

# Documentation of a Natural Event Due to High Winds <br> October 28, 2003 Kennewick and Walla Walla, Washington 

04-02-007
April 6, 2004

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# Documentation of a Natural Event Due to High Winds October 28, 2003 Kennewick and Walla Walla, Washington 

Prepared by:
Washington State Department of Ecology
Air Quality Program

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## Summary

On October 28, 2003, the Federal Reference Method monitors in Kennewick and Walla Walla, Washington measured concentrations of 1,438 and 1,338 micrograms per cubic meter ( $\mu \mathrm{g} / \mathrm{m}^{3}$ ), respectively, for particulate matter 10 microns and smaller in size $\left(\mathrm{PM}_{10}\right)$. These concentrations exceeded the primary 24-hour $\mathrm{PM}_{10}$ National Ambient Air Quality Standard (NAAQS) of 150 $\mu g / \mathrm{m}^{3}$.

The Washington State Department of Ecology (Ecology) has determined that the Kennewick and Walla Walla exceedances were due to a natural event caused by high winds. Thus, these data points should be excluded from assessments of the attainment status for the areas. Ecology flagged the data points for October 28, 2003 in the AIRS database maintained by the U.S. Environmental Protection Agency (EPA) to indicate a natural event was involved.

Ecology and the Benton Clean Air Authority determined to provide natural event documentation in one account, due to the regional nature of this high wind event. Thus, this documentation is being submitted to EPA in support of the data flags for EPA's acknowledgement and flagging of the data points.

## Natural Events Policy

EPA issued the policy on "Areas Affected by PM-10 Natural Events" (hereafter referred to as Natural Events Policy or NEP) on May 30, 1996. EPA's reasons for issuing the NEP are described in the following terms:

> In issuing the natural events policy, EPA now believes that, under certain circumstances, it is appropriate to again exclude PM-10 air quality data that are attributable to uncontrollable natural events from the decisions regarding an area's nonattainment status.

Under the policy, ambient $\mathrm{PM}_{10}$ concentrations raised by unusually high winds are treated as uncontrollable natural events when the dust originates from nonanthropogenic (other than human- caused) sources, or when the dust originates from contributing anthropogenic sources controlled with best available control measures (BACM).

After natural events cause the $\mathrm{PM}_{10}$ concentration to violate the $\mathrm{PM}_{10}$ NAAQS, the NEP requires a state to develop a natural events action plan (NEAP) to deal with future exceedances. The NEP specifies that the NEAP is available for public review and comment. A state submits the NEAP to EPA for review and comment.

Under the NEP, when a state has reason to believe that natural events have caused monitored exceedances of the $\mathrm{PM}_{10}$ standard, the state is responsible for establishing a clear causal relationship between the natural event and the exceedance. Documentation of the natural event should be sufficient to demonstrate that the natural event occurred and that it impacted a particular monitoring site. The documentation should provide evidence that concentrations at the monitoring site would not have exceeded the $\mathrm{PM}_{10}$ standard in the absence of a natural event.

## Ecology's Response to High Wind Events on the Columbia Plateau

During the late 1980s and early 1990s, a large number of exceedances of the 24-hour standard for $\mathrm{PM}_{10}$ were recorded in Spokane, Kennewick, and Wallula, Washington. Detailed examination of these exceedances showed a close correlation to high wind events. Upwind agricultural fields were identified as the chief source of the windblown dust. Accordingly, Ecology developed the Natural Events Action Plan for High Wind Events in the Columbia Plateau in March 1998, to deal with high wind natural events in eastern Washington.

EPA's NEP identifies various criteria states are expected to address in a NEAP, including a commitment to re-evaluate the NEAP every five years. Ecology completed a re-evaluation and submitted a revised NEAP to EPA in June 2003. The Columbia Plateau NEAP continues to address the NEP by providing for:
$>$ Notification of citizens when air quality is likely to be impaired due to high wind events.
> Advice to citizens on steps to minimize exposure.
$>$ Development of a program to identify and implement controls for anthropogenic sources of windblown dust in the Columbia Plateau.

As well, based on the re-evaluation, several changes were incorporated into the 2003 NEAP. Significant changes include a more refined definition for a high wind event and a finding that BACM is in place throughout the Columbia Plateau.

The 2003 NEAP refined the definition of a high wind event for Washington State in accordance with the provisions of the NEP allowing the states to determine this definition. This provision recognizes the multiple variables that affect the wind erosion processes that result in windblown dust and the generation and transport of $\mathrm{PM}_{10}$.
" $A$ high wind event occurs when the wind entrains and suspends dust to the extent that concentrations of $P M_{10}$ are elevated. This typically occurs when the average hourly wind speed at 33 ft is 18 miles per hour or greater for two or more hours; or in excess of 13 miles per hour for two hours or more hours when conditions of higher susceptibility to wind erosion exist. A high wind event that exceeds the $P M_{10}$ standard is a natural event."

The Columbia Plateau NEAP documents the research and explains the logic behind this "high wind event" definition. The high wind event definition necessarily includes the concept that the intensity of the wind event is a combination of wind speed and significant duration (sustained wind).

The state of Washington finds that windblown dust from agricultural fields is still a significant contributing source of $\mathrm{PM}_{10}$ exceedances throughout the Columbia Plateau. The soil is very fine with low organic content. This, coupled with low precipitation weather patterns, means very dry soil that is highly susceptible to wind erosion.

The 2003 NEAP identified BACM for agricultural fields as conservation programs and practices that reduce or minimize wind erosion. Specifically, this means USDA Conservation Title Programs supplemented by incentive based implementation of wind-erosion conservation practices or best management practices (BMPs).

Washington State evaluated BACM implementation for agricultural fields in the 2003 NEAP. Based on the evaluation, Washington State views these levels of wind erosion control as sufficient to fulfill BACM criterion of the NEP. A 2003 Annual Status Report regarding BACM implementation is found in Appendix B.

## Evaluation of the October 28, 2003 Exceedances on the Columbia Plateau, Washington

\author{

1. Kennewick and Walla Walla $\mathrm{PM}_{10}$ Data
}

The Kennewick monitor operated on a daily monitoring schedule throughout 2003. The average $\mathrm{PM}_{10}$ concentration was $30 \mu \mathrm{~g} / \mathrm{m}^{3}$. Monthly maxima ranged from a low of $10 \mu \mathrm{~g} / \mathrm{m}^{3}$ in January, to a high of $41 \mu \mathrm{~g} / \mathrm{m}^{3}$ in October, after the October 28, 2003 natural event value is excluded. The October average concentration is $92 \mu \mathrm{~g} / \mathrm{m}^{3}$ prior to excluding the October 28, 2003 natural event value.

