.80	134.60	5	64.13	0.876	kg
Seeding, Mixture TGM	8160008	267.42	113.54	421.29	23.76	822.73	14	266.50	0.997	kg
Seeding, Mixture THM	8160009	340.20	#NUM!	#NUM!	340.20	340.20	1			kg

Description	PIITEM	Avg	LL	UL	Min	Max	Count	StDev	COV	IUNITS
Seeding, Mixture THV	8160006	259.00	186.39	331.61	2.50	1679.26	66	295.36	1.140	kg
Sewer Bulkhead, 300 mm	4022305	1.00	#NUM!	#NUM!	1.00	1.00	1			ea
Sewer Bulkhead, 525 mm	4022308	1.00	1.00	1.00	1.00	1.00	2	0.00	0.000	ea
Sewer Bulkhead, 600 mm	4022309	1.33	-0.10	2.77	1.00	2.00	3	0.58	0.433	ea
Sewer Tap, 300 mm	4022204	3.67	-7.81	15.14	1.00	9.00	3	4.62	1.260	ea
Sewer, Cl 1, 1050 mm, Tr Det A	4020012	28.21	12.23	44.20	9.42	42.67	5	12.87	0.456	m
Sewer, Cl 1, 1350 mm, Tr Det A	4020014	33.08	25.12	41.03	0.79	48.77	16	14.93	0.451	m
Sewer, Cl 1, 300 mm, Tr Det B	4020033	22.94	13.44	32.43	1.71	58.10	15	17.14	0.747	m
Sewer, Cl 1, 450 mm, Tr Det A	4020006	19.37	-19.46	58.21	0.99	233.24	13	64.26	3.317	m
Sewer, Cl 1, 450 mm, Tr Det B	4020035	66.00	#NUM!	#NUM!	66.00	66.00	1			m
Sewer, Cl 1, 600 mm, Tr Det A	4020008	121.51	109.23	133.78	115.80	124.36	3	4.94	0.041	m
Sewer, Cl 1, 600 mm, Tr Det B	4020036	40.35	37.71	42.99	37.10	44.90	6	2.52	0.062	m
Sewer, Cl 1, 750 mm, Tr Det A	4020010	92.05	51.05	133.04	60.96	124.03	4	25.76	0.280	m
Sewer, Cl 1, 900 mm, Tr Det A	4020011	52.72	25.33	80.11	24.38	85.93	5	22.06	0.418	m
Sewer, Cl 2, 1050 mm, Tr Det A	4020189	30.67	-21.50	82.85	17.07	54.86	3	21.00	0.685	m
Sewer, Cl 2, 1350 mm, Tr Det A	4020191	38.56	13.41	63.70	36.58	40.53	2	2.80	0.073	m
Sewer, Cl 5, 300 mm, Tr Det B	4020750	64.80	#NUM!	#NUM!	64.80	64.80	1			m
Shear Developers	7070080	1.00	1.00	1.00	1.00	1.00	2	0.00	0.000	LS
Shoulder Gutter, Conc, Det 2	8020051	1.00	#NUM!	#NUM!	1.00	1.00	1			ea
Shoulder, Cl I	3070101	698.32	-1348.27	2744.91	135.26	1643.91	3	823.86	1.180	t
Shoulder, Cl I, 160 mm	3070109	6901.20	4309.46	9492.94	194.40	9903.60	9	3371.73	0.489	m2
Shoulder, Cl I, LM	3070103	164.86	-150.33	480.05	5.60	608.80	5	253.84	1.540	m3
Shoulder, Cl II	3070121	772.71	609.54	935.88	0.38	2673.07	73	699.36	0.905	t
Shoulder, Cl II, 100 mm	3070126	1021.80	704.26	1339.34	948.00	1169.40	3	127.83	0.125	m2
Shoulder, Cl II, 120 mm	3070127	3570.00	-5502.19	12642.19	2856.00	4284.00	2	1009.75	0.283	m2
Shoulder, Cl II, 140 mm	3070128	2143.88	-661.43	4949.18	176.40	3696.00	4	1762.99	0.822	m2
Shoulder, Cl II, 160 mm	3070129	659.85	210.02	1109.67	29.00	1054.00	6	428.64	0.650	m2
Shoulder, Cl II, LM	3070123	768.14	434.55	1101.72	18.39	2569.00	17	648.80	0.845	m3
Shoulder, Cl III, LM	3070153	377.00	#NUM!	#NUM!	377.00	377.00	1			m3
Sidewalk Ramp	8030012	21.67	-12.21	55.55	4.13	69.39	5	27.29	1.259	m2
Sidewalk, Conc, 100 mm	8030002	55.41	19.15	91.67	2.40	163.20	11	53.97	0.974	m2
Sidewalk, Conc, 150 mm	8030003	26.69	19.92	33.45	12.92	40.00	8	8.09	0.303	m2
Sidewalk, Rem	2040013	77.63	34.55	120.70	3.40	235.30	14	74.61	0.961	m2
Sign Cover	8120065	5.25	1.80	8.70	1.00	14.00	8	4.13	0.787	ea
Sign, Type A, Temp	8120056	0.36	0.36	0.36	0.36	0.36	2	0.00	0.000	m2
Sign, Type B, Temp	8120057	14.81	12.32	17.29	0.49	92.90	127	14.15	0.955	m2

Description	PITEM	Avg	LL	UL	Min	Max	Count	StDev	COV	IUNITS
Sign, Type II, Rem	8100151	3.67	-2.58	9.92	1.00	6.00	3	2.52	0.686	ea
Sign, Type II, Salv	8100172	1.00	#NUM!	#NUM!	1.00	1.00	1			ea
Sign, Type IIA	8100115	1.10	#NUM!	#NUM!	1.10	1.10	1			m2
Sign, Type IIB	8100119	3.91	1.60	6.22	2.00	7.02	5	1.86	0.475	m2
Sign, Type III, Rem	8100152	19.67	-2.00	41.33	1.00	54.00	6	20.65	1.050	ea
Sign, Type III, Salv	8100173	5.00	#NUM!	#NUM!	5.00	5.00	1			ea
Sign, Type IIIA	8100116	7.98	-0.39	16.34	4.70	11.43	3	3.37	0.422	m2
Sign, Type IIIB	8100120	7.42	3.42	11.42	0.60	31.47	16	7.50	1.011	m2
Site Preparation	8150001	1.00	1.00	1.00	1.00	1.00	2	0.00	0.000	LS
Slope Restoration	8160079	9710.50	-60586.28	80007.28	4178.00	15243.00	2	7824.14	0.806	m2
Sodding, Cl A	8160001	693.20	-3110.89	4497.29	393.81	992.59	2	423.40	0.611	m2
Sodding, Cl B	8160002	692.13	511.38	872.87	3.80	1917.70	34	518.02	0.748	m2
Spillway, Conc	8020074	5.00	#NUM!	#NUM!	5.00	5.00	1			m
Staking Plan Errors & Extras, 3 Person	1040009	2.50	-3.85	8.85	2.00	3.00	2	0.71	0.283	hr
Staking Plan Errors & Extras,One Person	1040005	8.00	#NUM!	#NUM!	8.00	8.00	1			hr
Staking Plan Errors & Extras,Two Person	1040008	10.00	-66.24	86.24	4.00	16.00	2	8.49	0.849	hr
Steel Sheet Piling, Temp	7040002	3.60	3.60	3.60	3.60	3.60	2	0.00	0.000	m2
Steel Structure, Cleaning, Type 4	7150045	0.33	-0.18	0.85	0.10	0.50	3	0.21	0.624	LS
Steel Structure, Coating, Type 4	7150046	0.50	-2.68	3.68	0.25	0.75	2	0.35	0.707	LS
Structural Crack, Repr	7120099	4.20	#NUM!	#NUM!	4.20	4.20	1			m
Structural Steel, Plate, Erect	7070008	201.70	#NUM!	#NUM!	201.70	201.70	1			kg
Structural Steel, Plate, Furn and Fab	7070007	201.70	#NUM!	#NUM!	201.70	201.70	1			kg
Structures, Rem	2040020	0.50	-3.31	4.31	0.20	0.80	2	0.42	0.849	LS
Structures, Rem Portions	2040021	1.00	-0.24	2.24	0.10	2.00	4	0.78	0.779	LS
Subbase, CIP	3010002	929.93	778.44	1081.42	2.19	8993.36	244	1201.33	1.292	m3
Subbase, LM	3010003	260.57	90.38	430.75	14.70	1243.38	18	342.22	1.313	m3
Subgrade Undercutting, Type II	2050042	405.46	326.35	484.56	12.10	1500.00	84	364.53	0.899	m3
Substructure Conc	7060020	3.14	-20.11	26.39	1.31	4.97	2	2.59	0.824	m3
Superstructure Conc, Night Casting	7060023	59.25	-458.53	577.03	18.50	100.00	2	57.63	0.973	m3
Supstr Conc,Form,Fin,& Cure,Night Cast	7060025	1.00	#NUM!	#NUM!	1.00	1.00	1			LS
Thinning, Selective, Type I	2010005	1339.00	-9410.40	12088.40	493.00	2185.00	2	1196.42	0.894	m2
Top Flanges & Beam Ends,Clean & Prime	7120100	75.00	#NUM!	#NUM!	75.00	75.00	1			m2
Topsoil Surface, Furn, 100 mm	8160035	1856.07	962.22	2749.92	3.00	13541.20	35	2602.09	1.402	m2
Topsoil Surface, Furn, 75 mm	8160034	4285.32	-3348.58	11919.22	225.00	18787.00	6	7274.30	1.697	m2
Topsoil Surface, Furn, LM	8160045	106.31	79.12	133.50	8.00	692.00	74	117.37	1.104	m3
Topsoil Surface, Salv, 100 mm	8160052	14067.43	8384.11	19750.75	333.00	77580.56	29	14941.16	1.062	m2

Description	PIITEM	Avg	LL	UL	Min	Max	Count	StDev	COV	IUNITS
Topsoil Surface, Salv, 150 mm	8160054	5727.20	#NUM!	#NUM!	5727.20	5727.20	1			m2
Topsoil Surface, Salv, 75 mm	8160051	18579.94	852.91	36306.96	135.40	138500.80	16	33267.52	1.791	m2
Topsoil Surface, Salv, LM	8160061	39.75	8.50	71.00	9.40	93.00	6	29.78	0.749	m3
Track, Unencased Railway, Rem	2040014	63.00	#NUM!	#NUM!	63.00	63.00	1			m
Tree, Rem, 200 to 450 mm	2020001	3.95	1.04	6.86	1.00	28.00	20	6.21	1.572	ea
Tree, Rem, 451 to 900 mm	2020002	2.89	1.38	4.40	1.00	6.00	9	1.96	0.680	ea
Tree, Rem, 901 mm or larger	2020003	1.00	#NUM!	#NUM!	1.00	1.00	1			ea
Trenching	3070200	3587.91	2404.40	4771.43	72.00	12966.00	23	2736.88	0.763	m
TS System, Temp, Oper	8120151	1.00	#NUM!	#NUM!	1.00	1.00	1			LS
TS, Span Wire Type	8120150	4.00	#NUM!	#NUM!	4.00	4.00	1			ea
Underdrain Outlet, 100 mm	4040090	12.42	5.94	18.90	3.00	24.00	8	7.75	0.624	m
Underdrain Outlet, 150 mm	4040093	7.23	5.39	9.06	0.80	23.60	36	5.43	0.751	m
Underdrain, Outlet Ending, 100 mm	4040110	1.86	-0.24	3.95	1.00	7.00	7	2.27	1.221	ea
Underdrain, Outlet Ending, 150 mm	4040113	1.75	1.32	2.18	1.00	4.00	28	1.11	0.634	ea
Underdrain, Subbase, 150 mm	4040063	98.86	30.66	167.05	36.00	301.00	9	88.72	0.897	m
Underdrain, Subgrade, 100 mm	4040070	87.68	52.02	123.33	31.00	231.00	11	53.07	0.605	m
Underdrain, Subgrade, 150 mm	4040073	85.30	68.03	102.57	3.00	274.32	43	56.11	0.658	m
Video Taping Sewer and Culv Pipe, 300 mm	4022420	80.20	#NUM!	#NUM!	80.20	80.20	1			m
Video Taping Sewer and Culv Pipe, 450 mm	4022422	234.20	#NUM!	#NUM!	234.20	234.20	1			m
Video Taping Sewer and Culv Pipe, 600 mm	4022424	111.40	53.64	169.16	87.00	133.30	3	23.25	0.209	m
Video Taping Sewer and Culv Pipe, 750 mm	4022426	225.25	-2319.16	2769.66	25.00	425.50	2	283.20	1.257	m
Water	8160003	14.51	10.87	18.14	2.00	22.71	15	6.57	0.453	kL
Water Repellent Treatment	7060052	219.00	-1496.33	1934.33	84.00	354.00	2	190.92	0.872	m2
Water Shutoff, Adj	8210660	11.00	#NUM!	#NUM!	11.00	11.00	1			ea
Watering and Cultivating, First Season	8150002	1.00	1.00	1.00	1.00	1.00	2	0.00	0.000	LS
Wood Pole	8190900	5.00	#NUM!	#NUM!	5.00	5.00	1			ea
Wood Pole, Fit Up, Metered Sec Elec Serv	8190941	1.00	#NUM!	#NUM!	1.00	1.00	1			ea

