WEST VIRGINIA DIVISION OF HIGHWAYS
ADMINISTRATIVE OPERATING PROCEDURES
SECTION V, CHAPTER 7

SECTION TITLE: HIGHWAY OPERATIONS
CHAPTER TITLE: MAINTENANCE SCHEDULES

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I. INTRODUCTION

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All Maintenance Supervisors within a maintenance organization will, from time to time, be involved with scheduling: from the Transportation Crew Supervisors who oversee the actual work performance to the District Administrators who develop the long range plans, all levels of maintenance managers are concerned with scheduling. The specific organization Maintenance Supervisor and the personnel that work directly with that supervisor will be committed to the task of preparing actual Weekly Work Schedules. Each supervisor may have

his own preferred scheduling techniques that work best. Nevertheless, there are certain basics that must be utilized in the development of a well-conceived schedule.

Scheduling is the keystone to increased efficiency. Scheduling highway maintenance is not an exact science; many variables must be considered, and often, once the schedule is fully developed, emergency situations interrupt the schedule. To offset such situations, Maintenance Supervisors should always schedule alternate activities. The successful Maintenance Supervisor will prepare his schedules with proper consideration for inclement weather and resource availability.

II. OBJECTIVES RESPONSIBILITIES

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The Maintenance Supervisor must use good management tools and techniques in the scheduling process. The Maintenance Management System provides several good managerial tools that will prove indispensable in scheduling highway maintenance. With a working knowledge of the Maintenance Performance Standards, the Annual Plans, and the Management Work Control Reports, the Maintenance Supervisor can effectively schedule the maintenance operation.

Also critical to good management and successful scheduling are communications and cooperation. There must be adequate cooperation and communications among all levels of Maintenance Supervisors. The Transportation Crew Supervisors are often more familiar with the actual road conditions than the (County) Highway Administrator. The Assistant District Administrator - Maintenance's office is often more aware of long range plans and Citizens' Requests for Assistance, than the (County) Highway Administrator. Good, two−way communications and cooperation among these individuals is therefore essential. Periodic meetings of the Maintenance Supervisors are often the first phase of scheduling.

Once Weekly Work Schedules are developed, and the tasks are assigned to the Crew Supervisors, the important implementation phase of the schedule has begun. Again it becomes very vital to develop good cooperation and communication. The Transportation Crew Supervisors are a very important link in the implementation of maintenance schedules. Regardless of how meticulous a schedule was prepared, if the maintenance forces do not attempt to follow that schedule, the maintenance operation is not operating to maximum efficiency.

III. PERFORMANCE STANDARDS

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The Performance Standards are important in preparing a weekly schedule. Performance Standards provide the Supervisor four basic aids:

1. Performance Criteria - when to schedule
2. Size of Crew to schedule
3. Necessary Equipment to schedule
4. Materials that will be needed

A. PERFORMANCE CRITERIA

The Performance Criteria shows the most appropriate time to plan the work. The Performance Criteria itself must be used to prepare the schedule on a weekly basis. For example, the Performance Criteria section of the Performance Standard for Activity 201 - Patching Bituminous Pavements states:

"All permanent repairs should be scheduled and performed as soon as possible when weather conditions permit. The type of maintenance performed will be dictated by the condition of pavement, shoulder and approaches when hot-mix is used. Base temperature should be above 40°F/4°C and the surface dry."

Using these criteria as a guide for when to perform the activity, the Supervisor should know whether or not he or she needs to schedule the work. As another example the Performance Criteria for Activity 244 - Joint & Crack Sealing In PCC Pavement is:

"Perform when joint openings and cracks are 1/4" wide or larger and when air temperature is below 50°F/10°C. Top of seal should be approximately 1/4" below top of pavement surface."

This means that if the Supervisor has some sections of pavement cracks large enough to fill, then he/she would schedule the activity for that particular week, depending of course on the priority of this and other activities.

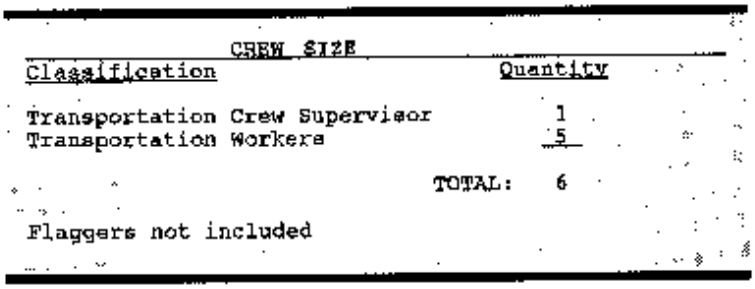
In preparing the weekly schedule, the Supervisor should consult the Performance Criteria to see when the activity should be performed.