The October 28, 2003 concentration of $1,438 \mu \mathrm{~g} / \mathrm{m}^{3}$ was one of three monitored exceedances of the $\mathrm{PM}_{10}$ NAAQS for the year in Kennewick, the other two being monitored concentrations of $186 \mu \mathrm{~g} / \mathrm{m}^{3}$ and $164 \mu \mathrm{~g} / \mathrm{m}^{3}$ on March 5, 2003 and November 10, 2003, respectively. The exceedances of March 5, 2003 and November 10, 2003 have been flagged as natural events due to high winds.

The Walla Walla monitor operated on a 1-in-3-day monitoring schedule throughout 2003. The average $\mathrm{PM}_{10}$ concentration was $39 \mu \mathrm{~g} / \mathrm{m}^{3}$. Monthly maxima ranged from a low of $8 \mu \mathrm{~g} / \mathrm{m}^{3}$ in April, to a high of $48 \mu \mathrm{~g} / \mathrm{m}^{3}$ in August, after the October 28, 2003 natural event value is excluded. The October average concentration is $181 \mu \mathrm{~g} / \mathrm{m}^{3}$ prior to excluding the October 28, 2003 natural event value.

The October 28, 2003, concentration of $1,338 \mu \mathrm{~g} / \mathrm{m}^{3}$ was one of two monitored exceedances of the $\mathrm{PM}_{10}$ NAAQS for the year in Walla Walla, the other being a monitored concentration of $165 \mu \mathrm{~g} / \mathrm{m}^{3}$ on November 11, 2003. The exceedance of November 11, 2003 has been flagged as a natural event due to high winds.

## 2. Kennewick and Walla Walla Meteorological Data

National Weather Service (NWS) data for Kennewick (Tri-Cities Airport) and Walla Walla (Walla Walla Regional Airport) shows high winds consistently from the south-southwest through west for the majority of the day on October 28, 2003. Wind speeds during this time ranged from the low 20s to the upper 30s; gusts ranged from 25 to 51 mph . The meteorological data is found in Appendix B.
A. Kennewick Meteorological Data

Data from the Tri-Cities Airport at Pasco shows windy and gusty conditions from about 0900 to 2200 hours, October 28, 2003, Pacific Standard Time (Table 1). Wind speeds ranged from 20 to 37 mph ; gusts ranged from 25 to 46 mph . For 14 consecutive hours the high winds ranged in direction from the south-southwest through west. The data shows the winds at Kennewick met Ecology's definition for a high wind event:
"A high wind event occurs when the wind entrains and suspends dust to the extent that concentrations of $P M_{10}$ are elevated. This typically occurs when the average hourly wind speed at 33 ft is 18 miles per hour or greater for two or more hours; or in excess of 13 miles per hour for two hours or more hours when conditions of higher susceptibility to wind erosion exist. A high wind event that exceeds the $\mathrm{PM}_{10}$ standard is a natural event."

Table 1. Select Pasco Wind Observations, October 28, 2003

| Time (PST) | Wind Direction | Wind Speed (mph) | Peak Wind Speed (mph) |
| :---: | :---: | :---: | :---: |
| 0853 | SW $\left(220^{\circ}\right)$ | 20 | 25 |
| 0953 | SW $\left(230^{\circ}\right)$ | 23 | 29 |
| 1053 | SW $\left(230^{\circ}\right)$ | 32 | 39 |
| 1153 | SW $\left(230^{\circ}\right)$ | 36 | 44 |
| 1253 | SSW $\left(210^{\circ}\right)$ | 25 | 37 |
| 1353 | WSW $\left(250^{\circ}\right)$ | 30 | 40 |
| 1453 | SW $\left(230^{\circ}\right)$ | 21 | 29 |
| 1553 | WSW $\left(240^{\circ}\right)$ | 37 | 46 |
| 1653 | WSW $\left(250^{\circ}\right)$ | 29 | 40 |
| 1753 | WSW $\left(240^{\circ}\right)$ | 32 | 45 |
| 1853 | WSW $\left(240^{\circ}\right)$ | 32 | 39 |
| 1953 | W $\left(260^{\circ}\right)$ | 24 | 36 |
| 2053 | WNW $\left(290^{\circ}\right)$ | 32 | 41 |
| 2153 | NW $\left(310^{\circ}\right)$ | 25 | 33 |

Wind speeds, gusts and wind direction at Pasco and Walla Walla, Washington from 2000, October 27, 2003, to 0000, October 29, 2003 are displayed in Figures 1 and 2.

## B. Walla Walla Meteorological Data

At Walla Walla, Washington high winds and gusty conditions were observed for eight consecutive hours, from 1053 to 1753, on October 28, 2003. Wind speeds ranged from 21 to 36 mph ; gusts ranged from 26 to 51 mph (Table 2). Winds were primarily from the west, southwest

Wind speeds, gusts and wind direction, Pasco, WA
2000(PST), October 27, 2003-0000(PST), October 29, 2003


Figure 1
Wind speeds, gusts and wind direction, Walla Walla, WA
2000(PST), October 27, 2003-0000(PST), October 29, 2003


Figure 2
and southwest. The data shows the winds at Walla Walla met Ecology's definition for a high wind event.

Table 2. Select Walla Walla Wind Observations, October 28, 2003

| Time (PST) | Wind Direction | Wind Speed (mph) | Peak Wind Speed (mph) |
| :---: | :---: | :---: | :---: |
| 1053 | SW $\left(230^{\circ}\right)$ | 21 | 26 |
| 1153 | SW $\left(230^{\circ}\right)$ | 22 | 31 |
| 1253 | WSW $\left(250^{\circ}\right)$ | 32 | 43 |
| 1353 | SW $\left(230^{\circ}\right)$ | 36 | 51 |
| 1453 | WSW $\left(250^{\circ}\right)$ | 36 | 47 |
| 1553 | WSW $\left(240^{\circ}\right)$ | 30 | 40 |
| 1653 | WSW $\left.\left(240^{\circ}\right)^{\circ}\right)$ | 35 | 46 |
| 1753 | SW $\left(230^{\circ}\right)$ | 23 | 31 |

## C. Additional Meteorological Data

1. Table 3 summarizes precipitation data from several reporting meteorological stations in the vicinity of Pasco and Walla Walla, Washington. These sites are operated by Washington State University’s Public Agricultural Weather System (PAWS) and the National Weather Service (NWS). The sites are generally located in an arc ranging from south, southwest to west, upwind of Kennewick and Walla Walla, Washington, with respect to the direction of the prevailing winds on October 28, 2003. None of the sites are greater than about 25 miles of either Kennewick or Walla Walla. A map showing the location of each site as well as the precipitation data is found in Appendix B.