Item	Avg	LL	UL	Min	Max	Count	StDev	COV	Units
Aggregate Base	3470.14	2699.81	4240.47	-620.01	19319.30	140.00	4609.96	1.33	m2
PIITEM numbers included: 3020010, 3020016, 3020020, 3020024, 3020026, 3020030									
Bit Mixture	1275.82	1206.45	1345.20	-652.66	4536.15	468.00	763.73	0.60	t
PIITEM numbers included: 5020066, 5020168, 5020169, 5020057, 5020174, 5020175, 5020176, 5020059, 5020182, 5020183									
Cold Milling Bit Surface	9159.43	7379.56	10939.30	-11474.10	25099.70	77.00	7841.80	0.86	m2
Cold Milling Bit Surface	505.91	163.74	848.07	14.34	939.00	7.00	369.97	0.73	t
Culv.	14.64	12.89	16.38	-133.00	130.00	495.00	19.77	1.35	m
PIITEM numbers included: 4010006, 4010000, 4010001, 4010002, 4010003, 4010207, 4010209, 4010200, 4010201, 4010202, 4010203, 4010204, 4010205, 4010403, 4010405, 4010032, 4010237, 4010243, 4010232, 4010233, 4010234, 4010235, 4010269, 4010297, 4010120, 4010122, 4010123, 4010124, 4010320, 4010321, 4010322, 4010323, 4010324, 4010325, 4010150, 4010151, 4010152, 4010153, 4010154, 4010350, 4010352, 4010353, 4010355, 4010550, 4010551, 4010552									
Excavation, Earth	1073.18	933.36	1212.99	-8836.00	11484.97	475.00	1550.73	1.44	m3
Embankment	359.82	200.60	519.04	-10277.25	15000.00	352.00	1518.86	4.22	m3
PIITEM numbers included: 2050010, 2050011									
Guardrail, Curved, Type B	10.51	6.46	14.55	-4.38	38.00	24.00	9.57	0.91	m3
Guardrail, Rem	211.09	126.87	295.31	0.00	1405.06	43.00	273.66	1.30	m3
Guardrail, Type B	210.34	151.29	269.39	-3.81	1230.50	63.00	234.47	1.11	m3
Pavt, Rem	930.83	701.69	1159.97	-1483.87	6909.45	106.00	1189.79	1.28	m2
Seeding	223.66	162.42	284.90	-777.00	1679.26	93.00	297.36	1.33	kg
PIITEM numbers included: 8160015, 8160005, 8160008, 8160009, 8160006									
Sewer	35.74	25.99	45.48	-124.00	233.24	75.00	42.35	1.19	m
PIITEM numbers included: 4020012, 4020014, 4020033, 4020006, 4020035, 4020008, 4020036, 4020010, 4020011, 4020189, 4020191, 4020750									
Shoulder	3135.42	1758.26	4512.58	-194.00	9903.60	27.00	3481.30	1.11	m2
PIITEM numbers included: 3070109, 3070126, 3070127, 3070128, 3070129									
Shoulder	533.81	278.44	789.18	-310.00	2569.00	26.00	632.25	1.18	m3
PIITEM numbers included: 3070103, 3070123, 3070153									
Shoulder	613.13	332.01	894.25	-8840.00	2673.07	81.00	1271.36	2.07	t
PIITEM numbers included: 3070101, 3070121									
Subbase	803.65	667.14	940.16	-2278.00	8993.36	284.00	1168.77	1.45	m3
PIITEM numbers included: 3010002, 3010003									

APPENDIX H: DATA AND RESULTS FROM CONTRACT 75022-45618

ATTACHMENT B

WORK DAY/COMPLETION DATE DETERMINATION

CS 75022 JN 45618A

DESCRIPTION OF WORK

MAJOR WORK ITEM	PRODUCTION QUANTITY	PRODUCTION RATE	ESTIMATED TIME
Curb and Gutter, Rem	785m	450m/day	2 Days
Large Culvert Extensions	3 Each	3 Days Each	9 Days
Small Culvert Work	9 Locations	3 Locations/Day	3 Days
Sewer Work			3 Days
Curb & Gutter	850m	300m/Day	3 Days
Cold Mill Bit. Surface	80178m²	18000m²/Day	5 Days
Bit. Mix	19858t	2000t/Day	10 Days
Bit. Appr.	2098t	1000t/Day	2 Days
G.R. Work	6 Locations	1.5 Locations/Day	4 Days
Slope Restoration			1 Day
Paint			1 Day
			43 Days

43 Days x 7/4 = 75 Calendar Days

TOTAL ESTIMATED TIME CAL WORK

COMPLETION DATE - WORK DAYS Assume start date of

COMMENTS: May 15, 2000 + 75 Days = July 28, 2000
+7 Days for Memorial Day and July 4th Holidays
= July 28 + 7 Days = August 4, 2000

Description	CONTID	PIITEM	DDDATE	Sum	# Postings	UNITS
_	75022-45618	4017102	5/23/00	57	2	m
_	75022-45618	8217050	6/14/00	15	1	ea
_	75022-45618	8217050	6/20/00	1	1	ea
_	75022-45618	4017050	8/10/00	9	1	ea
_	75022-45618	8217050	9/25/00	1	1	ea
_	75022-45618	2057051	9/25/00	1	1	LS
_	75022-45618	4017120	9/25/00	84.11	1	m3
Aggregate, 6A, LM	75022-45618	2050026	5/18/00	189	1	m3
Aggregate, 6A, LM	75022-45618	2050026	5/30/00	22.2	2	m3
Aggregate, 6A, LM	75022-45618	2050026	6/13/00	-13.3	1	m3
Approach, Cl I, LM	75022-45618	3070003	5/23/00	13.3	1	m3
Approach, Cl I, LM	75022-45618	3070003	6/7/00	62.4	1	m3
Approach, Cl I, LM	75022-45618	3070003	6/9/00	20.8	1	m3
Approach, Cl I, LM	75022-45618	3070003	6/21/00	14.8	1	m3
Approach, Cl I, LM	75022-45618	3070003	7/5/00	95.2	2	m3
Approach, Cl I, LM	75022-45618	3070003	7/13/00	56	1	m3
Approach, Cl I, LM	75022-45618	3070003	9/25/00	-22.1	1	m3
Bit Approach	75022-45618	5020200	5/17/00	10.89	1	t
Bit Approach	75022-45618	5020200	6/13/00	22.34	1	t
Bit Approach	75022-45618	5020200	6/14/00	66.81	1	t
Bit Approach	75022-45618	5020200	6/15/00	199.48	1	t
Bit Approach	75022-45618	5020200	6/22/00	95.91	1	t
Bit Approach	75022-45618	5020200	6/27/00	358.66	1	t
Bit Approach	75022-45618	5020200	6/28/00	84.57	1	t
Bit Approach	75022-45618	5020200	6/29/00	129.94	1	t
Bit Approach	75022-45618	5020200	6/30/00	168.88	1	t
Bit Approach	75022-45618	5020200	7/3/00	0.02	1	t
Bit Approach	75022-45618	5020200	7/6/00	8.74	1	t
Bit Approach	75022-45618	5020200	7/7/00	197.47	1	t
Bit Approach	75022-45618	5020200	7/10/00	354.29	1	t
Bit Approach	75022-45618	5020200	7/11/00	269.54	1	t
Bit Mixture, 4 E 3	75022-45618	5020176	5/31/00	240.18	1	t
Bit Mixture, 4 E 3	75022-45618	5020176	6/5/00	586.98	1	t
Bit Mixture, 4 E 3	75022-45618	5020176	6/6/00	939	1	t

Description	CONTID	PIITEM	DDDATE	Sum	# Postings	UNITS
Bit Mixture, 4 E 3	75022-45618	5020176	6/7/00	960.43	1	t
Bit Mixture, 4 E 3	75022-45618	5020176	6/8/00	264.33	1	t
Bit Mixture, 4 E 3	75022-45618	5020176	6/12/00	1735.66	1	t
Bit Mixture, 4 E 3	75022-45618	5020176	6/13/00	1714.97	1	t
Bit Mixture, 4 E 3	75022-45618	5020176	6/14/00	1278.52	1	t
Bit Mixture, 4 E 3	75022-45618	5020176	6/15/00	87.67	1	t
Bit Mixture, 4 E 3	75022-45618	5020176	6/22/00	28.78	1	t
Bit Mixture, 4 E 3	75022-45618	5020176	7/3/00	-0.06	1	t
Bit Mixture, 5 E 3	75022-45618	5020183	5/31/00	123.21	1	t
Bit Mixture, 5 E 3	75022-45618	5020183	6/23/00	953.22	1	t
Bit Mixture, 5 E 3	75022-45618	5020183	6/28/00	1327.36	1	t
Bit Mixture, 5 E 3	75022-45618	5020183	6/29/00	1350.57	1	t
Bit Mixture, 5 E 3	75022-45618	5020183	7/3/00	-0.01	1	t
Bit Mixture, 5 E 3	75022-45618	5020183	7/5/00	1449.79	1	t
Bit Mixture, 5 E 3	75022-45618	5020183	7/6/00	1005.24	1	t
Bit Quality Initiative	75022-45618	5010001	11/1/00	67322.95	1	dlr
Bolt, Adhesive Anchored, 19 mm	75022-45618	7120042	5/18/00	17	1	ea
Bolt, Adhesive Anchored, 19 mm	75022-45618	7120042	6/6/00	24	1	ea
Bolt, Adhesive Anchored, 19 mm	75022-45618	7120042	6/15/00	40	1	ea
Cold Milling Bit Surface	75022-45618	5020005	5/25/00	10142.13	2	m2
Cold Milling Bit Surface	75022-45618	5020005	5/30/00	12352	1	m2
Cold Milling Bit Surface	75022-45618	5020005	5/31/00	8702	1	m2
Cold Milling Bit Surface	75022-45618	5020005	6/1/00	2507.1	1	m2
Cold Milling Bit Surface	75022-45618	5020005	6/2/00	7127	1	m2
Cold Milling Bit Surface	75022-45618	5020005	6/5/00	1872.7	1	m2
Cold Milling Bit Surface	75022-45618	5020005	9/25/00	17610.07	1	m2
Conc, Grade S2	75022-45618	7060004	5/12/00	2.5	1	m3
Conc, Grade S2	75022-45618	7060004	5/16/00	4.57	1	m3
Conc, Grade S2	75022-45618	7060004	5/18/00	5.37	1	m3
Conc, Grade S2	75022-45618	7060004	6/6/00	9.8	1	m3
Conc, Grade S2	75022-45618	7060004	6/12/00	34.51	1	m3
Conc, Grade S2	75022-45618	7060004	6/15/00	59.4	1	m3
Conc, Grade S2	75022-45618	7060004	7/25/00	-35.18	1	m3
Culv End Sect, Conc, 300 mm	75022-45618	4011020	5/15/00	1	1	ea

Description	CONTID	PIITEM	DDDATE	Sum	# Postings	UNITS
Culv, Cl 1, Conc, 300 mm	75022-45618	4010200	5/15/00	6.3	1	m
Culv, Cl 1, Conc, 450 mm	75022-45618	4010202	5/15/00	4.8	2	m
Culv, Cl 1, Conc, 450 mm	75022-45618	4010202	5/16/00	2.4	1	m
Culv, Cl 1, Conc, 450 mm	75022-45618	4010202	5/17/00	3.6	1	m
Culv, Cl 1, Conc, 450 mm	75022-45618	4010202	5/18/00	7.2	1	m
Culv, Cl 1, Conc, 600 mm	75022-45618	4010203	5/12/00	2.4	1	m
Culv, Cl 1, Conc, 600 mm	75022-45618	4010203	5/15/00	2.4	1	m
Culv, Cl 1, Conc, 600 mm	75022-45618	4010203	5/16/00	10.8	2	m
Culv, Cl 1, Conc, 600 mm	75022-45618	4010203	5/19/00	2.4	1	m
Culv,Slp End Sect,1:4,450 mm,Transv	75022-45618	4010721	5/15/00	1	1	ea
Culv,Slp End Sect,1:4,450 mm,Transv	75022-45618	4010721	5/17/00	1	1	ea
Culv,Slp End Sect,1:4,600 mm,Transv	75022-45618	4010723	5/15/00	2	1	ea
Culv,Slp End Sect,1:4,600 mm,Transv	75022-45618	4010723	5/16/00	2	1	ea
Culv,Slp End Sect,1:4,600 mm,Transv	75022-45618	4010723	5/19/00	1	1	ea
Culv,Slp End Sect,1:6,450 mm,Longit	75022-45618	4010741	5/23/00	2	1	ea
Culv,Slp End Sect,1:6,600 mm,Longit	75022-45618	4010743	5/16/00	1	1	ea
Curb and Gutter, Conc, Det B2	75022-45618	8020018	5/30/00	83.5	1	m
Curb and Gutter, Conc, Det B2	75022-45618	8020018	6/28/00	126	1	m
Curb and Gutter, Conc, Det B2	75022-45618	8020018	6/29/00	72	1	m
Curb and Gutter, Conc, Det B2	75022-45618	8020018	6/30/00	45	1	m
Curb and Gutter, Conc, Det C4	75022-45618	8020025	5/30/00	39.2	1	m
Curb and Gutter, Rem	75022-45618	2040006	5/17/00	61.3	2	m
Curb and Gutter, Rem	75022-45618	2040006	6/27/00	209.9	1	m
Curb, Rem	75022-45618	2040005	5/17/00	35.5	1	m
Curb, Rem	75022-45618	2040005	6/8/00	7.3	1	m
Ditch Cleanout	75022-45618	2050006	5/23/00	26	2	m
Dr Marker Post	75022-45618	4011110	7/18/00	9	1	ea
Dr Structure Cover	75022-45618	4030042	5/19/00	318	2	kg
Dr Structure Cover	75022-45618	4030042	6/5/00	302	1	kg
Dr Structure Cover	75022-45618	4030042	9/25/00	159	1	kg
Dr Structure Cover, Adj, Case 1	75022-45618	4030045	6/14/00	15	1	ea
Dr Structure Cover, Adj, Case 1	75022-45618	4030045	6/20/00	4	1	ea
Dr Structure Cover, Adj, Case 1	75022-45618	4030045	6/22/00	2	1	ea
Dr Structure Cover, Adj, Case 1	75022-45618	4030045	6/28/00	1	1	ea

Description	CONTID	PIITEM	DDDATE	Sum	# Postings	UNITS
Dr Structure Cover, Adj, Case 1	75022-45618	4030045	7/5/00	2	1	ea
Dr Structure, 1200 mm dia	75022-45618	4030005	5/17/00	2	2	ea
Dr Structure, 1200 mm dia	75022-45618	4030005	5/19/00	0	2	ea
Dr Structure, 1200 mm dia	75022-45618	4030005	6/5/00	2	1	ea
Edge Trimming	75022-45618	5020011	5/24/00	4026	1	m
Embankment, LM	75022-45618	2050011	5/19/00	200.7	1	m3
Embankment, LM	75022-45618	2050011	5/30/00	20	1	m3
Embankment, LM	75022-45618	2050011	5/31/00	139.7	1	m3
Embankment, LM	75022-45618	2050011	6/13/00	39.9	1	m3
Embankment, LM	75022-45618	2050011	6/21/00	247.9	1	m3
Embankment, LM	75022-45618	2050011	6/22/00	224	1	m3
Embankment, LM	75022-45618	2050011	7/5/00	32.1	1	m3
Embankment, LM	75022-45618	2050011	7/11/00	147	1	m3
Erosion Control, Silt Fence	75022-45618	2080025	5/8/00	133	2	m
Erosion Control, Silt Fence	75022-45618	2080025	5/9/00	169.1	2	m
Erosion Control, Silt Fence	75022-45618	2080025	5/12/00	32.3	1	m
Erosion Control, Silt Fence	75022-45618	2080025	5/15/00	26.6	1	m
Erosion Control, Silt Fence	75022-45618	2080025	5/16/00	17.9	2	m
Erosion Control, Silt Fence	75022-45618	2080025	5/17/00	21.6	1	m
Excavation, Earth	75022-45618	2050015	5/10/00	11	1	m3
Excavation, Earth	75022-45618	2050015	5/18/00	135	1	m3
Excavation, Earth	75022-45618	2050015	5/23/00	325.86	1	m3
Excavation, Earth	75022-45618	2050015	5/31/00	88.7	1	m3
Excavation, Earth	75022-45618	2050015	6/7/00	120.8	1	m3
Excavation, Rock	75022-45618	2050017	5/10/00	4.5	1	m3
Excavation, Rock	75022-45618	2050017	5/17/00	5	1	m3
Flag Control	75022-45618	8120055	5/16/00	0.5	1	LS
Flag Control	75022-45618	8120055	6/27/00	0.25	1	LS
Flag Control	75022-45618	8120055	8/15/00	0.25	1	LS
Geotextile Fabric	75022-45618	9260001	5/18/00	506.2	1	m2
Geotextile Fabric	75022-45618	9260001	7/18/00	0	2	m2
Guardrail Anch, Bridge, Det T2	75022-45618	8070041	7/7/00	2	1	ea
Guardrail Approach Terminal, Type 1B	75022-45618	8070061	7/7/00	2	1	ea
Guardrail Reflector	75022-45618	8070080	7/7/00	16	1	ea