B. CREW SIZE

This is probably the most important section of the Performance Standard to use for scheduling. It lists the number of men that should be scheduled for that activity.

It should be noted that the crew size listed in the Performance Standards is based on a predetermined number of daily accomplishments for that activity. If more accomplishments are desired, the crew size will likely be increased. This will also

be true for equipment needs. The crew size block for Activity 201 - Patching Bituminous Pavements looks like this:



CREW SIZE

Classification	Quantity
Transportation Crew Supervisor	1
Transportation Workers	5
TOTAL:	6

Flaggers not included

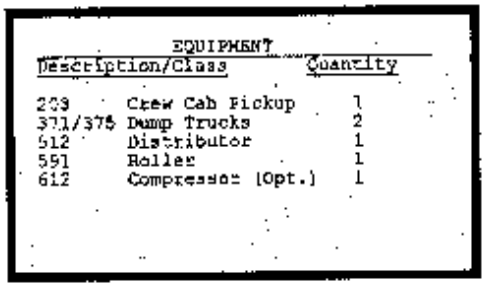
As shown, the Crew Size needed is one Transportation Crew Supervisor and five Transportation Workers, for a total crew size of six.

The designation of the number of men needed under each classification does not limit the Supervisor to scheduling only that crew. It merely states the ideal combination of job classifications. Depending on the availability, the Supervisor may schedule any combination of Transportation Workers provided that each is properly qualified. What the Supervisor should be looking at primarily is the total crew size.

At the bottom of the crew size block is the note "**FLAGGERS NOT INCLUDED**". This means that the Flaggers are not included as part of the total crew size. If a crew is performing Activity 201 on a road with a high traffic count, then the total crew size would be eight; however, as with all activities, the Flaggers are charged to a separate Flagger Activity and not to the specific crew activity with which they are working.

C. EQUIPMENT

Scheduling equipment is much like scheduling men. The Supervisor must consider what is available to him and what pieces of equipment are capable of performing the job. The equipment block of the Performance Standard for Activity 207 - Hand Patching & Sealing With Asphalt & Aggregate looks like this:



EQUIPMENT

Description/Class		Quantity
209	Crew Cab Pickup	1
371/375	Dump Trucks	2
512	Distributor	1
591	Roller	1
612	Compressor (Opt.)	1

The number of Dump Trucks is listed as two. Crew Cab Pickup Truck is one, Distributor one, Roller one, and Compressor one, which is also listed as optional.

The Supervisor will schedule these pieces of equipment according to the particular needs of the project and the availability of the equipment.

When scheduling equipment for different activities, the Supervisor must look at the class and type of equipment which is needed to do the job and the equipment which he/she has available to schedule. Maximum usage of equipment is the objective. Proper scheduling techniques could allow usage of a piece of equipment on more than one job during the day. If a piece of equipment is needed for only two hours at the start of the day on a particular job, the other six hours should be scheduled for another activity.

Moving the equipment to another project with the proper timing for the least amount of idle time will require the coordination of the Transportation Crew Supervisor involved as well the Supervisor and will require good scheduling techniques beforehand.

D. **MATERIALS**

The materials listed in the Performance Standards are the materials generally required for the performance of the specific Activity. Some of the materials listed may not be needed or materials other than those listed may have to be used. This will depend on the particular job. The Supervisor must make sure that the proper materials are at the job site when the project is ready to begin. If operators and equipment are available, some materials such as steel, guardrail and lumber can be delivered and left at the job site beforehand. Again, proper scheduling techniques and coordination between supervisory levels are needed to assure that all necessary materials are available and on hand for the job.

The Performance Standards then help the Supervisor decide **WHEN** to schedule and **WHAT** to schedule in the way of resources: manpower, equipment and materials. By knowing the size of the job and the work conditions, the Supervisor can estimate the length of the job and thus know how many days to schedule the crew. The organizational Supervisor, working with his/her Crew Supervisor, should consider the Performance Standards as a required tool in preparing the weekly schedule.