The data show October $17^{\text {th }}$ and October 20th as the most recently recorded precipitation at Walla Walla and Kennewick, Washington, respectively, prior to the high wind event.

Table 3. Precipitation prior to a Natural Event due to high winds, October 28, 2003 (inches)

| STATION: | Precipitation (inches) |  |  |  |
| ---: | :---: | :---: | :---: | :---: |
|  | October 28, 2003 | 72 hrs prior to event <br> day (10/28/03) | Last measured prior <br> to 72 hr. period | \# Days w/o precipitation <br> prior to event day |
| Wasco (NWS) | 0 | 0 | $0.03(10 / 20)$ | 8 |
| Walla (NWS) | 0 | 0 | $0.16(10 / 17)$ | 11 |
| Badger Canyon | 0 | 0 | NA | $>30$ |
| College Place | 0 | 0 | $0.06(10 / 16)$ | 12 |
| R. Eby | 0 | 0 | $0.09(10 / 15)$ | 13 |
| Finley | 0 | 0 | NA | $>30$ |
| Touchet | 0 | 0 | NA | $>30$ |

Data from the seven sites was analyzed in order to assess the general vulnerability of soils to high winds. The data shows that none of the sites recorded precipitation within 72 hours prior to the high winds on October 28, 2003. Three of the seven sites report no precipitation for over 30 days prior to the high winds.

October 2003 precipitation data from six of the seven sites was compared to long-term mean precipitation for the same time period in order to further assess the likelihood that soils were vulnerable to erosion by high winds. Long-term data is not readily available from Pasco (NWS). For this reason, a seventh site, Kennewick (PAWS) was chosen as a representative site to include in this assessment. The period of record for each site is found in Appendix B. All sites reported measurable precipitation at or below 31 percent of the mean for October 2003.

Table 4. October, 2003 precipitation compared to mean precipitation (inches)

| Station | October <br> Precip. | October <br> 2003 | Percent of mean |
| ---: | :---: | :---: | :---: |
| Kennewick | .9 | .12 | 13 |
| Walla Walla | 3.5 | .47 | 13 |
| Badger Canyon | .7 | 0 | 0 |
| College Place | .9 | .28 | 31 |
| R. Eby | .8 | .19 | 24 |
| Finley | .5 | 0 | 0 |
| Touchet | .5 | 0 | 0 |

Thus, all sites analyzed show conditions were sufficiently dry for wind-blown dust generation 72 hours prior to the high winds on October 28, 2003. Moreover, October 2003 was especially dry when compared to the long-term mean precipitation. Such dry conditions leave soils vulnerable to wind erosion, particularly in light of the observed high winds for 14 and eight consecutive hours recorded at Kennewick and Walla Walla, respectively.

## BACM Implementation

The 2003 NEAP evaluated data for the year 2000 and determined BACM is implemented in the Columbia Plateau based on 68 percent use of conservation practices. BACM for agricultural fields is defined as USDA Conservation Title Programs supplemented by incentive based implementation of wind erosion conservation practices or BMPs. In short, the BACM definition recognizes the critical role of agricultural agencies in defining and instituting BACM on the Columbia Plateau. The NEAP acknowledges the combined expertise of these agencies and relies on the various programs of these agencies in implementing the conservation practices that constitute BACM.

For defining BACM, the NEAP uses the USDA's CRP program and the wind erosion BMPs encouraged by NRCS and/or the Columbia Plateau Wind Erosion /Air Quality Project (referred to as the CP3). Use of these practices is tracked by the Conservation Technology Information Center's (CTIC) Core 4 program. The CTIC's Core 4 program tracks conservation tillage (NoTill, Ridge-Till, Mulch-Till) and conventional tillage ( $0-15 \%$ and $15-30 \%$ residue) practices and CRP enrollment on a county-by-county basis.

A 2003 Annual Status Report regarding BACM implementation evaluated data for the year 2002 (Appendix C). Comparing the 2003 NEAP to the annual report shows the level of Conservation Reserve Program (CRP) and Best Management Practice (BMP) use have increased, from the years 2000 to 2002, from 68 to 70 percent in the priority counties of the Columbia Plateau. Seventy percent of the total farmable acres in these counties are now part of a United States

Department of Agriculture (USDA) conservation program, use one of the minimum till practices, or contain $15-30 \%$ residue.

Washington State finds this level of CRP and BMP implementation fulfills BACM criteria. A full discussion on Ecology's BACM definition and tracking mechanism may be found in the revised NEAP.

## Findings

The meteorological data from the Pasco and Walla Walla, Washington NWS stations show that October 28, 2003 was characterized by windy and gusty conditions. Wind speeds and gusts were in the 20 s to 30 s at Pasco and Walla Walla, Washington for as many as 14 and eight consecutive hours, respectively. The winds meet Ecology's high wind event definition.

In the area lying upwind of Kennewick and Walla Walla, Washington, with respect to the prevailing winds, no precipitation is reported for as many as eight days prior to the high winds. The data shows precipitation for the month of October, 2003 was well below normal when compared to long-term mean precipitation for the area. Such conditions are consistent with areas being susceptible to windblown dust. Moreover, Ecology finds that BACM was implemented on agricultural fields.

Under the dry conditions so common in this area, the windy conditions are likely to raise dust that led to the monitored high $\mathrm{PM}_{10}$ levels. Therefore, the monitored $\mathrm{PM}_{10}$ concentrations of $1,438 \mu \mathrm{~g} / \mathrm{m} 3$ at Kennewick, Washington and $1,338 \mu \mathrm{~g} / \mathrm{m}^{3}$ at Walla Walla, Washington on October 28, 2003, are reasonably attributed to a natural event due to high winds.