Description	CONTID	PIITEM	DDDATE	Sum	# Postings	UNITS
Guardrail, Rem	75022-45618	2040008	7/7/00	8	1	m
Guardrail, Salv	75022-45618	8070074	7/6/00	101	1	m
Guardrail, Type B	75022-45618	8070002	7/7/00	30.48	1	m
Hydrant, Relocate, Case 1	75022-45618	8210547	5/17/00	1	1	ea
Joint Waterproofing	75022-45618	7100001	5/25/00	5.46	1	m2
Joint Waterproofing	75022-45618	7100001	6/13/00	6.36	1	m2
Joint Waterproofing	75022-45618	7100001	6/19/00	6.66	1	m2
Joint Waterproofing	75022-45618	7100001	6/22/00	5.97	1	m2
Joint Waterproofing	75022-45618	7100001	10/30/00	-24.45	1	m2
Lighted Arrow, Type C, Furn	75022-45618	8120013	5/8/00	2	1	ea
Lighted Arrow, Type C, Furn	75022-45618	8120013	5/25/00	2	1	ea
Lighted Arrow, Type C, Oper	75022-45618	8120014	5/8/00	2	1	ea
Lighted Arrow, Type C, Oper	75022-45618	8120014	5/25/00	2	1	ea
Minor Traf Devices	75022-45618	8120054	5/16/00	0.5	1	LS
Minor Traf Devices	75022-45618	8120054	6/27/00	0.25	1	LS
Minor Traf Devices	75022-45618	8120054	8/15/00	0.25	1	LS
Mobilization, Max. ____	75022-45618	1000001	5/16/00	0.5	1	LS
Mobilization, Max. ____	75022-45618	1000001	6/1/00	0.25	1	LS
Mobilization, Max. ____	75022-45618	1000001	6/12/00	0.25	1	LS
Monument Box	75022-45618	1070001	9/25/00	3	1	ea
Monument Box, Adj	75022-45618	1070003	6/14/00	3	1	ea
Monument Box, Adj	75022-45618	1070003	9/25/00	1	1	ea
Monument Preservation	75022-45618	1070005	4/2/01	3	1	ea
Mulch Blanket	75022-45618	8160077	7/14/00	925	1	m2
Pavt Mrkg, Overlay Cold Plastic, School	75022-45618	8110369	7/26/00	2	1	ea
Pavt Mrkg, Waterborne, 100 mm, White	75022-45618	8110450	7/17/00	8253.7	1	m
Pavt Mrkg, Waterborne, 100 mm, Yellow	75022-45618	8110451	7/17/00	5687.9	1	m
Pavt Mrkg,Overlay Cold Plas,150,X-Walk	75022-45618	8110362	7/26/00	267.73	1	m
Pavt Mrkg,Overlay Cold Plas,600,Stop Bar	75022-45618	8110361	7/26/00	46.91	1	m
Pavt Mrkg,Type NR,Paint,100mm,White,Temp	75022-45618	8120083	5/31/00	6056	1	m
Pavt Mrkg,Type NR,Paint,100mm,White,Temp	75022-45618	8120083	6/2/00	985	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	75022-45618	8120088	5/25/00	72.4	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	75022-45618	8120088	5/31/00	1089.2	2	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	75022-45618	8120088	6/2/00	2342	1	m

Description	CONTID	PITEM	DDDATE	Sum	# Postings	UNITS
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	75022-45618	8120088	6/5/00	60.8	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	75022-45618	8120088	6/6/00	167.5	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	75022-45618	8120088	6/8/00	60.6	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	75022-45618	8120088	6/12/00	301.5	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	75022-45618	8120088	6/23/00	74.8	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	75022-45618	8120088	6/28/00	207.5	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	75022-45618	8120088	6/29/00	52	1	m
Pavt Mrkg,Waterborne,2nd Appl,100,White	75022-45618	8110470	9/25/00	8136	1	m
Pavt Mrkg,Waterborne,2nd Appl,100,Yellow	75022-45618	8110471	9/25/00	5205	1	m
Pavt, Cleaning	75022-45618	5020003	8/15/00	1	1	LS
Pavt, Rem	75022-45618	2040011	5/17/00	89.62	2	m2
Pavt, Rem	75022-45618	2040011	6/8/00	11.9	1	m2
Pavt, Rem	75022-45618	2040011	6/27/00	412.59	1	m2
Pavt, Rem	75022-45618	2040011	7/5/00	112.7	1	m2
Pavt, Rem	75022-45618	2040011	7/7/00	31.9	1	m2
Plastic Drum, Lighted, Furn	75022-45618	8120026	5/9/00	35	1	ea
Plastic Drum, Lighted, Furn	75022-45618	8120026	5/15/00	25	1	ea
Plastic Drum, Lighted, Furn	75022-45618	8120026	5/19/00	20	1	ea
Plastic Drum, Lighted, Furn	75022-45618	8120026	4/2/01	8	1	ea
Plastic Drum, Lighted, Oper	75022-45618	8120027	5/9/00	35	1	ea
Plastic Drum, Lighted, Oper	75022-45618	8120027	5/15/00	25	1	ea
Plastic Drum, Lighted, Oper	75022-45618	8120027	5/19/00	20	1	ea
Quality Control Testing	75022-45618	5010002	5/31/00	363.39	1	t
Quality Control Testing	75022-45618	5010002	6/5/00	586.98	1	t
Quality Control Testing	75022-45618	5010002	6/6/00	939	1	t
Quality Control Testing	75022-45618	5010002	6/7/00	960.43	1	t
Quality Control Testing	75022-45618	5010002	6/8/00	264.33	1	t
Quality Control Testing	75022-45618	5010002	6/12/00	1735.66	1	t
Quality Control Testing	75022-45618	5010002	6/13/00	1737.31	1	t
Quality Control Testing	75022-45618	5010002	6/14/00	1345.33	1	t
Quality Control Testing	75022-45618	5010002	6/15/00	287.15	1	t
Quality Control Testing	75022-45618	5010002	6/22/00	124.69	1	t
Quality Control Testing	75022-45618	5010002	6/23/00	953.22	1	t
Quality Control Testing	75022-45618	5010002	6/27/00	358.66	1	t

Description	CONTID	PIITEM	DDDATE	Sum	# Postings	UNITS
Quality Control Testing	75022-45618	5010002	6/28/00	1411.93	2	t
Quality Control Testing	75022-45618	5010002	6/29/00	1480.51	1	t
Quality Control Testing	75022-45618	5010002	6/30/00	168.88	1	t
Quality Control Testing	75022-45618	5010002	7/5/00	1449.79	1	t
Quality Control Testing	75022-45618	5010002	7/6/00	1013.98	1	t
Quality Control Testing	75022-45618	5010002	7/7/00	197.74	1	t
Quality Control Testing	75022-45618	5010002	7/10/00	354.29	1	t
Quality Control Testing	75022-45618	5010002	7/11/00	269.54	1	t
Quality Control Testing	75022-45618	5010002	8/15/00	10.57	1	t
Reinforcement, Steel	75022-45618	7060030	5/16/00	713.6	1	kg
Reinforcement, Steel	75022-45618	7060030	5/18/00	290.9	1	kg
Reinforcement, Steel	75022-45618	7060030	6/6/00	851	1	kg
Reinforcement, Steel	75022-45618	7060030	6/15/00	3612.47	1	kg
Riprap, Plain	75022-45618	8130011	7/18/00	31	1	m2
Sewer, Cl 1, 300 mm, Tr Det B	75022-45618	4020033	6/5/00	41.8	1	m
Shoulder, Cl I, LM	75022-45618	3070103	5/24/00	608.8	1	m3
Shoulder, Cl I, LM	75022-45618	3070103	5/25/00	142.8	1	m3
Shoulder, Cl I, LM	75022-45618	3070103	6/2/00	20.8	1	m3
Shoulder, Cl I, LM	75022-45618	3070103	6/12/00	0	1	m3
Shoulder, Cl I, LM	75022-45618	3070103	6/13/00	5.6	1	m3
Shoulder, Cl I, LM	75022-45618	3070103	6/22/00	46.3	1	m3
Sign, Type B, Temp	75022-45618	8120057	5/8/00	52.68	2	m2
Sign, Type B, Temp	75022-45618	8120057	5/9/00	11.52	1	m2
Sign, Type B, Temp	75022-45618	8120057	5/25/00	4.32	1	m2
Sign, Type B, Temp	75022-45618	8120057	4/2/01	2.88	1	m2
Slope Restoration	75022-45618	8160079	7/14/00	15243	1	m2
Sodding, Cl A	75022-45618	8160001	7/18/00	393.81	2	m2
Structures, Rem Portions	75022-45618	2040021	5/8/00	1	1	LS
Structures, Rem Portions	75022-45618	2040021	5/10/00	2	2	LS
Topsoil Surface, Furn, 100 mm	75022-45618	8160035	6/9/00	143.2	1	m2
Topsoil Surface, Furn, 75 mm	75022-45618	8160034	5/18/00	225	1	m2
Topsoil Surface, Furn, 75 mm	75022-45618	8160034	7/13/00	1295.5	1	m2
Topsoil Surface, Furn, 75 mm	75022-45618	8160034	7/18/00	410	1	m2
Tree, Rem, 200 to 450 mm	75022-45618	2020001	5/17/00	1	1	ea

Description	PIITEM	Avg	LL	UL	Min	Max	Count	StDev	COV	Units
_	2057051	1.00	#NUM!	#NUM!	1.00	1.00	1			LS
_	4017050	9.00	#NUM!	#NUM!	9.00	9.00	1			ea
_	4017102	57.00	#NUM!	#NUM!	57.00	57.00	1			m
_	4017120	84.11	#NUM!	#NUM!	84.11	84.11	1			m3
_	8217050	5.67	-14.41	25.75	1.00	15.00	3	8.08	1.43	ea
Aggregate, 6A, LM	2050026	105.60	-954.09	1165.29	22.20	189.00	2	117.95	1.12	m3
Approach, Cl I, LM	3070003	43.75	9.14	78.36	13.30	95.20	6	32.98	0.75	m3
Bit Approach	5020200	140.54	69.64	211.43	0.02	358.66	14	122.79	0.87	t
Bit Mixture, 4 E 3	5020176	783.65	323.01	1244.30	28.78	1735.66	10	643.94	0.82	t
Bit Mixture, 5 E 3	5020183	1034.90	521.63	1548.17	123.21	1449.79	6	489.09	0.47	t
Bit Quality Initiative	5010001	67322.95	#NUM!	#NUM!	67322.95	67322.95	1			dlr
Bolt, Adhesive Anchored, 19 mm	7120042	27.00	-2.29	56.29	17.00	40.00	3	11.79	0.44	ea
Cold Milling Bit Surface	5020005	8616.14	3519.75	13712.53	1872.70	17610.07	7	5510.53	0.64	m2
Conc, Grade S2	7060004	19.36	-4.68	43.39	2.50	59.40	6	22.90	1.18	m3
Culv End Sect, Conc, 300 mm	4011020	1.00	#NUM!	#NUM!	1.00	1.00	1			ea
Culv, Cl 1, Conc, 300 mm	4010200	6.30	#NUM!	#NUM!	6.30	6.30	1			m
Culv, Cl 1, Conc, 450 mm	4010202	4.50	1.24	7.76	2.40	7.20	4	2.05	0.46	m
Culv, Cl 1, Conc, 600 mm	4010203	4.50	-2.18	11.18	2.40	10.80	4	4.20	0.93	m
Culv,Slp End Sect,1:4,450 mm,Transv	4010721	1.00	1.00	1.00	1.00	1.00	2	0.00	0.00	ea
Culv,Slp End Sect,1:4,600 mm,Transv	4010723	1.67	0.23	3.10	1.00	2.00	3	0.58	0.35	ea
Culv,Slp End Sect,1:6,450 mm,Longit	4010741	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Culv,Slp End Sect,1:6,600 mm,Longit	4010743	1.00	#NUM!	#NUM!	1.00	1.00	1			ea
Curb and Gutter, Conc, Det B2	8020018	81.63	28.00	135.25	45.00	126.00	4	33.70	0.41	m
Curb and Gutter, Conc, Det C4	8020025	39.20	#NUM!	#NUM!	39.20	39.20	1			m
Curb and Gutter, Rem	2040006	135.60	-808.47	1079.67	61.30	209.90	2	105.08	0.77	m
Curb, Rem	2040005	21.40	-157.76	200.56	7.30	35.50	2	19.94	0.93	m
Ditch Cleanout	2050006	26.00	#NUM!	#NUM!	26.00	26.00	1			m
Dr Marker Post	4011110	9.00	#NUM!	#NUM!	9.00	9.00	1			ea
Dr Structure Cover	4030042	259.67	42.19	477.14	159.00	318.00	3	87.55	0.34	kg
Dr Structure Cover, Adj, Case 1	4030045	4.80	-2.41	12.01	1.00	15.00	5	5.81	1.21	ea
Dr Structure, 1200 mm dia	4030005	2.00	2.00	2.00	2.00	2.00	2	0.00	0.00	ea
Edge Trimming	5020011	4026.00	#NUM!	#NUM!	4026.00	4026.00	1			m
Embankment, LM	2050011	131.41	55.38	207.45	20.00	247.90	8	90.95	0.69	m3
Erosion Control, Silt Fence	2080025	66.75	-3.00	136.50	17.90	169.10	6	66.47	1.00	m
Excavation, Earth	2050015	136.27	-8.18	280.73	11.00	325.86	5	116.34	0.85	m3