IV. **ANNUAL WORK PLAN**

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The Annual Work Plan shows the number of accomplishments, estimated man hours and estimated cost of each activity planned. In order for this Plan to be of use, the Supervisor must work toward achieving the work in the time provided in the Plan. Therefore, in making up a weekly schedule the Maintenance Supervisor should try to schedule and accomplish what was set forth in the Annual Work Plan.

The Supervisor will not always be able to schedule activities according to the Annual Work Plan, due to extraordinary circumstances, and this Plan does not limit the Supervisor to only those activities planned. Emergencies and higher priority activities could very possibly disrupt the Plan. However, the Plan does provide a basic guideline of what is to be accomplished in the given period. The Supervisor must use his/her knowledge and experience to arrive at a well developed schedule.

V. WORK CONTROL REPORTS

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A Work Control Reporting System is, just as the title implies, a system of reporting which the Supervisor can use for controlling the work within his/her organization. These reports give the Supervisor invaluable information on manpower, equipment and materials usage, crew efficiency, budgetary status and other important information necessary for the Supervisor to be an effective manager. One very important use to be made of these reports is scheduling.

There are two reports that the Supervisor will have available:

1. Field Production/Cost Report
2. Key Ranking Report

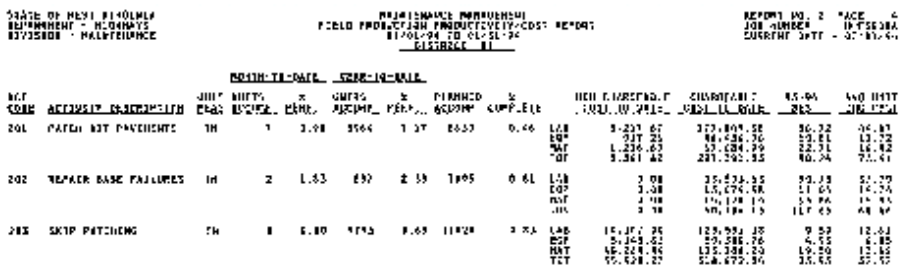
The following illustrates how each can be used for developing an effective schedule.

A. FIELD PRODUCTION/COST REPORT

The Field Production Cost Report is updated in the Central Office the night of each working day. Daily processing is for the previous day's information. Monday night's processing includes Friday, Saturday and Sunday. Holidays are processed in combination with the day or days prior to the holiday.

Two forms of the Field Production Cost Report are available to managers. One can be accessed on the computer screen via CICS, HWIQ, Item #12. This screen version provides the most recent data as processed by the Central Office. For example, the information in the "Month To Date" section will be reflective of accomplishments performed from the beginning of the current MONTH through the latest processed day by the Central Office. Information in the "Year-to-Date" section will contain accomplishments performed from the beginning of the FISCAL YEAR through the latest processed day by the Central Office.

The second is in the form of a hard copy that is submitted to the Districts from the Central Office each month. This hard copy is then distributed to the annual plan organizations. The hard copy provides the information for the five month as well as the Year to Date information through the same period. The following is an example of the hard copy Field Production Cost Report.



The cost information is given at the far right of the report. There are four columns as follows:

The first column is the "Nonchargeable Cost To Date" information. This column represents activity expenditures that were funded by sources "other" than Annual Plan funds such as special authorizations.

The second column is "Chargeable Cost To Date". This column represents expenditures using Annual Plan funds allocated to the organization.

The third column reflects the current Basic Expense Standard Costs. This Standard was developed before the year began, in preparing the Plan with estimated costs.

The fourth column reflects the actual cost of the activity to your organization, based on the number of accomplishments reported as compared to the money expended. This information is very beneficial to the Supervisor because he/she can monitor expenditures by resource (labor, equipment & material) as compared to the current Basic Expense Standard.

The Field Production Cost Report will give the Supervisor the status of the work completed up to the end of the particular reporting period as well as the status of the current Plan. This will enable the Supervisor to monitor **WHAT WORK HAS ALREADY BEEN DONE** in addition to **WHAT WORK IS LEFT TO DO.**

The Field Production/Cost Report also provides the Supervisor with information on the effectiveness of his manpower. Percent performance is given for the monthly period in addition to the year-to-date period. This information compares actual man-hours used to the standard productivity as found in the Performance Standards. Standard productivity is the number of man-hours required to perform a given unit of accomplishment. Percent performance can be high or low; thus indicating the work is being performed too rapidly or too slowly. A range of 75% to 110% is usually considered acceptable. It is important to remember that Central Office processing of daily information will cause the productivity to fluctuate from day to day for any reported activity. This is true only for the "on screen" Field Production Cost Report available through CICS. The Supervisor must consider working conditions and many other factors in estimating the daily production of a crew, but by knowing this data for the last reporting period and for the year-to-date period, the time needed to complete activities on future projects can be more closely estimated.