## Appendix A

Kennewick and Walla Walla, Washington PM ${ }_{10}$ Data

Annual Parameter Report
Reporting Year: 2003
Time of Report: 03/31/04 11:59

| STATION: K |  | KENNEWICK VSC |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| SITE |  | 002 |  | AIRS : | Parameter | Code: | 81102 | Method | Code: | 063 | Units | Code: | 001 | Decimal | Position | 0 |
| Param | $r: ~ P M$ |  |  | SAROAD: | Parameter | Code: | 81102 | Method | Code: | 63 | Units | Code: | 01 | Units: |  |  |
| Day | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |  | OCT | NOV | DEC | MAX | MEAN | NO |
| 1 | 8 | 5 | 22 | 10 | 11 | 16 | 23 | 32 | 36 |  | 48 | 40 | 8 |  |  |  |
| 2 | 12 | 5 | 17 | 6 | 21 | 25 | 18 | 26 | 58 |  | 49 | 26 | 18 |  |  |  |
| 3 | 7 |  |  | 32 | 28 | 24 | 24 | 21 |  |  | 56 | 17 | 23 |  |  |  |
| 4 | 5 | 13 | 11 | 11 | 33 | 25 | 21 | 47 | 75 |  | 53 | 22 | 10 |  |  |  |
| 5 | 6 | 21 | 186 | 10 | 14 |  | 20 | 45 | 49 |  | 47 | 40 | 15 |  |  |  |
| 6 | 13 | 26 | 126 | 4 | 13 | 34 |  | 19 | 86 |  | 59 |  | 10 |  |  |  |
| 7 | 11 | 27 | 21 | 10 | 17 | 27 |  | 18 |  |  | 19 | 39 |  |  |  |  |
| 8 | 12 | 20 | 7 | 16 | 18 | 36 | 36 | 16 | 15 |  | 84 | 37 | 13 |  |  |  |
| 9 | 11 | 22 | 33 | 13 | 20 | 27 | 27 | 80 | 13 |  | 30 | 32 | 9 |  |  |  |
| 10 |  | 22 | 17 | 17 | 17 | 33 |  | 15 | 29 |  | 14 | 164 | 5 |  |  |  |
| 11 | 14 | 20 | 34 | 7 | 15 | 19 | 42 | 14 | 5 | 5 | 16 | 41 | 12 |  |  |  |
| 12 | 14 | 18 |  | 11 | 13 | 28 | 69 | 16 | 16 |  | 138 | 38 | 19 |  |  |  |
| 13 | 14 | 16 | 60 | 9 | 16 | 37 | 25 | 30 | 22 |  |  | 40 | 11 |  |  |  |
| 14 | 13 | 22 | 19 |  | 34 | 15 | 22 | 34 | 27 |  | 14 | 50 | 3 |  |  |  |
| 15 | 9 | 17 |  | 9 | 39 | 17 | 30 | 62 |  |  | 13 |  | 8 |  |  |  |
| 16 | 12 | 4 |  |  | 8 | 28 | 25 | 41 | 54 |  |  | 18 | 10 |  |  |  |
| 17 |  | 4 |  | 11 | 9 | 34 | 22 | 17 | 14 |  | 15 | 31 | 12 |  |  |  |
| 18 | 10 |  | 12 | 7 | 9 | 65 | 29 |  | 24 |  | 23 |  | 13 |  |  |  |
| 19 | 12 | 15 | 10 | 15 | 14 | 50 | 33 | 50 | 81 |  |  | 10 | 15 |  |  |  |
| 20 | 6 | 14 | 36 | 14 | 18 | 17 | 23 | 41 | 20 |  | 22 | 7 | 18 |  |  |  |
| 21 |  | 9 | 6 | 13 | 16 | 20 | 25 | 54 |  |  | 14 | 16 | 11 |  |  |  |
| 22 | 5 | 5 | 9 | 17 | 27 | 9 | 43 | 40 | 33 |  | 42 | 14 |  |  |  |  |
| 23 | 12 | 10 | 11 | 16 | 72 | 16 | 36 | 21 | 36 |  | 22 | 13 | 11 |  |  |  |
| 24 | 19 | 14 | 11 | 15 | 24 | 19 | 39 | 16 | 43 |  | 22 | 22 | 10 |  |  |  |
| 25 | 21 | 27 |  | 4 | 13 | 22 | 34 |  | 40 |  | 24 | 37 | 2 |  |  |  |
| 26 | 4 | 25 | 19 | 2 | 9 | 30 | 35 | 31 | 45 |  | 27 | 12 | 7 |  |  |  |
| 27 | 6 | 25 | 16 | 3 | 10 | 22 | 29 | 17 | 41 |  |  | 12 |  |  |  |  |
| 28 | 9 | 19 | 13 |  | 22 | 22 | 37 | 24 | 38 |  | 1438 | 24 | 7 |  |  |  |
| 29 | 10 |  | 14 | 5 | 21 | 32 | 40 | 55 | 61 |  | 40 | 7 | 10 |  |  |  |
| 30 | 11 |  | 20 | 5 | 28 | 43 | 44 | 45 | 55 |  | 126 |  |  |  |  |  |
| 31 | 6 |  | 29 |  | 17 |  | 35 | 40 |  |  | 39 |  | 22 |  |  |  |
| AVG | 10 | 16 | 30 | 11 | 20 | 27 | 32 | 33 | 39 |  | 92 | 31 | 12 |  | 30 |  |
| MAX | 21 | 27 | 186 | 32 | 72 | 65 | 69 | 80 | 86 |  | 1438 | 164 | 23 | 1438 |  |  |
| DAYS | 28 | 26 | 25 | 27 | 31 | 29 | 28 | 29 | 26 |  | 27 | 26 | 27 |  |  | 329 |

Reporting Year: 2003
Time of Report: 04/08/04 09:55


## Appendix B

## Meteorological Data Kennewick and Walla Walla



Pasco Site and Instrument specifications
Pasco, WA
NWS: This site is a National Weather Service site.
Archived data available via this UW link since: 01 Jul 1996