Description	PIITEM	Avg	LL	UL	Min	Max	Count	StDev	COV	Units
Excavation, Rock	2050017	4.75	1.57	7.93	4.50	5.00	2	0.35	0.07	m3
Flag Control	8120055	0.33	-0.03	0.69	0.25	0.50	3	0.14	0.43	LS
Geotextile Fabric	9260001	506.20	#NUM!	#NUM!	506.20	506.20	1			m2
Guardrail Anch, Bridge, Det T2	8070041	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Guardrail Approach Terminal, Type 1B	8070061	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Guardrail Reflector	8070080	16.00	#NUM!	#NUM!	16.00	16.00	1			ea
Guardrail, Rem	2040008	8.00	#NUM!	#NUM!	8.00	8.00	1			m
Guardrail, Salv	8070074	101.00	#NUM!	#NUM!	101.00	101.00	1			m
Guardrail, Type B	8070002	30.48	#NUM!	#NUM!	30.48	30.48	1			m
Hydrant, Relocate, Case 1	8210547	1.00	#NUM!	#NUM!	1.00	1.00	1			ea
Joint Waterproofing	7100001	6.11	5.29	6.94	5.46	6.66	4	0.52	0.08	m2
Lighted Arrow, Type C, Furn	8120013	2.00	2.00	2.00	2.00	2.00	2	0.00	0.00	ea
Lighted Arrow, Type C, Oper	8120014	2.00	2.00	2.00	2.00	2.00	2	0.00	0.00	ea
Minor Traf Devices	8120054	0.33	-0.03	0.69	0.25	0.50	3	0.14	0.43	LS
Mobilization, Max. ____	1000001	0.33	-0.03	0.69	0.25	0.50	3	0.14	0.43	LS
Monument Box	1070001	3.00	#NUM!	#NUM!	3.00	3.00	1			ea
Monument Box, Adj	1070003	2.00	-10.71	14.71	1.00	3.00	2	1.41	0.71	ea
Monument Preservation	1070005	3.00	#NUM!	#NUM!	3.00	3.00	1			ea
Mulch Blanket	8160077	925.00	#NUM!	#NUM!	925.00	925.00	1			m2
Pavt Mrkg, Overlay Cold Plastic, School	8110369	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Pavt Mrkg, Waterborne, 100 mm, White	8110450	8253.70	#NUM!	#NUM!	8253.70	8253.70	1			m
Pavt Mrkg, Waterborne, 100 mm, Yellow	8110451	5687.90	#NUM!	#NUM!	5687.90	5687.90	1			m
Pavt Mrkg,Overlay Cold Plas,150,X-Walk	8110362	267.73	#NUM!	#NUM!	267.73	267.73	1			m
Pavt Mrkg,Overlay Cold Plas,600,Stop Bar	8110361	46.91	#NUM!	#NUM!	46.91	46.91	1			m
Pavt Mrkg,Type NR,Paint,100mm,White,Temp	8120083	3520.50	-28695.94	35736.94	985.00	6056.00	2	3585.74	1.02	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	8120088	442.83	-84.64	970.30	52.00	2342.00	10	737.36	1.67	m
Pavt Mrkg,Waterborne,2nd Appl,100,White	8110470	8136.00	#NUM!	#NUM!	8136.00	8136.00	1			m
Pavt Mrkg,Waterborne,2nd Appl,100,Yellow	8110471	5205.00	#NUM!	#NUM!	5205.00	5205.00	1			m
Pavt, Cleaning	5020003	1.00	#NUM!	#NUM!	1.00	1.00	1			LS
Pavt, Rem	2040011	131.74	-69.76	333.24	11.90	412.59	5	162.28	1.23	m2
Plastic Drum, Lighted, Furn	8120026	22.00	4.14	39.86	8.00	35.00	4	11.22	0.51	ea
Plastic Drum, Lighted, Oper	8120027	26.67	7.69	45.64	20.00	35.00	3	7.64	0.29	ea
Quality Control Testing	5010002	762.54	499.14	1025.95	10.57	1737.31	21	578.67	0.76	t
Reinforcement, Steel	7060030	1366.99	-1045.05	3779.03	290.90	3612.47	4	1515.84	1.11	kg
Riprap, Plain	8130011	31.00	#NUM!	#NUM!	31.00	31.00	1			m2

Description	PIITEM	Avg	LL	UL	Min	Max	Count	StDev	COV	Units
Sewer, Cl 1, 300 mm, Tr Det B	4020033	41.80	#NUM!	#NUM!	41.80	41.80	1			m
Shoulder, Cl I, LM	3070103	164.86	-150.33	480.05	5.60	608.80	5	253.84	1.54	m3
Sign, Type B, Temp	8120057	17.85	-19.58	55.28	2.88	52.68	4	23.53	1.32	m2
Slope Restoration	8160079	15243.00	#NUM!	#NUM!	15243.00	15243.00	1			m2
Sodding, Cl A	8160001	393.81	#NUM!	#NUM!	393.81	393.81	1			m2
Structures, Rem Portions	2040021	1.50	-4.85	7.85	1.00	2.00	2	0.71	0.47	LS
Topsoil Surface, Furn, 100 mm	8160035	143.20	#NUM!	#NUM!	143.20	143.20	1			m2
Topsoil Surface, Furn, 75 mm	8160034	643.50	-777.86	2064.86	225.00	1295.50	3	572.18	0.89	m2
Tree, Rem, 200 to 450 mm	2020001	1.00	#NUM!	#NUM!	1.00	1.00	1			ea

APPENDIX I: DATA AND RESULTS FROM CONTRACT 17062-38019

WORK DAY/COMPLETION DATE DETERMINATION

CS 17062 JN 38019C

DESCRIPTION OF WORK

MAJOR WORK ITEM	PRODUCTION QUANTITY RATE	ESTIMATED TIME
shoulder Agg 13580 ton @ 700 t/day = 19 days		
Culverts 23 days for pipe E.S. 179 @ 15 = 12 days		
D.S. 1 day		
D. taking 9653 m @ 600 m/d = 16 days		
Earth Ex & SU 1 day		
Agg base 2 day		
Crush & Shape 102198 @ 10000 m/day = 10.2 days		
Bit paving 47203 @ 1100 ton/day = 42.9 days		
Seeding 78488 @ 1650/day = 47.5 days! (will be downsized)		

TOTAL ESTIMATED TIME _____ CAL WORK

COMPLETION DATE-WORK DAYS _____

COMMENTS:

See attached CPM - durations are comparable to above. Add 3 wks for rain days & float.

Bridge work will be compressed by the note in M.T spec Prov about continuous work.

50 days [illegible]

Say completion by 9-11-2000

Description	CONTID	PIITEM	DDDATE	Sum	# Postings	IUNITS
_	17062-38019	7127050	5/25/00	48	1	ea
_	17062-38019	8077050	6/12/00	1	1	ea
_	17062-38019	9747150	6/12/00	2	1	ea
_	17062-38019	9217102	6/12/00	24	1	m
_	17062-38019	9727102	6/12/00	5	1	m
_	17062-38019	6037050	6/19/00	2	1	ea
_	17062-38019	7127050	6/19/00	32	1	ea
_	17062-38019	2057102	6/19/00	601	1	m
_	17062-38019	2057102	6/20/00	651	1	m
_	17062-38019	2057102	6/21/00	922	1	m
_	17062-38019	2057102	6/22/00	592	1	m
_	17062-38019	2057102	6/23/00	648	1	m
_	17062-38019	2057102	6/26/00	55	1	m
_	17062-38019	7127050	6/27/00	10	1	ea
_	17062-38019	2057102	6/27/00	512	1	m
_	17062-38019	2057102	6/28/00	653	1	m
_	17062-38019	9217102	6/28/00	27	1	m
_	17062-38019	2057102	6/29/00	647	1	m
_	17062-38019	2057102	6/30/00	786	1	m
_	17062-38019	2057102	7/5/00	1186	1	m
_	17062-38019	2057102	7/6/00	332	1	m
_	17062-38019	2057102	7/11/00	324	1	m
_	17062-38019	2057102	7/21/00	10	1	m
_	17062-38019	2057102	7/26/00	24	1	m
_	17062-38019	7157050	8/24/00	14	2	ea
_	17062-38019	7157051	8/24/00	2	2	LS
_	17062-38019	2057102	8/28/00	70	1	m
_	17062-38019	8027102	10/19/00	325	1	m
_	17062-38019	2057102	10/20/00	19	1	m
_	17062-38019	1037060	5/18/01	-17050	1	dlr
_	17062-38019	8127050	5/18/01	2	1	ea
Aggregate Base	17062-38019	3020001	6/2/00	57.43	1	t
Aggregate Base	17062-38019	3020001	6/21/00	298.08	1	t
Aggregate Base	17062-38019	3020001	6/28/00	113	1	t

Description	CONTID	PIITEM	DDDATE	Sum	# Postings	IUNITS
Aggregate Base	17062-38019	3020001	7/12/00	83.25	1	t
Aggregate Base	17062-38019	3020001	7/26/00	153.85	1	t
Aggregate Base	17062-38019	3020001	7/27/00	84.96	1	t
Aggregate Base	17062-38019	3020001	8/8/00	109.97	1	t
Aggregate Base	17062-38019	3020001	8/9/00	29.47	1	t
Aggregate Base	17062-38019	3020001	8/10/00	161.83	1	t
Aggregate Base	17062-38019	3020001	9/27/00	5.52	1	t
Aggregate Base, 100 mm	17062-38019	3020010	6/1/00	80.2	1	m2
Aggregate Base, 100 mm	17062-38019	3020010	6/24/00	108.8	1	m2
Aggregate Base, 100 mm	17062-38019	3020010	7/3/00	-27.45	1	m2
Aggregate Base, 100 mm	17062-38019	3020010	2/6/01	55.45	1	m2
Approach, Cl I	17062-38019	3070001	7/11/00	73.6	1	t
Approach, Cl I	17062-38019	3070001	7/12/00	23.06	1	t
Approach, Cl I	17062-38019	3070001	8/8/00	144.83	1	t
Approach, Cl II	17062-38019	3070021	6/28/00	19.45	1	t
Approach, Cl II	17062-38019	3070021	6/30/00	56.57	1	t
Approach, Cl II	17062-38019	3070021	7/7/00	41.98	1	t
Approach, Cl II	17062-38019	3070021	7/12/00	29.67	1	t
Approach, Cl II	17062-38019	3070021	7/19/00	-3.9	1	t
Approach, Cl II	17062-38019	3070021	8/5/00	147.49	1	t
Approach, Cl II	17062-38019	3070021	8/11/00	56.36	1	t
Approach, Cl II	17062-38019	3070021	8/16/00	203.71	1	t
Approach, Cl II	17062-38019	3070021	8/18/00	123.83	1	t
Approach, Cl II	17062-38019	3070021	8/21/00	68.57	1	t
Approach, Cl II	17062-38019	3070021	9/27/00	0.04	1	t
Approach, Cl II	17062-38019	3070021	10/26/00	18	1	t
Approach, Cl II	17062-38019	3070021	6/21/01	-3.74	1	t
Backfill, Structure, CIP	17062-38019	2060002	5/30/00	12.5	1	m3
Backfill, Structure, CIP	17062-38019	2060002	6/20/00	12.5	1	m3
Backfill, Structure, CIP	17062-38019	2060002	4/11/01	0	1	m3
Backfill, Structure, CIP	17062-38019	2060002	6/21/01	0	1	m3
Beam Plate, Seal Perimeter	17062-38019	7130025	8/24/00	161	1	m
Bit Approach	17062-38019	5020200	7/13/00	80	1	t
Bit Approach	17062-38019	5020200	7/18/00	50	1	t

Description	CONTID	PIITEM	DDDATE	Sum	# Postings	IUNITS
Bit Approach	17062-38019	5020200	7/29/00	188.75	1	t
Bit Approach	17062-38019	5020200	7/31/00	41.73	1	t
Bit Approach	17062-38019	5020200	8/7/00	97.39	1	t
Bit Approach	17062-38019	5020200	8/12/00	223.51	1	t
Bit Approach	17062-38019	5020200	8/14/00	5	1	t
Bit Approach	17062-38019	5020200	8/15/00	198.05	1	t
Bit Approach	17062-38019	5020200	8/16/00	16.64	1	t
Bit Approach	17062-38019	5020200	8/17/00	326.21	1	t
Bit Approach	17062-38019	5020200	8/23/00	10	1	t
Bit Approach	17062-38019	5020200	10/19/00	47.83	1	t
Bit Base Crushing and Shaping	17062-38019	3050001	7/19/00	11757.6	1	m2
Bit Base Crushing and Shaping	17062-38019	3050001	7/20/00	9816.4	1	m2
Bit Base Crushing and Shaping	17062-38019	3050001	7/24/00	14025.6	1	m2
Bit Base Crushing and Shaping	17062-38019	3050001	7/25/00	13664.8	1	m2
Bit Base Crushing and Shaping	17062-38019	3050001	7/26/00	1483	1	m2
Bit Base Crushing and Shaping	17062-38019	3050001	7/27/00	8971	1	m2
Bit Base Crushing and Shaping	17062-38019	3050001	7/28/00	2256	1	m2
Bit Base Crushing and Shaping	17062-38019	3050001	7/31/00	10296	1	m2
Bit Base Crushing and Shaping	17062-38019	3050001	8/1/00	7838.4	1	m2
Bit Base Crushing and Shaping	17062-38019	3050001	8/7/00	10994	1	m2
Bit Base Crushing and Shaping	17062-38019	3050001	8/8/00	8142	1	m2
Bit Base Crushing and Shaping	17062-38019	3050001	8/9/00	4170	1	m2
Bit Base Crushing and Shaping	17062-38019	3050001	8/28/00	1097.8	1	m2
Bit Base Crushing and Shaping	17062-38019	3050001	11/9/00	-253.53	1	m2
Bit Mixture, 4 E 1	17062-38019	5020175	6/6/00	6.54	1	t
Bit Mixture, 4 E 1	17062-38019	5020175	6/30/00	192.53	1	t
Bit Mixture, 4 E 1	17062-38019	5020175	7/5/00	848.38	1	t
Bit Mixture, 4 E 1	17062-38019	5020175	7/6/00	594.41	1	t
Bit Mixture, 4 E 1	17062-38019	5020175	7/7/00	1262.85	1	t
Bit Mixture, 4 E 1	17062-38019	5020175	7/8/00	848.21	1	t
Bit Mixture, 4 E 1	17062-38019	5020175	7/10/00	2749.33	1	t
Bit Mixture, 4 E 1	17062-38019	5020175	7/11/00	3185.77	1	t
Bit Mixture, 4 E 1	17062-38019	5020175	7/13/00	940.87	1	t
Bit Mixture, 4 E 1	17062-38019	5020175	7/18/00	152.25	1	t