B. KEY RANKING REPORT

The Key Ranking Report was developed to monitor major activities, often referred to as "gut" maintenance activities. This report contains selected activities for the following categories:

BY DISTRICT

1. County Maintenance Organizations
2. Expressway Maintenance Organizations
3. SRIC Support Operations
4. Organizational Overhead

STATEWIDE

5. Roadway Striping Activity

For each of the categories listed above the following information is given.

Example (County Maintenance Organizations)

ACTIVITY 201 PATCH BIT PAVEMENTS

DISTRICT 08

STANDARD PRODUCTIVITY: 4.00
YTD STATEWIDE AVERAGE PRODUCTIVITY: 2.610 166%

ORGANIZATION	%PERCENT PERFORMANCE TO DATE	YTD UNITS ACCOMPLISHED	YTD COST	PLANNED UNITS
0838	13%	12	$4,722.94	100
0847	46%	53	$3,162.57	500
0842	88%	922	$60,457.08	2100
0856	152%	205	$11,912.05	50

%PERCENT PERFORMANCE AS COMPARED TO YTD STATEWIDE AVERAGE PRODUCTIVITY.

All the information found on this report has been taken from the Field Production/Cost Report except for the "Percent Performance To Date" as noted on the Report. The "Percent Performance to Date" on this report is not compared to Standard Productivity, but is compared to the Statewide actual average productivity. This will enable the Supervisor to compare his/her organization's percent performance with the rest of the state. Standard Productivity is also found on the report for informational purposes.

Valuable information such as Year-To-Date Cost and Planned Units of Accomplishments can be obtained from this report also. The Work Control Reports are helpful in developing a weekly schedule. For a more defined review of the Work Control Reports refer to Section V, Chapter 6 of the DOH Administrative Operating Procedures.

VI. DEVELOPING A WEEKLY SCHEDULE AND COMPLETING THE FORM OM-41

Effective: 5/1/2006

The scheduling tools that the Maintenance Management System gives to the Supervisor have been reviewed. Now the Supervisor must make use of these along with his/her own experience and knowledge to develop a good work schedule. The Maintenance Schedule Worksheet, OM 41, shown on Exhibit I, is a sample of an organization's weekly schedule. Completion of the form will be discussed by each item and reference will be made to the sample schedule.

Number of Men Assigned − This is the number of men in the field working force of the organization. This will not include the Organizational Maintenance Supervisor, Office Assistants, or in some cases County Highway Maintenance Assistants. The only time that a County Highway Maintenance Assistant is included is when that position functions as a working crewmember. The same applies to the Transportation Crew Supervisor. Watchmen and Janitors would not be included unless they are on shifts and a schedule is needed to show the changes in shifts. The number of men assigned is the number of men that will be scheduled to perform maintenance tasks.

Number of Work Days During Period - This is the number of days to be scheduled. A full workweek contains five eight hour or four ten hour working days. If a holiday had occurred between April 10th and April 14th, then the number of working days would have been four on the sample OM 41, and no work assignments would have been scheduled for that day.

Total Man-Days Available - Spreadsheet formulas determine the total man-days available by multiplying the number of men assigned by the number of work days during period.

Unavailable Time - This area is utilized to calculate the amount of leave that is anticipated for the scheduling period. Some Sick and Annual Leave cannot accurately be scheduled. Properly managed, planned Annual Leave, training, and jury duty can be scheduled, allowing the Supervisor advance knowledge of "Unavailable Time".

In the example, the Webster County Highway Administrator knows that one employee has requested Annual Leave for the week and this organization's historical data points to another five days of unexpected leave. This is a total of ten man-days of leave for the week.

Number of Man-Days Available - Spreadsheet formulas determine the number of man days available by subtracting the man days less the man days of planned leave.

Period From - Enter the scheduling period. The scheduling period will generally be for one week and will run from Monday to Friday. If Saturday work is planned, then additional forms can be prepared.