2003-10-01 16:53 2452914.7034722 1018.5 63.0 47.0 340 5.0 NA 2003-10-01 17:53 2452914.7451389 1018.1 68.0 46.0 10 6.0 NA 2003-10-01 18:53 2452914.7868056 1017.5 70.0 47.0340 6.0 NA 2003-10-01 19:12 2452914.8000000 NA 72.0 46.0 350 2003-10-01 19:53 2452914.8284722 1016.8 75.0 46.0 360 7.0 NA 2003-10-01 20:53 2452914.87013891016 .078 .046 .0340 6.0 NA 2003-10-01 21:53 2452914.9118056 1015.4 81.0 45.0 0 0.0 NA 2003-10-01 22:53 2452914.95347221014 .782 .047 .0320 3.0 NA 2003-10-01 23:53 2452914.9951389 1014.2 84.0 44.0 NA 3.0 NA 2003-10-02 00:53 $2452915.03680561013 .981 .045 .0 \quad 0 \quad 0.0$ NA 2003-10-02 01:53 2452915.0784722 1013.9 73.0 47.0 140 5.0 NA 2003-10-02 02:53 2452915.1201389 1014.1 69.0 48.0 150 3.0 NA 2003-10-02 03:53 2452915.1618056 1014.2 67.0 45.0 140 4.0 NA 2003-10-02 04:53 2452915.2034722 1014.5 63.0 45.0 90 4.0 NA 2003-10-02 05:53 2452915.2451389 1014.6 60.0 47.0 110 5.0 NA 2003-10-02 06:53 2452915.2868056 1014.7 56.0 48.0 0 0.0 NA 2003-10-02 07:53 2452915.3284722 1014.5 56.0 47.0 NA 3.0 NA 2003-10-02 08:53 2452915.3701389 1014.4 53.0 46.0 $100 \quad 3.0$ NA 2003-10-02 09:53 2452915.4118056 1014.3 50.0 47.0 0 0.0 NA 2003-10-02 10:53 2452915.4534722 1014.2 48.0 46.0 40 2003-10-02 11:53 2452915, 4951389 1014.3 47.0 44.0 340-5.0 2003-10-02 12:53 2452915.5368056 1014.4 46.0 44.0 350 6.0 NA 2003-10-02 13:53 2452915.5784722 1014.6 45.0 43.0 350 5.0 NA 2003-10-02 14:53 $2452915.62013891014 .846 .045 .0 \quad 0 \quad 0.0$ NA 2003-10-02 15:53 2452915.6618056 1015.0 53.0 48.0 0 0.0 NA 2003-10-02 16:53 2452915.7034722 1015.1 $62.047 .0 \quad 0 \quad 0.0$ NA 2003-10-02 17:53 2452915.7451389 1014.9 67.0 47.0 0 0.0 NA 2003-10-02 18:53 2452915.7868056 1014.4 73.0 46.0 NA 2003-10-02 19:53 2452015. 8284722 1014.1 75.0 48.0 350 0.0 2003-10-02 20:53 2452915.8701389 1013.2 76.0 49.0 350 6.0 NA 2003-10-02 21:53 2452915.9118056 1012.6 77.0 47.0 350 6.0 NA 2003-10-02 22:53 2452915.9534722 1012.1 78.0 49.0330 2003-10-02 23:53 2452915.9951389 1011.6 79.0 52.0 350 2003-10-03 00:53 2452916.0368056 1011.2 79.0 47.0 0 2003-10-03 01:53 2452916.0784722 1011.3 73.0 46.0130 2003-10-03 02:53 2452916.1201389 1011.8 64.0 50.0 0 2003-10-03 03:53 2452916.1618056 1011.9 59.0 53.010 2003-10-03 04:53 2452916.2034722 1012.1 55.0 51.0 360 2003-10-03 05:53 2452916.2451389 1012.3 54.0 51.0 0 2003-10-03 06:53 2452916.2868056 1012.6 53.0 49.0 90 2003-10-03 07:53 2452916.3284722 1012.6 49.0 47.0 340 2003-10-03 08:53 2452916.37013891012 .848 .047 .0340 2003-10-03 09:53 2452916.4118056 1012.7 46.0 45.0 340 2003-10-03 10:53 2452916.4534722 1012.8 45.0 44.0 0 $\begin{array}{lllllll}2003-10-03 & 11: 53 & 2452916.4951389 & 1013.2 & 43.0 & 43.0 & 320 \\ 2003-10-03 & 12.53 & 2452916.5368056 & 1013.5 & 46.0 & 42.0 & 120\end{array}$ 2003-10-03 12:53 2452916.5368056 1013.5 46.0 42.0120 2003-10-03 13:53 2452916.5784722 1013.643 .042 .00 2003-10-03 14:53 2452916. 6201389 1014.1 44.0 42.0 0 0.0 NA

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55.8 NA 45.2 NA 43.8 NA

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2003-10-07 15:53 2452920.66180561011 .162 .054 .0240 5.0 NA 2003-10-07 16:53 2452920.7034722 1011.5 66.0 53.0 220 9.0 NA 2003-10-07 17:53 2452920.7451389 1011.2 69.0 51.0 230 7.0 NA 2003-10-07 18:53 2452920.7868056 1011.4 71.0 52.020012 .018 .0 2003-10-07 19:53 2452920.82847221011 .071 .050 .020012 .018 .0 2003-10-07 20:53 2452920.8701389 1010.4 72.0 44.0240 8.0 NA 2003-10-07 21:53 2452920.9118056 1010.5 71.0 46.023014 .0 NA 2003-10-07 22:53 2452920.9534722 1010.3 70.0 46.0230 10.0 NA 2003-10-07 23:53 2452920.9951389 1010.1 69.0 45.0 230 12.0 NA 2003-10-08 00:53 2452921.03680561009 .867 .046 .0230 10.0 NA 2003-10-08 01:53 2452921.0784722 1009.8 66.046 .0230 8.0 NA 2003-10-08 02:53 2452921.1201389 1009.8 64.047 .0220 8.0 NA 2003-10-08 $03: 532452921.1618056$ 1009.6 61.0 47.0220 8.0 NA 2003-10-08 04:53 2452921.2034722 1009.7 59.0 47.0 240 8.0 NA 2003-10-08 05:53 2452921.2451389 1009.6 56.0 46.0 220 6.0 NA 2003-10-08 06:53 2452921.2868056 1009.3 50.0 46.0 0 0.0 NA 2003-10-08 07:53 2452921.3284722 1009.0 47.0 44.0 0 0.0 NA 2003-10-08 08:53 2452921.37013891008 .945 .043 .0340 5.0 NA 2003-10-08 09:53 2452921.4118056 1008.6 44.0 43.0 0 0.0 NA 2003-10-08 10:53 2452921.4534722 1008.3 43.0 43.0 330 3.0 NA 2003-10-08 11:53 2452921.4951389 1007.7 44.0 43.0 0 0.0 NA 2003-10-08 12:53 2452921.53680561007 .646 .046 .0350 3.0 NA 2003-10-08 13:53 2452921.5784722 1007.4 45.044 .0330 3.0 NA 2003-10-08 14:53 2452921.6201389 1007.3 48.0 47.0 0 0.0 NA 2003-10-08 15:53 2452921.66180561006 .956 .046 .01305 .0 NA 2003-10-08 16:53 2452921.7034722 1007.0 59.0 $46.0 \quad 0 \quad 0.0$ NA 2003-10-08 17:53 2452921.74513891006 .564 .047 .0190 5.0 NA 2003-10-08 18:53 2452921.7868056 1006.4 69.0 47.0 250 4.0 NA 2003-10-08 19:53 2452921.8284722 1006.2 71.0 45.0 240 6.0 NA 2003-10-08 20:53 2452921.87013891006 .175 .041 .024017 .024 .0 2003-10-08 21:53 2452921.9118056 1006.0 72.0 47.0 27016.024 .0 2003-10-08 22:53 2452921.9534722 1005.871 .048 .026023 .027 .0 2003-10-08 23:53 2452921.99513891006 .569 .048 .0260 13.0 NA 2003-10-09 00:53 2452922.0368056 1007.2 69.046 .0250 10.0 NA 2003-10-09 01:53 2452922.0784722 1008.1 66.0 42.0 250 16.0 NA 2003-10-09 02:53 2452922.1201389 1009.0 63.043 .025013 .0 NA 2003-10-09 03:53 2452922.1618056 1010.2 60.0 44.0250 9.0 NA 2003-10-09 04:53 2452922.2034722 1010.9 58.0 43.0 240 11.0 NA 2003-10-09 05:53 2452922.2451389 1011.4 58.0 41.0 250 12.0 NA 2003-10-09 06:53 2452922.2868056 1012.3 56.0 39.0 220 11.0 NA 2003-10-09 07:53 2452922.3284722 1012.4 53.0 38.0230 9.0 NA 2003-10-09 08:53 2452922.3701389 1013.0 52.0 39.0 240 6.0 NA 2003-10-09 09:53 2452922.4118056 1013.0 53.0 41.0 250 9.0 NA 2003-10-09 10:53 2452922.4534722 1013.3 52.0 41.0 210 8.0 NA 2003-10-09 11:53 2452922.49513891013 .452 .042 .023012 .0 NA 2003-10-09 12:53 2452922.5368056 1013.8 51.0 42.0 0 0.0 NA 2003-10-09 13:53 2452922.57847221014 .250 .041 .0230 7.0 NA 2003-10-09 14:53 2452922.62013891014 .651 .040 .0220 8.0 NA