Description	CONTID	PIITEM	DDDATE	Sum	# Postings	IUNITS
Bit Mixture, 4 E 1	17062-38019	5020175	7/21/00	2489.97	1	†
Bit Mixture, 4 E 1	17062-38019	5020175	7/22/00	682.85	1	†
Bit Mixture, 4 E 1	17062-38019	5020175	7/26/00	2765.73	1	†
Bit Mixture, 4 E 1	17062-38019	5020175	7/27/00	728.96	1	†
Bit Mixture, 4 E 1	17062-38019	5020175	7/28/00	1554.52	1	†
Bit Mixture, 4 E 1	17062-38019	5020175	7/29/00	1074.84	1	†
Bit Mixture, 4 E 1	17062-38019	5020175	8/4/00	2143.03	1	†
Bit Mixture, 4 E 1	17062-38019	5020175	8/9/00	1254.2	1	†
Bit Mixture, 4 E 1	17062-38019	5020175	8/10/00	2284.48	1	†
Bit Mixture, 4 E 1	17062-38019	5020175	8/11/00	114.26	1	†
Bit Mixture, 4 E 1	17062-38019	5020175	8/12/00	205.63	1	†
Bit Mixture, 4 E 1	17062-38019	5020175	9/27/00	0.2	1	†
Bit Mixture, 5 E 1	17062-38019	5020182	7/14/00	182.91	1	†
Bit Mixture, 5 E 1	17062-38019	5020182	7/19/00	2271.85	1	†
Bit Mixture, 5 E 1	17062-38019	5020182	7/24/00	2261.15	1	†
Bit Mixture, 5 E 1	17062-38019	5020182	7/25/00	2703.07	1	†
Bit Mixture, 5 E 1	17062-38019	5020182	7/31/00	2384	1	†
Bit Mixture, 5 E 1	17062-38019	5020182	8/7/00	2247.68	1	†
Bit Mixture, 5 E 1	17062-38019	5020182	8/8/00	956.52	1	†
Bit Mixture, 5 E 1	17062-38019	5020182	8/9/00	1106.12	1	†
Bit Mixture, 5 E 1	17062-38019	5020182	8/11/00	1493.93	1	†
Bit Mixture, 5 E 1	17062-38019	5020182	8/14/00	1849.61	1	†
Bit Mixture, 5 E 1	17062-38019	5020182	8/15/00	807.6	1	†
Bit Mixture, 5 E 1	17062-38019	5020182	8/16/00	1310.81	1	†
Bit Mixture, 5 E 1	17062-38019	5020182	8/17/00	33	1	†
Bit Mixture, 5 E 1	17062-38019	5020182	8/23/00	60.15	1	†
Bit Quality Assurance Testing	17062-38019	5010003	6/30/00	192.53	1	†
Bit Quality Assurance Testing	17062-38019	5010003	7/5/00	848.38	1	†
Bit Quality Assurance Testing	17062-38019	5010003	7/6/00	594.41	1	†
Bit Quality Assurance Testing	17062-38019	5010003	7/7/00	1262.85	1	†
Bit Quality Assurance Testing	17062-38019	5010003	7/8/00	848.21	1	†
Bit Quality Assurance Testing	17062-38019	5010003	7/10/00	2749.33	1	†
Bit Quality Assurance Testing	17062-38019	5010003	7/11/00	3185.77	1	†
Bit Quality Assurance Testing	17062-38019	5010003	7/13/00	1020.87	1	†

Description	CONTID	PIITEM	DDDATE	Sum	# Postings	IUNITS
Bit Quality Assurance Testing	17062-38019	5010003	7/14/00	182.91	1	t
Bit Quality Assurance Testing	17062-38019	5010003	7/18/00	202.25	1	t
Bit Quality Assurance Testing	17062-38019	5010003	7/19/00	2271.85	1	t
Bit Quality Assurance Testing	17062-38019	5010003	7/21/00	2489.97	1	t
Bit Quality Assurance Testing	17062-38019	5010003	7/22/00	682.85	1	t
Bit Quality Assurance Testing	17062-38019	5010003	7/24/00	2261.15	1	t
Bit Quality Assurance Testing	17062-38019	5010003	7/25/00	2703.07	1	t
Bit Quality Assurance Testing	17062-38019	5010003	7/26/00	2765.73	1	t
Bit Quality Assurance Testing	17062-38019	5010003	7/27/00	728.96	1	t
Bit Quality Assurance Testing	17062-38019	5010003	7/28/00	1554.52	1	t
Bit Quality Assurance Testing	17062-38019	5010003	7/29/00	1263.59	1	t
Bit Quality Assurance Testing	17062-38019	5010003	7/31/00	2425.73	1	t
Bit Quality Assurance Testing	17062-38019	5010003	8/4/00	2143.03	1	t
Bit Quality Assurance Testing	17062-38019	5010003	8/7/00	2345.07	1	t
Bit Quality Assurance Testing	17062-38019	5010003	8/8/00	956.52	1	t
Bit Quality Assurance Testing	17062-38019	5010003	8/9/00	2360.32	1	t
Bit Quality Assurance Testing	17062-38019	5010003	8/10/00	2284.48	1	t
Bit Quality Assurance Testing	17062-38019	5010003	8/11/00	1608.19	1	t
Bit Quality Assurance Testing	17062-38019	5010003	8/12/00	429.14	1	t
Bit Quality Assurance Testing	17062-38019	5010003	8/14/00	1854.61	1	t
Bit Quality Assurance Testing	17062-38019	5010003	8/15/00	1005.65	1	t
Bit Quality Assurance Testing	17062-38019	5010003	8/16/00	1327.45	1	t
Bit Quality Assurance Testing	17062-38019	5010003	8/17/00	359.21	1	t
Bit Quality Assurance Testing	17062-38019	5010003	8/23/00	70.15	1	t
Bit Quality Initiative	17062-38019	5010001	1/5/01	100147.07	1	dlr
Bit Surface, Rem	17062-38019	5020006	5/17/00	77	1	m2
Bit Surface, Rem	17062-38019	5020006	6/20/00	77	1	m2
Bridge Deck Surface Construction	17062-38019	7060325	5/23/00	15	1	m2
Bridge Deck Surface Construction	17062-38019	7060325	6/8/00	62	1	m2
Bridge Deck Surface Construction	17062-38019	7060325	7/3/00	77	1	m2
Clearing	17062-38019	2010001	6/2/00	1216	1	m2
Clearing	17062-38019	2010001	7/10/00	1483.5	1	m2
Conc Barrier, Temp, Adjusted	17062-38019	8120040	6/13/00	116	1	m
Conc Barrier, Temp, Furn	17062-38019	8120041	3/28/01	116	1	m

Description	CONTID	PIITEM	DDDATE	Sum	# Postings	IUNITS
Conc Barrier, Temp, Oper	17062-38019	8120042	5/15/00	116	1	m
Conc Barrier, Temp, Relocated	17062-38019	8120043	6/13/00	21	1	m
Conc Pavt, Misc, Reinf, 260 mm	17062-38019	6020160	6/2/00	95.2	1	m2
Conc Pavt, Misc, Reinf, 260 mm	17062-38019	6020160	6/19/00	72	1	m2
Conc Pavt, Misc, Reinf, 260 mm	17062-38019	6020160	6/27/00	108	1	m2
Conc Pavt, Misc, Reinf, 260 mm	17062-38019	6020160	6/30/00	0.77	1	m2
Conc Pavt, Misc, Reinf, 260 mm	17062-38019	6020160	7/3/00	-27.42	1	m2
Conc Pavt, Misc, Reinf, 260 mm	17062-38019	6020160	1/18/01	0	1	m2
Conc Pavt, Misc, Reinf, 260 mm	17062-38019	6020160	2/6/01	27.42	1	m2
Conc Quality Assurance	17062-38019	6050100	2/6/01	249.5	2	m3
Conc Quality Initiative	17062-38019	6050101	5/18/01	350.98	1	dlr
Conc, Bridge Deck Overlay	17062-38019	7060320	6/1/00	8.5	1	m3
Conc, Bridge Deck Overlay	17062-38019	7060320	6/14/00	-0.8	1	m3
Conc, Bridge Deck Overlay	17062-38019	7060320	6/26/00	8.5	1	m3
Conc, Bridge Deck Overlay	17062-38019	7060320	1/18/01	0	1	m3
Conc, Grade D	17062-38019	7060007	5/25/00	4.4	1	m3
Conc, Grade D	17062-38019	7060007	6/19/00	4.6	1	m3
Contractor Staking	17062-38019	1040001	5/30/00	0.05	1	LS
Contractor Staking	17062-38019	1040001	6/13/00	0.04	1	LS
Contractor Staking	17062-38019	1040001	6/26/00	0.02	1	LS
Contractor Staking	17062-38019	1040001	7/10/00	0.09	1	LS
Contractor Staking	17062-38019	1040001	7/24/00	0.18	1	LS
Contractor Staking	17062-38019	1040001	8/19/00	0.38	1	LS
Contractor Staking	17062-38019	1040001	6/21/01	0.24	1	LS
Controller, TS	17062-38019	8200336	7/12/00	1	1	ea
Culv Bedding	17062-38019	4011100	6/12/00	27.9	1	m3
Culv End Sect, 900 mm	17062-38019	4011006	5/18/01	2	1	ea
Culv End, Rem	17062-38019	2030005	5/9/00	8	1	ea
Culv End, Rem	17062-38019	2030005	5/10/00	2	1	ea
Culv End, Rem	17062-38019	2030005	5/11/00	4	1	ea
Culv End, Rem	17062-38019	2030005	5/17/00	5	1	ea
Culv End, Rem	17062-38019	2030005	5/18/00	6	1	ea
Culv End, Rem	17062-38019	2030005	5/19/00	2	1	ea
Culv End, Rem	17062-38019	2030005	5/23/00	2	1	ea

Description	CONTID	PIITEM	DDDATE	Sum	# Postings	IUNITS
Culv End, Rem	17062-38019	2030005	5/24/00	4	1	ea
Culv End, Rem	17062-38019	2030005	6/7/00	1	1	ea
Culv End, Rem	17062-38019	2030005	5/18/01	2	1	ea
Culv, Cl 1, 1050 mm	17062-38019	4010006	6/1/00	24	1	m
Culv, Cl 1, Conc, 450 mm	17062-38019	4010202	5/18/00	12.5	1	m
Culv, Cl 1, Conc, 450 mm	17062-38019	4010202	6/7/00	2.5	1	m
Culv, Cl 1, Conc, 600 mm	17062-38019	4010203	5/9/00	5	1	m
Culv, Cl 1, Conc, 600 mm	17062-38019	4010203	5/10/00	10	1	m
Culv, Cl 1, Conc, 600 mm	17062-38019	4010203	5/11/00	10	1	m
Culv, Cl 1, Conc, 600 mm	17062-38019	4010203	5/17/00	5	1	m
Culv, Cl 1, Conc, 600 mm	17062-38019	4010203	5/23/00	7	1	m
Culv, Cl 1, Conc, 600 mm	17062-38019	4010203	5/24/00	17	1	m
Culv, Cl 1, Conc, 750 mm	17062-38019	4010204	6/12/00	5	1	m
Culv, Cl 1, Conc, 900 mm	17062-38019	4010205	5/9/00	5	1	m
Culv, Cl 1, Conc, 900 mm	17062-38019	4010205	5/19/00	6.2	1	m
Culv, Cl 1, CSP, 600 mm	17062-38019	4010403	5/17/00	34	1	m
Culv, Cl 1, CSP, 900 mm	17062-38019	4010405	5/18/01	16.5	1	m
Culv, Cl 6, 450 mm	17062-38019	4010152	5/11/00	36	1	m
Culv, Cl 6, 450 mm	17062-38019	4010152	5/12/00	41	1	m
Culv, Cl 6, 450 mm	17062-38019	4010152	5/15/00	94	1	m
Culv, Cl 6, 450 mm	17062-38019	4010152	5/16/00	82	1	m
Culv, Cl 6, 450 mm	17062-38019	4010152	5/18/00	14	1	m
Culv, Cl 6, 450 mm	17062-38019	4010152	5/19/00	19	1	m
Culv, Cl 6, 450 mm	17062-38019	4010152	5/22/00	59	1	m
Culv, Cl 6, 450 mm	17062-38019	4010152	5/23/00	35	1	m
Culv, Cl 6, 450 mm	17062-38019	4010152	5/24/00	7	1	m
Culv, Cl 6, 450 mm	17062-38019	4010152	5/25/00	80	1	m
Culv, Cl 6, 450 mm	17062-38019	4010152	5/31/00	69	1	m
Culv, Cl 6, 450 mm	17062-38019	4010152	6/5/00	87	1	m
Culv, Cl 6, 450 mm	17062-38019	4010152	6/7/00	18.3	1	m
Culv, Cl 6, 450 mm	17062-38019	4010152	6/14/00	22	1	m
Culv, Cl 6, 450 mm	17062-38019	4010152	6/26/00	10	1	m
Culv, Cl 6, 450 mm	17062-38019	4010152	7/11/00	10	1	m
Culv, Cl 6, 450 mm	17062-38019	4010152	7/13/00	12	1	m

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Culv, Rem	17062-38019	2030004	36670	1	1	ea
Culv, Rem	17062-38019	2030004	5/31/00	5	1	ea
Culv, Rem	17062-38019	2030004	6/14/00	1	1	ea
Culv, Rem	17062-38019	2030004	7/11/00	1	1	ea
Culv,End Sect,Ellip,1:4,1345X855,Transv	17062-38019	4010926	5/30/00	2	1	ea
Culv,Slp End Sect,1:4,1050 mm,Transv	17062-38019	4010727	6/2/00	2	1	ea
Culv,Slp End Sect,1:4,450 mm,Transv	17062-38019	4010721	5/18/00	5	1	ea
Culv,Slp End Sect,1:4,600 mm,Transv	17062-38019	4010723	5/9/00	3	1	ea
Culv,Slp End Sect,1:4,600 mm,Transv	17062-38019	4010723	5/10/00	2	1	ea
Culv,Slp End Sect,1:4,600 mm,Transv	17062-38019	4010723	5/11/00	4	1	ea
Culv,Slp End Sect,1:4,600 mm,Transv	17062-38019	4010723	5/23/00	2	1	ea
Culv,Slp End Sect,1:4,600 mm,Transv	17062-38019	4010723	5/24/00	4	1	ea
Culv,Slp End Sect,1:4,900 mm,Transv	17062-38019	4010726	5/22/00	2	1	ea
Culv,Slp End Sect,1:4,900 mm,Transv	17062-38019	4010726	5/26/00	2	1	ea
Culv,Slp End Sect,1:6,450 mm,Longit	17062-38019	4010741	5/10/00	8	1	ea
Culv,Slp End Sect,1:6,450 mm,Longit	17062-38019	4010741	5/11/00	10	1	ea
Culv,Slp End Sect,1:6,450 mm,Longit	17062-38019	4010741	5/12/00	6	1	ea
Culv,Slp End Sect,1:6,450 mm,Longit	17062-38019	4010741	5/15/00	12	1	ea
Culv,Slp End Sect,1:6,450 mm,Longit	17062-38019	4010741	5/16/00	14	1	ea
Culv,Slp End Sect,1:6,450 mm,Longit	17062-38019	4010741	5/18/00	4	1	ea
Culv,Slp End Sect,1:6,450 mm,Longit	17062-38019	4010741	5/19/00	4	1	ea
Culv,Slp End Sect,1:6,450 mm,Longit	17062-38019	4010741	5/22/00	6	1	ea
Culv,Slp End Sect,1:6,450 mm,Longit	17062-38019	4010741	5/23/00	16	1	ea
Culv,Slp End Sect,1:6,450 mm,Longit	17062-38019	4010741	5/24/00	2	1	ea
Culv,Slp End Sect,1:6,450 mm,Longit	17062-38019	4010741	5/25/00	12	1	ea
Culv,Slp End Sect,1:6,450 mm,Longit	17062-38019	4010741	5/31/00	6	1	ea
Culv,Slp End Sect,1:6,450 mm,Longit	17062-38019	4010741	6/1/00	6	1	ea
Culv,Slp End Sect,1:6,450 mm,Longit	17062-38019	4010741	6/5/00	20	1	ea
Culv,Slp End Sect,1:6,450 mm,Longit	17062-38019	4010741	6/6/00	1	1	ea
Culv,Slp End Sect,1:6,450 mm,Longit	17062-38019	4010741	6/7/00	2	1	ea
Culv,Slp End Sect,1:6,450 mm,Longit	17062-38019	4010741	6/14/00	2	1	ea
Culv,Slp End Sect,1:6,450 mm,Longit	17062-38019	4010741	6/26/00	2	1	ea
Culv,Slp End Sect,1:6,450 mm,Longit	17062-38019	4010741	7/11/00	2	1	ea
Culv,Slp End Sect,1:6,600 mm,Longit	17062-38019	4010743	5/17/00	1	1	ea