Scheduled By - The name of the person completing the schedule will appear here.

Schedule Approved - The person designated by the District Administrator to review and approve the schedule. The schedule should be reviewed to see that all man days available are scheduled and that the schedule is a good and workable one.

Remarks - Any remarks pertinent to the schedule, such as reminders of upcoming holidays, should be noted by the appropriate authority and returned to the organizational Supervisor.

Number of Hours in Workday – The number of hours scheduled each day. Eight (8) or ten (10) hour shifts are available. If both shifts are scheduled, then an additional form must be prepared.

Organization Name and Number – The organization name and number is entered into this field.

Activity / Estimate Type – Enter in or use the drop down box to select the activity and estimate type. The number of the particular activity to be performed will be placed in the Activity field. Refer to the Maintenance Performance Standards Manual for a complete listing of maintenance activities. The Estimate Type is determined by either selecting option (1) Quantity known or option (2) Crew Days known.

Estimate – Enter the approximate quantity or crew days needed to complete the maintenance.

Route Number - The Route Numbers should be listed in the order in which the work should progress on them. This will allow the Crew Supervisor to know approximately what location he/she will be on a certain day.

Work Description / Location − A brief description of the activity is automatically provided. The location of the work on a particular route should be noted. Milepost markers are the best way to identify a location; however, if these are not available, intersections, geographic or other permanent markers can be listed.

Estimated Quantity - Spreadsheet formulas retrieve this information from the Performance Standards based on the values in the estimate and estimate type fields. Quantities should be estimated in order to determine the resources and time it would take to perform the work.

Crew Size / Flaggers Needed - The Maintenance Supervisor can make use of the Performance Standards or Work Control Reports to help determine this data. The spreadsheet formulas retrieve the standard crew from the Performance Standards list, and this is the crew that the Supervisor should strive for. Work Control Reports may show that in certain situations the productivity may increase by adding or taking away a worker using the second field. The Supervisor must fit the crew to the particular situation. Traffic conditions and the particular activity will dictate the use of Flaggers. Remember, Flaggers are in addition to the standard crew. The total amount of flaggers accumulates at the bottom of the OM-41 for easy reference.

Estimated Man-Days - The estimated man days for each activity are automatically retrieved from the Performance Standards. For Activity 201, for example, the Supervisor estimated the job would take five days. The calculation is as follows:

6 Men x 5 Days = 30 Man Days

Equipment/Comments - After the activities to be scheduled and estimated man days for each have been determined, the Supervisor will have to list the equipment quantities used and/or comments. The Crew Supervisor who is to perform the activity should be listed with the

number of additional men needed. Under the Crew Supervisor's name, the quantity and type of equipment can be listed so the Crew Supervisor will know ahead of time what equipment is needed. Additional comments including: travel time, work evaluation, and explanations of miscellaneous work may be included for clarification purposes.

Total Man-Days Scheduled - The estimated man days for each activity is automatically totaled by formula, which provides the total man days available. The man days scheduled for each work day should equal 28 man days. These figures should be double-checked to assure that all available men are scheduled. The total man-days scheduled will appear in red text if the amount exceeds the number of man-days available or if it is outside of the scheduled target of 90% of the number of man-days available.

Alternate Activities - Enter in or use the drop down box to schedule alternate activities each week. Schedule adjustments are usually necessary in each scheduling period due to factors such as inclement weather, unexpected sick leave, etc. If alternate activities are listed, adjustments can be made with minimum lost time. Reference can be made to Exhibit I as a typical summertime schedule with conforming alternate activities listed and Exhibit II as a typical wintertime schedule with conforming alternate activities listed. Experience and knowledge gained will permit the Supervisor to cope with these problems when they occur.

TIMELY SUBMISSION AND POSTING

The Work Schedule (OM-41) must be prepared and posted two weeks in advance of the proposed work week. The Work Schedule must be submitted to the appropriate District Manager for review. All revisions will be posted on the schedule as soon as possible. The Work Schedule shall remain posted for a period of one week after the scheduled work is completed.

Posting the maintenance schedule in this manner will allow the maintenance employees to have sufficient notice of proposed work and be able to provide input beneficial towards accomplishment of the tasks. Additionally, the workers will be able to review the Supervisor's comments regarding the quality of the work accomplished.