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| 6 | 90 | 10 |
| 8 | 75 | 10 |
| 8 | 60 | 10 |
| 6 | 70 | 10 |
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| 0 | 120 | 10 | NA | 47.8 | NA | 62 | 49 | M |
| 0 | 120 | 10 | NA | 44.4 | NA | M | M | M |
| 0 | 120 | 10 | NA | 41.2 | NA | M | M | M |
| 0 | 120 | 10 | NA | 35.6 | NA | M | M | M |
| 0 | 120 | 10 | NA | 38.4 | NA | M | M | M |
| $\bigcirc$ | 120 | 10 | NA | 38.4 | NA | M | M | M |
| $\bigcirc$ | 120 | 10 | NA | 36.8 | NA | 67 | 61 | 67.6 |
| $\bigcirc$ | 120 | 10 | NA | 42.5 | NA | M | M | M |
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| 0 | 120 | 10 | NA | 68.6 | NA | M | M | M |
| 0 | 120 | 10 | NA | 68.6 | NA | 65 | 50 | M |
| 0 | 120 | 10 | NA | 76.7 | NA | M | M | M |
| 1 | 120 | 10 | NA | 66.0 | NA | M | M | M |
| 6 | 120 | 10 | NA | 66.0 | NA | M | M | M |
| 3 | 120 | 10 | NA | 71.3 | NA | M | M | M |
| 8 | 90 | 10 | NA | 63.6 | NA | M | M | M |
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| 8 | 50 | 10 | NA | 86.1 | NA | M | M | M |
| 8 | 55 | 9 | NA | 92.8 | NA | M | M | M |
| 8 | 40 | 6 | NA | 92.8 | NA | M | M | M |
| 8 | 36 | 10 | NA | 92.8 | NA | M | M | M |
| 6 | 80 | 8 | NA | 92.9 | NA | M | M | M |
| 1 | 120 | 10 | NA | 83.2 | NA | 55 | 49 | M |
| 0 | 120 | 10 | NA | 66.7 | NA | M | M | M |
| 3 | 120 | 10 | NA | 55.4 | NA | M | M | M |
| 8 | 95 | 10 | NA | 49.7 | NA | M | M | M |
| 6 | 100 | 10 | NA | 51.8 | NA | M | M | M |
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| 3 | 120 | 10 | NA | 50.0 | NA | 65 | 55 | 67.1 |
| 0 | 120 | 10 | NA | 55.5 | NA | M | M | M |
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| $\bigcirc$ | 120 | 10 | NA | 89.3 | NA | 64 | 48 | M |
| $\bigcirc$ | 120 | 10 | NA | 92.6 | NA | M | M | M |
| 0 | 120 | 10 | NA | 92.6 | NA | M | M | M |
| 0 | 120 | 10 | NA | 96.2 | NA | M | M | M |
| 0 | 120 | 10 | NA | 100.0 | NA | M | M | M |
| 0 | 120 | 10 | NA | 96.2 | NA | M | M | M |
| $\bigcirc$ | 120 | 10 | NA | 100.0 | 0.11 | 48 | 37 | M |
| $\bigcirc$ | 120 | 10 | NA | 100.0 | NA | M | M | M |
| 0 | 120 | 10 | NA | 100.0 | NA | M | M | M |
| $\bigcirc$ | 120 | 10 | NA | 96.2 | NA | M | M | M |



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| 3 | 120 | 3 |
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| 64.8 | NA | M | M | M | M | M | M |
| 64.8 | 0.00 | 54 | 38 | M | 37.8 | M | 22 |

Walla Walla Site and Instrument specifications
Walla Walla, WA
NWS: This site is a National Weather Service site.
Archived data available via this UW link since: 01 Jul 1996