Description	CONTID	PIITEM	DDDATE	Sum	# Postings	IUNITS
Culv,Slp End Sect,1:6,600 mm,Longit	17062-38019	4010743	5/24/00	2	1	ea
Culv,Slp End Sect,1:6,600 mm,Longit	17062-38019	4010743	5/30/00	6	1	ea
Curb and Gutter, Bridge Approach	17062-38019	8020009	6/8/00	20	1	m
Curb and Gutter, Bridge Approach	17062-38019	8020009	7/10/00	20	1	m
Curb and Gutter, Conc, Det B2	17062-38019	8020018	6/8/00	39.2	1	m
Curb and Gutter, Conc, Det B2	17062-38019	8020018	6/12/00	70.6	1	m
Curb and Gutter, Conc, Det B2	17062-38019	8020018	6/13/00	150.2	1	m
Curb and Gutter, Conc, Det B2	17062-38019	8020018	6/14/00	123.7	1	m
Curb and Gutter, Conc, Det B2	17062-38019	8020018	6/19/00	49.1	1	m
Curb and Gutter, Conc, Det B2	17062-38019	8020018	6/20/00	83.8	1	m
Curb and Gutter, Conc, Det B2	17062-38019	8020018	7/5/00	24.7	1	m
Curb and Gutter, Conc, Det B2	17062-38019	8020018	1/8/01	0	1	m
Curb and Gutter, Conc, Det B2	17062-38019	8020018	1/18/01	0	1	m
Curb and Gutter, Rem	17062-38019	2040006	6/5/00	69	1	m
Curb and Gutter, Rem	17062-38019	2040006	6/7/00	92	1	m
Curb, Rem	17062-38019	2040005	6/5/00	109	1	m
Curb, Rem	17062-38019	2040005	6/13/00	15	1	m
Curb, Rem	17062-38019	2040005	6/19/00	9.5	1	m
Dr Marker Post	17062-38019	4011110	12/6/00	28	1	ea
Dr Marker Post	17062-38019	4011110	6/27/01	5	1	ea
Dr Structure Cover	17062-38019	4030042	6/6/00	138	1	kg
Dr Structure Cover	17062-38019	4030042	6/7/00	435	1	kg
Dr Structure Cover	17062-38019	4030042	6/13/00	297	1	kg
Dr Structure Cover	17062-38019	4030042	6/19/00	297	1	kg
Dr Structure Cover, Adj, Case 1	17062-38019	4030045	12/26/00	2	1	ea
Dr Structure, 1200 mm dia	17062-38019	4030005	6/6/00	2	1	ea
Dr Structure, 1200 mm dia	17062-38019	4030005	6/7/00	2	1	ea
Drain Casting Assembly, Type 2	17062-38019	7170011	5/31/00	2	1	ea
Drain Casting Assembly, Type 2	17062-38019	7170011	6/26/00	2	1	ea
Driveway Opening, Conc, Det M	17062-38019	8020049	6/12/00	36	1	m
Driveway Opening, Conc, Det M	17062-38019	8020049	6/13/00	20.8	1	m
Driveway Opening, Conc, Det M	17062-38019	8020049	6/14/00	8.6	1	m
Driveway Opening, Conc, Det M	17062-38019	8020049	1/8/01	0	1	m
Embankment, LM	17062-38019	2050011	5/9/00	19.8	1	m3

Description	CONTID	PIITEM	DDDATE	Sum	# Postings	IUNITS
Embankment, LM	17062-38019	2050011	5/10/00	59.4	1	m3
Embankment, LM	17062-38019	2050011	5/11/00	19.8	1	m3
Embankment, LM	17062-38019	2050011	5/16/00	49.5	1	m3
Embankment, LM	17062-38019	2050011	5/17/00	59.4	1	m3
Embankment, LM	17062-38019	2050011	5/18/00	29.7	1	m3
Embankment, LM	17062-38019	2050011	5/19/00	19.8	1	m3
Embankment, LM	17062-38019	2050011	5/22/00	19.8	1	m3
Embankment, LM	17062-38019	2050011	5/23/00	9.9	1	m3
Embankment, LM	17062-38019	2050011	5/24/00	29.7	1	m3
Embankment, LM	17062-38019	2050011	5/25/00	9.9	1	m3
Embankment, LM	17062-38019	2050011	5/26/00	19.8	1	m3
Embankment, LM	17062-38019	2050011	5/30/00	9.9	1	m3
Embankment, LM	17062-38019	2050011	6/2/00	39.6	1	m3
Embankment, LM	17062-38019	2050011	6/13/00	95.4	1	m3
Embankment, LM	17062-38019	2050011	6/19/00	10.6	1	m3
Embankment, LM	17062-38019	2050011	6/30/00	21.2	1	m3
Embankment, LM	17062-38019	2050011	7/7/00	10.6	1	m3
Embankment, LM	17062-38019	2050011	7/14/00	530	1	m3
Embankment, LM	17062-38019	2050011	8/16/00	31.8	1	m3
Embankment, LM	17062-38019	2050011	8/21/00	21.2	1	m3
Erosion Control, Check Dam, Stone	17062-38019	2080001	5/9/00	1	1	m
Erosion Control, Check Dam, Stone	17062-38019	2080001	11/6/00	3	1	m
Erosion Control, Silt Fence	17062-38019	2080025	5/9/00	99	1	m
Erosion Control, Silt Fence	17062-38019	2080025	5/10/00	34	1	m
Erosion Control, Silt Fence	17062-38019	2080025	5/11/00	11	1	m
Erosion Control, Silt Fence	17062-38019	2080025	5/15/00	51	1	m
Erosion Control, Silt Fence	17062-38019	2080025	5/17/00	48	1	m
Erosion Control, Silt Fence	17062-38019	2080025	5/18/00	46	1	m
Erosion Control, Silt Fence	17062-38019	2080025	5/19/00	22	1	m
Erosion Control, Silt Fence	17062-38019	2080025	5/24/00	71	1	m
Erosion Control, Silt Fence	17062-38019	2080025	5/26/00	31	1	m
Erosion Control, Silt Fence	17062-38019	2080025	5/30/00	30	1	m
Erosion Control, Silt Fence	17062-38019	2080025	6/2/00	61	1	m
Erosion Control, Silt Fence	17062-38019	2080025	6/5/00	9	1	m

Description	CONTID	PIITEM	DDDATE	Sum	# Postings	IUNITS
Erosion Control, Silt Fence	17062-38019	2080025	6/6/00	13	1	m
Erosion Control, Silt Fence	17062-38019	2080025	6/8/00	27	1	m
Erosion Control, Silt Fence	17062-38019	2080025	6/26/00	31	1	m
Erosion Control, Silt Fence	17062-38019	2080025	6/29/00	78	1	m
Erosion Control, Silt Fence	17062-38019	2080025	6/30/00	14	1	m
Erosion Control, Silt Fence	17062-38019	2080025	7/21/00	28	1	m
Erosion Control, Silt Fence	17062-38019	2080025	8/21/00	35	1	m
Erosion Control, Silt Fence	17062-38019	2080025	8/25/00	108	1	m
Excavation, Earth	17062-38019	2050015	6/1/00	28.8	1	m3
Excavation, Earth	17062-38019	2050015	6/5/00	200	1	m3
Excavation, Earth	17062-38019	2050015	6/13/00	67	1	m3
Excavation, Earth	17062-38019	2050015	6/19/00	16.8	1	m3
Excavation, Earth	17062-38019	2050015	6/24/00	39.2	1	m3
Excavation, Earth	17062-38019	2050015	6/29/00	10.36	1	m3
Excavation, Earth	17062-38019	2050015	7/11/00	66.8	1	m3
Excavation, Earth	17062-38019	2050015	7/14/00	700	1	m3
Excavation, Earth	17062-38019	2050015	7/17/00	300	1	m3
Excavation, Earth	17062-38019	2050015	7/18/00	400	1	m3
Excavation, Earth	17062-38019	2050015	4/11/01	64.64	1	m3
Excavation, Earth	17062-38019	2050015	6/19/01	249.4	2	m3
Excavation, Fdn	17062-38019	2060011	5/23/00	12.5	1	m3
Excavation, Fdn	17062-38019	2060011	6/15/00	12.5	1	m3
Excavation, Fdn	17062-38019	2060011	4/11/01	0	1	m3
False Decking	17062-38019	7060029	6/28/00	19.2	1	m2
Fertilizer, Chemical Nutrient, Cl A	17062-38019	8160020	7/12/00	137.7	1	kg
Fertilizer, Chemical Nutrient, Cl A	17062-38019	8160020	7/17/00	101.4	1	kg
Fertilizer, Chemical Nutrient, Cl A	17062-38019	8160020	8/4/00	145.4	1	kg
Fertilizer, Chemical Nutrient, Cl A	17062-38019	8160020	10/16/00	6.2	1	kg
Fertilizer, Chemical Nutrient, Cl A	17062-38019	8160020	12/20/00	-12.25	1	kg
Flag Control	17062-38019	8120055	5/16/00	0.5	1	LS
Flag Control	17062-38019	8120055	8/19/00	0.25	1	LS
Flag Control	17062-38019	8120055	9/29/00	0.25	1	LS
Guardrail Approach Terminal, Type 1B	17062-38019	8070061	6/12/00	1	1	ea
Guardrail Approach Terminal, Type 1B	17062-38019	8070061	7/12/00	1	1	ea

Description	CONTID	PIITEM	DDDATE	Sum	# Postings	IUNITS
Guardrail Approach Terminal, Type 1B	17062-38019	8070061	9/28/00	13	1	ea
Guardrail Departing Terminal, Type B	17062-38019	8070063	7/12/00	1	1	ea
Guardrail Departing Terminal, Type B	17062-38019	8070063	9/28/00	5	1	ea
Guardrail Reflector	17062-38019	8070080	6/12/00	14	1	ea
Guardrail Reflector	17062-38019	8070080	7/12/00	14	1	ea
Guardrail Reflector	17062-38019	8070080	10/20/00	196	1	ea
Guardrail, Curved, Type B	17062-38019	8070026	7/12/00	12	1	m
Guardrail, Curved, Type B	17062-38019	8070026	9/28/00	38	1	m
Guardrail, Curved, Type B	17062-38019	8070026	12/4/00	-4.38	1	m
Guardrail, Rem	17062-38019	2040008	6/12/00	69	1	m
Guardrail, Rem	17062-38019	2040008	6/29/00	65	1	m
Guardrail, Rem	17062-38019	2040008	9/27/00	1055.4	1	m
Guardrail, Type B	17062-38019	8070002	6/12/00	58	1	m
Guardrail, Type B	17062-38019	8070002	7/12/00	54	1	m
Guardrail, Type B	17062-38019	8070002	9/28/00	1230.5	1	m
Guardrail, Type B	17062-38019	8070002	12/4/00	-1.51	2	m
Guardrail, Type B	17062-38019	8070002	1/25/01	0.13	1	m
Hand Chipping, Other Than Deck	17062-38019	7120007	6/22/00	1	1	m3
Hand Chipping, Other Than Deck	17062-38019	7120007	6/28/00	0.06	1	m3
Hand Chipping, Other Than Deck	17062-38019	7120007	6/29/00	0.5	1	m3
Hand Chipping, Shallow	17062-38019	7120003	5/31/00	5.07	1	m2
Hand Chipping, Shallow	17062-38019	7120003	6/29/00	0.3	1	m2
Hand Patching	17062-38019	5020025	5/16/00	110.49	1	t
Hand Patching	17062-38019	5020025	5/17/00	41.43	1	t
Hand Patching	17062-38019	5020025	5/18/00	45.66	1	t
Hand Patching	17062-38019	5020025	5/19/00	18.67	1	t
Hand Patching	17062-38019	5020025	6/2/00	10	1	t
High Intensity Light, Type B, Furn	17062-38019	8120045	7/12/00	2	1	ea
High Intensity Light, Type B, Oper	17062-38019	8120046	7/12/00	2	1	ea
Hydrodemolition, First Pass	17062-38019	7120076	5/18/00	77	1	m2
Hydrodemolition, First Pass	17062-38019	7120076	6/14/00	77	1	m2
Hydrodemolition, Second Pass	17062-38019	7120077	5/22/00	6.4	1	m2
Hydrodemolition, Second Pass	17062-38019	7120077	6/22/00	2.52	1	m2
Joint Repr, Longit	17062-38019	6030040	5/16/00	771	1	m

Description	CONTID	PIITEM	DDDATE	Sum	# Postings	IUNITS
Joint Repr, Longit	17062-38019	6030040	5/19/00	248	1	m
Joint Waterproofing	17062-38019	7100001	5/30/00	4.4	1	m2
Joint Waterproofing	17062-38019	7100001	6/20/00	4.4	1	m2
Joint Waterproofing	17062-38019	7100001	6/27/00	4.6	1	m2
Joint, Expansion, E3	17062-38019	6020066	6/2/00	10	1	m
Joint, Expansion, E3	17062-38019	6020066	6/27/00	10	1	m
Lighted Arrow, Type C, Furn	17062-38019	8120013	5/15/00	1	1	ea
Lighted Arrow, Type C, Furn	17062-38019	8120013	5/16/00	1	1	ea
Lighted Arrow, Type C, Furn	17062-38019	8120013	4/23/01	2	1	ea
Lighted Arrow, Type C, Oper	17062-38019	8120014	5/15/00	1	1	ea
Lighted Arrow, Type C, Oper	17062-38019	8120014	5/16/00	1	1	ea
Lighted Arrow, Type C, Oper	17062-38019	8120014	4/23/01	2	1	ea
Luminaire	17062-38019	8190536	7/12/00	2	1	ea
Material,Surplus & Unsuitable,Rem,LM	17062-38019	3050045	6/30/00	84.8	1	m3
Material,Surplus & Unsuitable,Rem,LM	17062-38019	3050045	7/19/00	53	1	m3
Material,Surplus & Unsuitable,Rem,LM	17062-38019	3050045	7/25/00	240	1	m3
Material,Surplus & Unsuitable,Rem,LM	17062-38019	3050045	7/26/00	230	1	m3
Material,Surplus & Unsuitable,Rem,LM	17062-38019	3050045	8/1/00	30	1	m3
Material,Surplus & Unsuitable,Rem,LM	17062-38019	3050045	8/9/00	160	1	m3
Material,Surplus & Unsuitable,Rem,LM	17062-38019	3050045	8/10/00	40	1	m3
Minor Traf Devices	17062-38019	8120054	5/16/00	0.5	1	LS
Minor Traf Devices	17062-38019	8120054	8/19/00	0.25	1	LS
Minor Traf Devices	17062-38019	8120054	9/29/00	0.25	1	LS
Mobilization, Max. ____	17062-38019	1000001	5/30/00	0.5	1	LS
Mobilization, Max. ____	17062-38019	1000001	6/26/00	0.25	1	LS
Mobilization, Max. ____	17062-38019	1000001	7/24/00	0.25	1	LS
Monument Box	17062-38019	1070001	10/10/00	8	1	ea
Monument Box, Adj	17062-38019	1070003	10/10/00	1	1	ea
Monument Preservation	17062-38019	1070005	7/12/01	7	1	ea
Mulch	17062-38019	8160070	7/12/00	5117.86	1	m2
Mulch	17062-38019	8160070	7/17/00	3755.63	1	m2
Mulch	17062-38019	8160070	8/4/00	5383.5	1	m2
Mulch	17062-38019	8160070	10/16/00	231.3	1	m2
Mulch	17062-38019	8160070	10/20/00	135	1	m2