VII. **EXHIBITS**

EXHIBIT I

MAINTENANCE SCHEDULE WORKSHEET (FORM OM-41)
TYPICAL SUMMERTIME SCHEDULE

Form OM-41
(Rev. 5/06)

Maintenance Schedule Worksheet

Help

Number Of Men Assigned		Number of Work Days in Period		Total Man-Days Available
30	X	5	=	150
Unavailable Time				-10
Number Man-Days Available				140

PERIOD:	FROM / TO	04/10/06	04/14/06
Scheduled By:	John Doe		
Approved By:	J.B. Harris		
Remarks:	Consider patching SL5 15/10 while in the area.		
Number of Hours in Workday:			8

Organization Name & Number:

Activity/ EstType	Est.	Route Numbers	Work Description / Location	Estimated Quantity	Crew Size Flaggers		Estimated Crew Days	Estimated Man Days
Unavailable Time			Includes Planned AL, SL, Greivance, Training	**80 EH**	**5**		**2**	**10**
201	60	20 MP13 - MP25	Patching of Bituminous Pavements	**60**	**6**		**5**	**30**
1				**TN**	**2**			
Equipment/Comments:								
261	300	28/2, 22, 20/2, 22/1	Stabilization -- Roadway	**300**	**5**	**6**	**4**	**24**
1				**TN**	**2**			
Equipment/Comments:								
262	5	15	Ditching and Blading -- Unpaved Roadway	**18**	**4**		**5**	**20**
2				**MI**	**2**			
Equipment/Comments:								
305	4	42	Brush Control -- Machine	**4**	**2**		**2**	**4**
1				**AC**	**2**			
Equipment/Comments:								
281	5	10, 32	Minor Drainage Structures	**160**	**4**		**5**	**20**
2				**EH**	**2**			
Equipment/Comments:								
				0	**0**		**0**	**0**
1								
Equipment/Comments:								
				0	**0**		**0**	**0**
1								
Equipment/Comments:								
				0	**0**		**0**	**0**
1								
Equipment/Comments:								
813			Flagging	**336**	**1**		**42**	**42**
				EH				
Equipment/Comments:								
TOTAL MAN-DAYS SCHEDULED								**140**

Alternate Activities

Activity	Description	Location / Comments
815	Cleaning of Equipment	

EXHIBIT II

MAINTENANCE SCHEDULE WORKSHEET (FORM OM-41)
TYPICAL WINTERTIME SCHEDULE

Form OM-41
(Rev. 5/06)

Maintenance Schedule Worksheet

Help

Number Of Men Assigned		Number of Work Days in Period		Total Man-Days Available
30	X	5	=	150
Unavailable Time				-10
Number Man-Days Available				140

PERIOD:	FROM / TO	02/06/06	02/10/06
Scheduled By:	John Doe		
Approved By:	J.B. Harris		
Remarks:			
Number of Hours in Workday:			10

Organization Name & Number:

Activity/ EstType	Est.	Route Numbers	Work Description / Location	Estimated Quantity	Crew Size Flaggers		Estimated Crew Days	Estimated Man Days
Unavailable Time			Includes Planned AL, SL, Greivance, Training	**100 EH**	**2**		**5**	**10**
209	30	10, 14, 16, 20/1	Temporary Patch -- Cold Mix	**30**	**3**	**5**	**5**	**25**
1				**TN**	**2**			
Equipment/Comments:								
281	160	15, 15/2, 20, 20/3	Minor Drainage Structures	**160**	**4**		**4**	**16**
1				**EH**	**2**			
Equipment/Comments:								
304	5	16, 20/1	Brush Control -- Hand	**250**	**5**		**5**	**25**
2				**EH**	**2**			
Equipment/Comments:								
305	30	10, 14, 19, 19/2	Brush Control -- Machine	**30**	**2**	**5**	**5**	**25**
1				**AC**	**2**			
Equipment/Comments:								
				0	**0**		**0**	**0**
1								
Equipment/Comments:								
				0	**0**		**0**	**0**
1								
Equipment/Comments:								
				0	**0**		**0**	**0**
1								
Equipment/Comments:								
				0	**0**		**0**	**0**
1								
Equipment/Comments:								
813			Flagging	**380**	**1**		**38**	**38**
				EH				
Equipment/Comments:								
TOTAL MAN-DAYS SCHEDULED								**129**

Alternate Activities

Activity	Description	Location / Comments
341	Mechanical Application of SRIC Materials	