2003-10-01 16:53 2452914.7034722 1018.3 61.0 44.0 230 6.0 NA 2003-10-01 17:53 2452914.7451389 1018.2 63.0 43.0 220 6.0 NA 2003-10-01 18:53 2452914.78680561017 .665 .043 .0220 5.0 NA 2003-10-01 19:53 2452914.8284722 1017.5 67.0 44.0 NA 4.0 NA 2003-10-01 20:53 2452914.8701389 1016.8 71.0 45.0 0 0.0 NA 2003-10-01 21:53 2452914.9118056 1016.4 73.0 46.0 NA 4.0 NA 2003-10-01 $22: 53$ 2452914.9534722 1015.9 75.0 47.0 290 4.0 NA 2003-10-01 23:53 2452914.9951389 1015.6 75.0 48.0 210 7.0 NA 2003-10-02 00:53 2452915.0368056 1015.4 72.0 48.0 180 6.0 NA 2003-10-02 01:53 2452915.0784722 1015.6 68.049 .0180 3.0 NA 2003-10-02 02:53 2452915.12013891015 .565 .047 .0130 6.0 NA 2003-10-02 03:53 2452915.1618056 1015.6 59.0 47.0 70 4.0 NA 2003-10-02 04:53 2452915.2034722 1015.7 63.0 46.0110 2003-10-02 05:53 2452915.2451389 1016.0 62.0 46.0140 2003-10-02 06:53 2452915.2868056 1016.0 62.045 .0140 2003-10-02 07:53 2452915.3284722 1015.7 60.0 44.0130 2003-10-02 08:53 2452915.3701389 1015.5 58.0 44.0110 2003-10-02 09:53 2452915.4118056 1015.1 58.0 44.0110 2003-10-02 10:53 2452915.4534722 1015.058 .044 .0110 2003-10-02 11:53 2452915.4951389 1014.9 57.0 43.0140 2003-10-02 12:53 2452915.53680561014 .954 .043 .0110 2003-10-02 13:53 2452915.5784722 1015.0 55.0 43.0 140 2003-10-02 14:53 2452915.6201389 1015.1 56.0 44.0130 2003-10-02 15:53 2452915.6618056 1015.4 63.0 45.0180 2003-10-02 16:53 2452915.7034722 1015.5 67.0 46.0230 2003-10-02 17:53 2452915.7451389 1015.3 69.0 50.0 210 2003-10-02 18:53 2452915.7868056 1014.9 71.0 50.0 240 2003-10-02 19:53 2452915.8284722 1014.6 72.0 49.0270 2003-10-02 20:53 2452915.8701389 1013.7 75.0 48.0 250 2003-10-02 21:53 2452915.9118056 1013.2 75.0 46.0 NA 2003-10-02 22:53 2452915.9534722 1012.5 77.0 46.0 NA 2003-10-02 23:53 2452915.9951389 1012.2 76.0 45.0260 2003-10-03 00:53 2452916.0368056 1012.2 75.0 46.0 240 2003-10-03 01:53 2452916.0784722 1012.4 70.0 48.0180 2003-10-03 02:53 2452916.1201389 1012.9 64.0 48.0100 2003-10-03 03:53 2452916.1618056 1012.6 62.0 48.0 100 2003-10-03 04:53 2452916.2034722 1012.761 .048 .0100 2003-10-03 05:53 2452916.2451389 1013.0 61.0 47.0 120 2003-10-03 06:53 2452916.2868056 1013.0 58.0 47.0 100 2003-10-03 07:53 2452916.3284722 1013.1 58.0 45.0100 2003-10-03 08:53 2452916.37013891012 .858 .045 .0100 2003-10-03 09:53 2452916.4118056 1012.857 .044 .0110 2003-10-03 10:53 2452916.4534722 1012.955 .044 .0100 2003-10-03 11:53 2452916.4951389 1013.1 54.044 .0110 2003-10-03 12:53 2452916.5368056 1013.3 53.0 $44.0 \quad 70$ 2003-10-03 13:53 2452916.5784722 1013.6 53.0 44.0 90 2003-10-03 14:53 2452916.62013891014 .156 .045 .0120 2003-10-03 15:53 2452916.6618056 1014.2 61.0 47.0190

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| 0 | 120 | 10 | NA | 44.1 | NA | M | M | M |
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| 0 | 120 | 10 | NA | 35.6 | NA | M | M | M |
| 0 | 120 | 10 | NA | 33.3 | NA | M | M | M |
| 0 | 120 | 10 | NA | 33.2 | NA | 78 | 68 | 72.1 |
| 0 | 120 | 10 | NA | 35.6 | NA | M | M | M |
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| 0 | 120 | 10 | NA | 60.1 | NA | M | M | M |
| 0 | 120 | 10 | NA | 62.2 | NA | M | M | M |
| 0 | 120 | 10 | NA | 59.9 | NA | 77 | 60 | M |
| 0 | 120 | 10 | NA | 66.7 | NA | M | M | M |
| 0 | 120 | 10 | NA | 61.8 | NA | M | M | M |
| 0 | 120 | 10 | NA | 61.8 | NA | M | M | M |
| 0 | 120 | 10 | NA | 61.7 | NA | M | M | M |
| 0 | 120 | 10 | NA | 66.3 | NA | M | M | M |
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| 0 | 120 | 10 | NA | 66.5 | NA | M | M | M |
| 0 | 120 | 10 | NA | 59.9 | NA | M | M | M |