Description	CONTID	PIITEM	DDDATE	Sum	# Postings	IUNITS
Mulch	17062-38019	8160070	12/20/00	-471.54	1	m2
Mulch Anchoring	17062-38019	8160072	7/12/00	5117.86	1	m2
Mulch Anchoring	17062-38019	8160072	7/17/00	3755.63	1	m2
Mulch Anchoring	17062-38019	8160072	8/4/00	5383.5	1	m2
Mulch Anchoring	17062-38019	8160072	12/20/00	-471.54	1	m2
On the Job Training	17062-38019	1100000	6/19/01	385.5	1	hr
Patch, Forming	17062-38019	7120017	6/7/00	2.34	1	m2
Patch, Forming	17062-38019	7120017	6/8/00	8	1	m2
Patch, Forming	17062-38019	7120017	6/16/00	-6.01	1	m2
Patch, Forming	17062-38019	7120017	6/22/00	4.22	1	m2
Patch, Forming	17062-38019	7120017	6/28/00	0.3	1	m2
Patch, Forming	17062-38019	7120017	6/29/00	2.6	1	m2
Patching Concrete, LM	17062-38019	7120021	6/7/00	0.57	1	m3
Patching Concrete, LM	17062-38019	7120021	6/8/00	0.5	1	m3
Patching Concrete, LM	17062-38019	7120021	6/23/00	1	1	m3
Patching Concrete, LM	17062-38019	7120021	6/28/00	0.06	1	m3
Patching Concrete, LM	17062-38019	7120021	6/29/00	0.5	1	m3
Paved Ditch, Bit	17062-38019	8140014	8/15/00	43	1	m2
Pavt for Butt Joints, Rem	17062-38019	5020010	7/6/00	677.4	1	m2
Pavt Joint and Crack Repr, Det 7	17062-38019	5020020	5/17/00	307.4	1	m
Pavt Joint and Crack Repr, Det 7	17062-38019	5020020	5/18/00	358.7	1	m
Pavt Joint and Crack Repr, Det 7	17062-38019	5020020	5/19/00	43.9	1	m
Pavt Mrkg, Overlay Cold Plastic, Only	17062-38019	8110367	8/28/00	4	1	ea
Pavt Mrkg, Waterborne, 100 mm, White	17062-38019	8110450	8/31/00	39026	1	m
Pavt Mrkg, Waterborne, 100 mm, Yellow	17062-38019	8110451	8/31/00	4980	1	m
Pavt Mrkg,Longit,125 or Less Width,Rem	17062-38019	8120135	6/30/00	5	1	m
Pavt Mrkg,Overlay Cold Plas,600,Stop Bar	17062-38019	8110361	5/15/00	6.6	1	m
Pavt Mrkg,Overlay Cold Plas,600,Stop Bar	17062-38019	8110361	8/28/00	36.5	1	m
Pavt Mrkg,Overlay Cold Plas,600,Stop Bar	17062-38019	8110361	8/29/00	5.1	1	m
Pavt Mrkg,Overlay Cold Plastic,Rt Ar Sym	17062-38019	8110375	8/28/00	6	1	ea
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	17062-38019	8120088	5/16/00	56.4	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	17062-38019	8120088	6/30/00	19	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	17062-38019	8120088	7/5/00	137	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	17062-38019	8120088	7/6/00	89	1	m

Description	CONTID	PITEM	DDDATE	Sum	# Postings	IUNITS
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	17062-38019	8120088	7/8/00	115	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	**17062-38019**	**8120088**	**36717**	**361**	**1**	**m**
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	17062-38019	8120088	7/13/00	58	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	17062-38019	8120088	7/19/00	402	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	17062-38019	8120088	7/21/00	188	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	17062-38019	8120088	7/25/00	341	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	17062-38019	8120088	7/26/00	155	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	17062-38019	8120088	7/27/00	56	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	17062-38019	8120088	7/28/00	72	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	17062-38019	8120088	8/4/00	137	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	17062-38019	8120088	8/7/00	343	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	17062-38019	8120088	8/9/00	117	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	17062-38019	8120088	8/10/00	192	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	17062-38019	8120088	8/11/00	227	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	17062-38019	8120088	8/14/00	78	1	m
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	17062-38019	8120088	8/15/00	152	1	m
Pavt Mrkg,Waterborne,2nd Appl,100,White	17062-38019	8110470	9/15/00	39027	1	m
Pavt Mrkg,Waterborne,2nd Appl,100,Yellow	17062-38019	8110471	9/15/00	4983	1	m
Pavt, Rem	17062-38019	2040011	5/23/00	25	1	m2
Pavt, Rem	17062-38019	2040011	5/26/00	81.7	1	m2
Pavt, Rem	17062-38019	2040011	6/15/00	107.1	1	m2
Plastic Drum, Lighted, Furn	17062-38019	8120026	6/15/00	200	1	ea
Plastic Drum, Lighted, Oper	17062-38019	8120027	6/15/00	68	1	ea
Plastic Drum, Lighted, Oper	17062-38019	8120027	7/19/00	132	1	ea
Reinforcement, Steel, Epoxy Coated	17062-38019	7060031	5/25/00	349.4	1	kg
Reinforcement, Steel, Epoxy Coated	17062-38019	7060031	5/31/00	9.88	1	kg
Reinforcement, Steel, Epoxy Coated	17062-38019	7060031	6/2/00	46.5	1	kg
Reinforcement, Steel, Epoxy Coated	17062-38019	7060031	6/7/00	17.05	1	kg
Reinforcement, Steel, Epoxy Coated	17062-38019	7060031	6/19/00	248	1	kg
Reinforcement, Steel, Epoxy Coated	17062-38019	7060031	6/26/00	1.86	1	kg
Reinforcement, Steel, Epoxy Coated	17062-38019	7060031	6/27/00	35.34	1	kg
Reinforcement, Steel, Epoxy Coated	17062-38019	7060031	3/15/01	291.97	1	kg
Ride Quality Measurement, Bit	17062-38019	5020251	12/7/00	79	1	lnkm
Ride Quality, Bit	17062-38019	5020250	4/6/01	136329.88	1	m2

Description	CONTID	PIITEM	DDDATE	Sum	# Postings	IUNITS
Scarifying	17062-38019	7120001	5/24/00	77	1	m2
Scarifying	17062-38019	7120001	6/14/00	77	1	m2
Seeding, Mixture TDS	17062-38019	8160005	7/12/00	127.5	1	kg
Seeding, Mixture TDS	17062-38019	8160005	7/17/00	93.9	1	kg
Seeding, Mixture TDS	17062-38019	8160005	8/4/00	134.6	1	kg
Seeding, Mixture TDS	17062-38019	8160005	10/16/00	6.2	1	kg
Seeding, Mixture TDS	17062-38019	8160005	10/20/00	3.8	1	kg
Seeding, Mixture TDS	17062-38019	8160005	12/20/00	-11.35	1	kg
Sewer Tap, 300 mm	17062-38019	4022204	6/7/00	1	1	ea
Sewer, Cl 1, 450 mm, Tr Det B	17062-38019	4020035	6/6/00	66	1	m
Shoulder, Cl II	17062-38019	3070121	7/17/00	2673.07	1	t
Shoulder, Cl II	17062-38019	3070121	7/18/00	1575.6	1	t
Shoulder, Cl II	17062-38019	3070121	8/5/00	1109.03	1	t
Shoulder, Cl II	17062-38019	3070121	8/10/00	2353.68	1	t
Shoulder, Cl II	17062-38019	3070121	8/11/00	1803.81	1	t
Shoulder, Cl II	17062-38019	3070121	8/16/00	1086.14	1	t
Shoulder, Cl II	17062-38019	3070121	8/17/00	1884.52	1	t
Shoulder, Cl II	17062-38019	3070121	8/18/00	121.43	1	t
Shoulder, Cl II	17062-38019	3070121	8/21/00	119.05	1	t
Shoulder, Cl II	17062-38019	3070121	8/22/00	215.23	1	t
Shoulder, Cl II	17062-38019	3070121	8/24/00	54.25	1	t
Shoulder, Cl II	17062-38019	3070121	9/27/00	0.38	1	t
Sign Cover	17062-38019	8120065	5/15/00	14	1	ea
Sign, Type A, Temp	17062-38019	8120056	5/15/00	0.36	1	m2
Sign, Type A, Temp	17062-38019	8120056	1/29/01	0.36	1	m2
Sign, Type B, Temp	17062-38019	8120057	5/15/00	24.04	2	m2
Sign, Type B, Temp	17062-38019	8120057	5/16/00	11.52	1	m2
Sign, Type B, Temp	17062-38019	8120057	6/15/00	44.82	1	m2
Sign, Type B, Temp	17062-38019	8120057	7/19/00	5.22	1	m2
Sign, Type B, Temp	17062-38019	8120057	1/29/01	23.04	1	m2
Sodding, Cl B	17062-38019	8160002	10/20/00	116.5	1	m2
Steel Sheet Piling, Temp	17062-38019	7040002	5/23/00	3.6	1	m2
Steel Sheet Piling, Temp	17062-38019	7040002	4/6/01	3.6	1	m2
Subbase, CIP	17062-38019	3010002	4/11/01	110	1	m3

Description	CONTID	PIITEM	DDDATE	Sum	# Postings	IUNITS
Subbase, CIP	17062-38019	3010002	6/19/01	8	1	m3
Subgrade Undercutting, Type II	17062-38019	2050042	6/1/00	12.1	1	m3
Subgrade Undercutting, Type II	17062-38019	2050042	7/12/00	137.28	1	m3
Topsoil Surface, Furn, LM	17062-38019	8160045	6/28/00	84.8	1	m3
Topsoil Surface, Furn, LM	17062-38019	8160045	6/30/00	127.2	1	m3
Topsoil Surface, Furn, LM	17062-38019	8160045	7/5/00	127.2	1	m3
Topsoil Surface, Furn, LM	17062-38019	8160045	7/7/00	63.6	1	m3
Topsoil Surface, Furn, LM	17062-38019	8160045	7/11/00	95.4	1	m3
Topsoil Surface, Furn, LM	17062-38019	8160045	7/12/00	137.8	1	m3
Topsoil Surface, Furn, LM	17062-38019	8160045	7/14/00	53	1	m3
Topsoil Surface, Furn, LM	17062-38019	8160045	7/17/00	519.4	1	m3
Topsoil Surface, Furn, LM	17062-38019	8160045	7/21/00	106	1	m3
Topsoil Surface, Furn, LM	17062-38019	8160045	7/27/00	31.8	1	m3
Topsoil Surface, Furn, LM	17062-38019	8160045	8/16/00	21.2	1	m3
Topsoil Surface, Furn, LM	17062-38019	8160045	8/21/00	10.6	1	m3
Topsoil Surface, Furn, LM	17062-38019	8160045	8/22/00	21.2	1	m3
Topsoil Surface, Furn, LM	17062-38019	8160045	8/24/00	31.8	1	m3
Topsoil Surface, Furn, LM	17062-38019	8160045	10/20/00	21.2	1	m3
TS System, Temp, Oper	17062-38019	8120151	7/12/00	1	1	LS
TS, Span Wire Type	17062-38019	8120150	7/12/00	4	1	ea
Underdrain, Subgrade, 150 mm	17062-38019	4040073	7/12/00	35	1	m
Water Repellent Treatment	17062-38019	7060052	8/24/00	354	1	m2
Water Repellent Treatment	17062-38019	7060052	6/21/01	-204	1	m2
Wood Pole	17062-38019	8190900	7/12/00	5	1	ea
Wood Pole, Fit Up, Metered Sec Elec Serv	17062-38019	8190941	7/12/00	1	1	ea

Description	PIITEM	Avg	LL	UL	Min	Max	Count	StDev	COV	Units
_	2057102	472.47	292.23	652.71	10.00	1186.00	17	350.56	0.74	m
_	6037050	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
_	7127050	30.00	-17.39	77.39	10.00	48.00	3	19.08	0.64	ea
_	7157050	14.00	#NUM!	#NUM!	14.00	14.00	1			ea
_	7157051	2.00	#NUM!	#NUM!	2.00	2.00	1			LS
_	8027102	325.00	#NUM!	#NUM!	325.00	325.00	1			m
_	8077050	1.00	#NUM!	#NUM!	1.00	1.00	1			ea
_	8127050	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
_	9217102	25.50	6.44	44.56	24.00	27.00	2	2.12	0.08	m
_	9727102	5.00	#NUM!	#NUM!	5.00	5.00	1			m
_	9747150	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Aggregate Base	3020001	109.74	50.60	168.87	5.52	298.08	10	82.66	0.75	t
Aggregate Base, 100 mm	3020010	81.48	15.16	147.81	55.45	108.80	3	26.70	0.33	m2
Approach, Cl I	3070001	80.50	-71.48	232.47	23.06	144.83	3	61.18	0.76	t
Approach, Cl II	3070021	69.61	27.27	111.94	0.04	203.71	11	63.02	0.91	t
Backfill, Structure, CIP	2060002	12.50	12.50	12.50	12.50	12.50	2	0.00	0.00	m3
Beam Plate, Seal Perimeter	7130025	161.00	#NUM!	#NUM!	161.00	161.00	1			m
Bit Approach	5020200	107.09	41.73	172.45	5.00	326.21	12	102.87	0.96	t
Bit Base Crushing and Shaping	3050001	8039.43	5343.74	10735.12	1097.80	14025.60	13	4460.90	0.55	m2
Bit Mixture, 4 E 1	5020175	1185.45	742.25	1628.64	0.20	3185.77	22	999.60	0.84	t
Bit Mixture, 5 E 1	5020182	1404.89	876.57	1933.20	33.00	2703.07	14	915.01	0.65	t
Bit Quality Assurance Testing	5010003	1468.09	1134.62	1801.55	70.15	3185.77	32	924.91	0.63	t
Bit Quality Initiative	5010001	100147.07	#NUM!	#NUM!	100147.07	100147.07	1			dlr
Bit Surface, Rem	5020006	77.00	77.00	77.00	77.00	77.00	2	0.00	0.00	m2
Bridge Deck Surface Construction	7060325	51.33	-29.02	131.69	15.00	77.00	3	32.35	0.63	m2
Clearing	2010001	1349.75	-349.70	3049.20	1216.00	1483.50	2	189.15	0.14	m2
Conc Barrier, Temp, Adjusted	8120040	116.00	#NUM!	#NUM!	116.00	116.00	1			m
Conc Barrier, Temp, Furn	8120041	116.00	#NUM!	#NUM!	116.00	116.00	1			m
Conc Barrier, Temp, Oper	8120042	116.00	#NUM!	#NUM!	116.00	116.00	1			m
Conc Barrier, Temp, Relocated	8120043	21.00	#NUM!	#NUM!	21.00	21.00	1			m
Conc Pavt, Misc, Reinf, 260 mm	6020160	60.68	4.27	117.08	0.77	108.00	5	45.43	0.75	m2
Conc Quality Assurance	6050100	249.50	#NUM!	#NUM!	249.50	249.50	1			m3
Conc Quality Initiative	6050101	350.98	#NUM!	#NUM!	350.98	350.98	1			dlr
Conc, Bridge Deck Overlay	7060320	8.50	8.50	8.50	8.50	8.50	2	0.00	0.00	m3
Conc, Grade D	7060007	4.50	3.23	5.77	4.40	4.60	2	0.14	0.03	m3
Contractor Staking	1040001	0.14	0.02	0.26	0.02	0.38	7	0.13	0.92	LS
Controller, TS	8200336	1.00	#NUM!	#NUM!	1.00	1.00	1			ea

Description	PIITEM	Avg	LL	UL	Min	Max	Count	StDev	COV	Units
Culv Bedding	4011100	27.90	#NUM!	#NUM!	27.90	27.90	1			m3
Culv End Sect, 900 mm	4011006	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Culv End, Rem	2030005	3.60	2.01	5.19	1.00	8.00	10	2.22	0.62	ea
Culv, Cl 1, 1050 mm	4010006	24.00	#NUM!	#NUM!	24.00	24.00	1			m
Culv, Cl 1, Conc, 450 mm	4010202	7.50	-56.03	71.03	2.50	12.50	2	7.07	0.94	m
Culv, Cl 1, Conc, 600 mm	4010203	9.00	4.26	13.74	5.00	17.00	6	4.52	0.50	m
Culv, Cl 1, Conc, 750 mm	4010204	5.00	#NUM!	#NUM!	5.00	5.00	1			m
Culv, Cl 1, Conc, 900 mm	4010205	5.60	-2.02	13.22	5.00	6.20	2	0.85	0.15	m
Culv, Cl 1, CSP, 600 mm	4010403	34.00	#NUM!	#NUM!	34.00	34.00	1			m
Culv, Cl 1, CSP, 900 mm	4010405	16.50	#NUM!	#NUM!	16.50	16.50	1			m
Culv, Cl 6, 450 mm	4010152	40.90	25.00	56.80	7.00	94.00	17	30.93	0.76	m
Culv, Rem	2030004	2.00	-1.18	5.18	1.00	5.00	4	2.00	1.00	ea
Culv,End Sect,Ellip,1:4,1345X855,Transv	4010926	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Culv,Slp End Sect,1:4,1050 mm,Transv	4010727	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Culv,Slp End Sect,1:4,450 mm,Transv	4010721	5.00	#NUM!	#NUM!	5.00	5.00	1			ea
Culv,Slp End Sect,1:4,600 mm,Transv	4010723	3.00	1.76	4.24	2.00	4.00	5	1.00	0.33	ea
Culv,Slp End Sect,1:4,900 mm,Transv	4010726	2.00	2.00	2.00	2.00	2.00	2	0.00	0.00	ea
Culv,Slp End Sect,1:6,450 mm,Longit	4010741	7.11	4.46	9.75	1.00	20.00	19	5.49	0.77	ea
Culv,Slp End Sect,1:6,600 mm,Longit	4010743	3.00	-3.57	9.57	1.00	6.00	3	2.65	0.88	ea
Curb and Gutter, Bridge Approach	8020009	20.00	20.00	20.00	20.00	20.00	2	0.00	0.00	m
Curb and Gutter, Conc, Det B2	8020018	77.33	35.00	119.66	24.70	150.20	7	45.77	0.59	m
Curb and Gutter, Rem	2040006	80.50	-65.62	226.62	69.00	92.00	2	16.26	0.20	m
Curb, Rem	2040005	44.50	-94.43	183.43	9.50	109.00	3	55.93	1.26	m
Dr Marker Post	4011110	16.50	-129.62	162.62	5.00	28.00	2	16.26	0.99	ea
Dr Structure Cover	4030042	291.75	98.57	484.93	138.00	435.00	4	121.40	0.42	kg
Dr Structure Cover, Adj, Case 1	4030045	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Dr Structure, 1200 mm dia	4030005	2.00	2.00	2.00	2.00	2.00	2	0.00	0.00	ea
Drain Casting Assembly, Type 2	7170011	2.00	2.00	2.00	2.00	2.00	2	0.00	0.00	ea
Driveway Opening, Conc, Det M	8020049	21.80	-12.30	55.90	8.60	36.00	3	13.73	0.63	m
Embankment, LM	2050011	53.18	2.51	103.85	9.90	530.00	21	111.32	2.09	m3
Erosion Control, Check Dam, Stone	2080001	2.00	-10.71	14.71	1.00	3.00	2	1.41	0.71	m
Erosion Control, Silt Fence	2080025	42.35	29.10	55.60	9.00	108.00	20	28.31	0.67	m
Excavation, Earth	2050015	178.58	46.50	310.67	10.36	700.00	12	207.89	1.16	m3
Excavation, Fdn	2060011	12.50	12.50	12.50	12.50	12.50	2	0.00	0.00	m3
False Decking	7060029	19.20	#NUM!	#NUM!	19.20	19.20	1			m2
Fertilizer, Chemical Nutrient, Cl A	8160020	97.68	-4.05	199.40	6.20	145.40	4	63.93	0.65	kg
Flag Control	8120055	0.33	-0.03	0.69	0.25	0.50	3	0.14	0.43	LS

Description	PIITEM	Avg	LL	UL	Min	Max	Count	StDev	COV	Units
Guardrail Approach Terminal, Type 1B	8070061	5.00	-12.21	22.21	1.00	13.00	3	6.93	1.39	ea
Guardrail Departing Terminal, Type B	8070063	3.00	-22.41	28.41	1.00	5.00	2	2.83	0.94	ea
Guardrail Reflector	8070080	74.67	-186.36	335.69	14.00	196.00	3	105.08	1.41	ea
Guardrail, Curved, Type B	8070026	25.00	-140.18	190.18	12.00	38.00	2	18.38	0.74	m
Guardrail, Rem	2040008	396.47	-1021.12	1814.06	65.00	1055.40	3	570.66	1.44	m
Guardrail, Type B	8070002	335.66	-614.53	1285.85	0.13	1230.50	4	597.14	1.78	m
Hand Chipping, Other Than Deck	7120007	0.52	-0.65	1.69	0.06	1.00	3	0.47	0.90	m3
Hand Chipping, Shallow	7120003	2.69	-27.62	32.99	0.30	5.07	2	3.37	1.26	m2
Hand Patching	5020025	45.25	-3.71	94.21	10.00	110.49	5	39.43	0.87	t
High Intensity Light, Type B, Furn	8120045	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
High Intensity Light, Type B, Oper	8120046	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Hydrodemolition, First Pass	7120076	77.00	77.00	77.00	77.00	77.00	2	0.00	0.00	m2
Hydrodemolition, Second Pass	7120077	4.46	-20.19	29.11	2.52	6.40	2	2.74	0.62	m2
Joint Repr, Longit	6030040	509.50	-2813.16	3832.16	248.00	771.00	2	369.82	0.73	m
Joint Waterproofing	7100001	4.47	4.18	4.75	4.40	4.60	3	0.12	0.03	m2
Joint, Expansion, E3	6020066	10.00	10.00	10.00	10.00	10.00	2	0.00	0.00	m
Lighted Arrow, Type C, Furn	8120013	1.33	-0.10	2.77	1.00	2.00	3	0.58	0.43	ea
Lighted Arrow, Type C, Oper	8120014	1.33	-0.10	2.77	1.00	2.00	3	0.58	0.43	ea
Luminaire	8190536	2.00	#NUM!	#NUM!	2.00	2.00	1			ea
Material,Surplus & Unsuitable,Rem,LM	3050045	119.69	36.68	202.69	30.00	240.00	7	89.75	0.75	m3
Minor Traf Devices	8120054	0.33	-0.03	0.69	0.25	0.50	3	0.14	0.43	LS
Mobilization, Max. ____	1000001	0.33	-0.03	0.69	0.25	0.50	3	0.14	0.43	LS
Monument Box	1070001	8.00	#NUM!	#NUM!	8.00	8.00	1			ea
Monument Box, Adj	1070003	1.00	#NUM!	#NUM!	1.00	1.00	1			ea
Monument Preservation	1070005	7.00	#NUM!	#NUM!	7.00	7.00	1			ea
Mulch	8160070	2924.66	-276.27	6125.59	135.00	5383.50	5	2577.93	0.88	m2
Mulch Anchoring	8160072	4752.33	2582.86	6921.80	3755.63	5383.50	3	873.33	0.18	m2
On the Job Training	1100000	385.50	#NUM!	#NUM!	385.50	385.50	1			hr
Patch, Forming	7120017	3.49	-0.08	7.07	0.30	8.00	5	2.88	0.82	m2
Patching Concrete, LM	7120021	0.53	0.11	0.94	0.06	1.00	5	0.33	0.63	m3
Paved Ditch, Bit	8140014	43.00	#NUM!	#NUM!	43.00	43.00	1			m2
Pavt for Butt Joints, Rem	5020010	677.40	#NUM!	#NUM!	677.40	677.40	1			m2
Pavt Joint and Crack Repr, Det 7	5020020	236.67	-182.90	656.24	43.90	358.70	3	168.90	0.71	m
Pavt Mrkg, Overlay Cold Plastic, Only	8110367	4.00	#NUM!	#NUM!	4.00	4.00	1			ea
Pavt Mrkg, Waterborne, 100 mm, White	8110450	39026.00	#NUM!	#NUM!	39026.00	39026.00	1			m
Pavt Mrkg, Waterborne, 100 mm, Yellow	8110451	4980.00	#NUM!	#NUM!	4980.00	4980.00	1			m
Pavt Mrkg,Longit,125 or Less Width,Rem	8120135	5.00	#NUM!	#NUM!	5.00	5.00	1			m

Description	PITEM	Avg	LL	UL	Min	Max	Count	StDev	COV	Units
Pavt Mrkg,Overlay Cold Plas,600,Stop Bar	8110361	16.07	-27.93	60.06	5.10	36.50	3	17.71	1.10	m
Pavt Mrkg,Overlay Cold Plastic,Rt Ar Sym	8110375	6.00	#NUM!	#NUM!	6.00	6.00	1			ea
Pavt Mrkg,Type NR,Tape,100mm,Yellow,Temp	8120088	164.77	111.36	218.18	19.00	402.00	20	114.11	0.69	m
Pavt Mrkg,Waterborne,2nd Appl,100,White	8110470	39027.00	#NUM!	#NUM!	39027.00	39027.00	1			m
Pavt Mrkg,Waterborne,2nd Appl,100,Yellow	8110471	4983.00	#NUM!	#NUM!	4983.00	4983.00	1			m
Pavt, Rem	2040011	71.27	-33.15	175.68	25.00	107.10	3	42.03	0.59	m2
Plastic Drum, Lighted, Furn	8120026	200.00	#NUM!	#NUM!	200.00	200.00	1			ea
Plastic Drum, Lighted, Oper	8120027	100.00	-306.60	506.60	68.00	132.00	2	45.25	0.45	ea
Reinforcement, Steel, Epoxy Coated	7060031	125.00	3.59	246.41	1.86	349.40	8	145.23	1.16	kg
Ride Quality Measurement, Bit	5020251	79.00	#NUM!	#NUM!	79.00	79.00	1			lnkm
Ride Quality, Bit	5020250	136329.88	#NUM!	#NUM!	136329.88	136329.88	1			m2
Scarifying	7120001	77.00	77.00	77.00	77.00	77.00	2	0.00	0.00	m2
Seeding, Mixture TDS	8160005	73.20	-6.43	152.83	3.80	134.60	5	64.13	0.88	kg
Sewer Tap, 300 mm	4022204	1.00	#NUM!	#NUM!	1.00	1.00	1			ea
Sewer, Cl 1, 450 mm, Tr Det B	4020035	66.00	#NUM!	#NUM!	66.00	66.00	1			m
Shoulder, Cl II	3070121	1083.02	465.65	1700.38	0.38	2673.07	12	971.67	0.90	t
Sign Cover	8120065	14.00	#NUM!	#NUM!	14.00	14.00	1			ea
Sign, Type A, Temp	8120056	0.36	0.36	0.36	0.36	0.36	2	0.00	0.00	m2
Sign, Type B, Temp	8120057	21.73	2.93	40.53	5.22	44.82	5	15.14	0.70	m2
Sodding, Cl B	8160002	116.50	#NUM!	#NUM!	116.50	116.50	1			m2
Steel Sheet Piling, Temp	7040002	3.60	3.60	3.60	3.60	3.60	2	0.00	0.00	m2
Subbase, CIP	3010002	59.00	-589.01	707.01	8.00	110.00	2	72.12	1.22	m3
Subgrade Undercutting, Type II	2050042	74.69	-720.59	869.97	12.10	137.28	2	88.52	1.19	m3
Topsoil Surface, Furn, LM	8160045	96.81	27.65	165.98	10.60	519.40	15	124.90	1.29	m3
TS System, Temp, Oper	8120151	1.00	#NUM!	#NUM!	1.00	1.00	1			LS
TS, Span Wire Type	8120150	4.00	#NUM!	#NUM!	4.00	4.00	1			ea
Underdrain, Subgrade, 150 mm	4040073	35.00	#NUM!	#NUM!	35.00	35.00	1			m
Water Repellent Treatment	7060052	354.00	#NUM!	#NUM!	354.00	354.00	1			m2
Wood Pole	8190900	5.00	#NUM!	#NUM!	5.00	5.00	1			ea
Wood Pole, Fit Up, Metered Sec Elec Serv	8190941	1.00	#NUM!	#NUM!	1.00	1.00	1			ea