2003-10-03 17:53 2452916.7451389 1014.0 68.0 46.0 NA 3.0 NA 2003-10-03 18:53 2452916.7868056 1013.8 70.0 45.0 NA 4.0 NA 2003-10-03 19:53 2452916.8284722 1013.4 73.0 44.0 NA 5.0 NA 2003-10-03 20:53 2452916.87013891012 .874 .044 .0240 5.0 NA 2003-10-03 21:53 2452916.9118056 1012.0 75.0 45.0 0 0.0 NA 2003-10-03 22:53 2452916.9534722 1011.5 76.0 45.0 NA 3.0 NA 2003-10-03 23:53 2452916.9951389 1011.2 75.045 .0250 6.0 NA 2003-10-04 00:53 2452917.03680561011 .073 .047 .0240 5.0 NA 2003-10-04 01:53 2452917.0784722 1010.9 70.0 49.0 0 0.0 NA 2003-10-04 02:53 2452917.12013891011 .063 .048 .0120 4.0 NA 2003-10-04 03:53 2452917.1618056 1010.9 61.0 $48.0 \quad 80$ 3.0 NA 2003-10-04 04:53 2452917.2034722 1010.6 59.0 48.0100 4.0 NA 2003-10-04 05:53 2452917.2451389 1010.6 59.0 48.080 2003-10-04 06:53 2452917.2868056 1010.4 59.0 48.0110 2003-10-04 07:53 2452917.3284722 1010.4 56.0 47.0 90 2003-10-04 08:53 2452917.3701389 1010.4 56.0 47.0 90 2003-10-04 09:53 2452917.4118056 1010.2 56.0 46.0 0 2003-10-04 10:53 2452917. 4534722 1010.2 56.0 46.0120 2003-10-04 11:53 2452917.4951389 1010.2 54.0 46.0100 2003-10-04 12:53 2452917.5368056 1010.1 54.0 46.00 2003-10-04 13:53 2452917.5784722 1010.9 52.0 45.0 0 2003-10-04 14:53 2452917.62013891011 .655 .046 .0130 2003-10-04 15:53 2452917.6618056 1011.8 62.0 47.0 0 2003-10-04 16:53 2452917.7034722 1011.9 65.0 46.0 0 2003-10-04 17:53 2452917.7451389 1011.5 68.0 46.0 0 2003-10-04 18:53 2452917.7868056 1011.3 70.0 47.0 NA 2003-10-04 19:53 2452917.8284722 1010.9 73.0 47.0 NA 2003-10-04 20:53 2452917.8701389 1010.5 74.0 48.0 NA 2003-10-04 21:53 2452917.9118056 1010.1 75.0 47.0 230 2003-10-04 22:53 2452917.9534722 1009.8 76.0 46.0 0 2003-10-04 23:53 2452917.9951389 1009.5 77.0 46.0 0 2003-10-05 00:53 2452918.0368056 1009.6 75.0 49.0 220 2003-10-05 01:53 2452918.0784722 1010.5 68.0 49.0 200 2003-10-05 02:53 2452918.1201389 1011.1 65.050 .040 2003-10-05 03:53 2452918.1618056 1011.3 67.0 50.0 100 2003-10-05 04:53 2452918.2034722 1010.8 68.0 51.0110 2003-10-05 05:53 2452918.2451389 1011.0 64.0 50.0 120 2003-10-05 06:53 2452918.2868056 1010.9 65.0 48.0110 2003-10-05 07:53 2452918.3284722 1011.2 63.0 48.0 80 2003-10-05 08:53 2452918.3701389 1011.9 60.0 47.0130 2003-10-05 09:53 2452918.4118056 1012.2 61.0 47.0 0 2003-10-05 10:53 2452918.4534722 1011.9 60.0 47.0 100 2003-10-05 11:53 2452918.4951389 1012.2 58.0 47.0 0 2003-10-05 12:53 2452918.5368056 1012.4 63.046 .0120 2003-10-05 13:53 2452918.57847221013 .163 .046 .0180 2003-10-05 14:53 2452918.6201389 1013.8 63.047 .0190 2003-10-05 15:53 2452918.6618056 1014.4 67.0 48.0180 2003-10-05 16:53 2452918.7034722 1014.9 68.0 49.0220


2003-10-05 17:53 2452918.7451389 1015.0 72.0 49.0 0 0.0 NA 2003-10-05 18:53 2452918.7868056 1015.0 76.0 50.0 0 0.0 NA 2003-10-05 19:53 2452918.8284722 1014.5 77.049 .0230 5.0 NA 2003-10-05 20:53 2452918.87013891014 .079 .050 .0240 5.0 NA 2003-10-05 21:53 2452918.9118056 1013.7 81.0 51.0 260 6.0 NA 2003-10-05 $22: 532452918.9534722$ 1013.2 81.0 51.0 260 3.0 NA 2003-10-05 23:53 2452918.9951389 1013.2 81.0 51.0 $240 \quad 3.0$ NA 2003-10-06 00:53 2452919.0368056 1012.9 80.0 51.0 200 3.0 NA 2003-10-06 01:53 2452919.0784722 1013.1 75.0 54.0 0 0.0 NA 2003-10-06 02:53 2452919.12013891013 .569 .052 .01006 .0 NA 2003-10-06 03:53 2452919.16180561013 .767 .052 .0110 5.0 NA 2003-10-06 04:53 2452919.2034722 1013.4 68.0 51.0 110 2003-10-06 05:53 2452919.2451389 1013.1 67.0 50.0 110 2003-10-06 06:53 2452919.2868056 1013.3 64.0 50.0 100 2003-10-06 07:53 2452919.3284722 1013.7 66.0 48.0 0 2003-10-06 08:53 $2452919.37013891014 .064 .049 .0 \quad 0$ 2003-10-06 09:53 2452919.4118056 1014.1 65.048 .0170 2003-10-06 10:53 2452919.4534722 1014.1 63.048 .0160 2003-10-06 11:53 2452919.4951389 1014.3 62.0 47.0160 2003-10-06 12:53 2452919.5368056 1014.661 .047 .0140 2003-10-06 13:53 2452919.5784722 1014.4 57.0 47.0110 2003-10-06 14:53 2452919.62013891014 .558 .048 .00 2003-10-06 15:53 2452919.6618056 1014.1 68.0 50.0 50 2003-10-06 16:53 2452919.7034722 1013.5 72.0 48.0 0 2003-10-06 17:53 2452919.7451389 1012.9 74.0 47.0 230 2003-10-06 18:53 2452919.78680561012 .0 77.0 46.0 NA 2003-10-06 19:53 2452919.8284722 1010.9 79.0 46.0260 2003-10-06 20:53 2452919.8701389 1009.6 80.0 46.0310 2003-10-06 21:53 2452919.9118056 1008.5 82.0 43.0240 2003-10-06 22:53 2452919.95347221007 .781 .043 .0230 2003-10-06 23:53 2452919.9951389 1006.9 81.0 43.0 240 2003-10-07 00:53 2452920.0368056 1006.2 78.0 44.0 200 2003-10-07 01:53 2452920.0784722 1005.9 73.0 46.0 200 2003-10-07 02:53 2452920.1201389 1005.5 68.0 46.0 90 2003-10-07 03:53 2452920.1618056 1005.8 66.047 .0120 3.0 NA 2003-10-07 05:53 2452020. 2451389 1000. 68.042 .0190 20031007 10.53 2452020.2451389 NA 2003-10-07 06:53 2452920.2868056 1008.7 67.0 45.0 190 15.0 NA 2003-10-07 07:53 2452920.3284722 1009.2 64.0 51.0 190 11.0 NA 2003-10-07 08:53 2452920.3701389 1009.5 61.0 52.0 210 8.0 NA 2003-10-07 09:53 2452920.4118056 1009.4 62.0 51.0 170 7.0 NA 2003-10-07 10:53 2452920.4534722 1009.5 63.0 49.0 210 10.0 NA 2003-10-07 11:53 2452920.4951389 1010.1 62.0 49.0 0 0.0 NA 2003-10-07 12:53 2452920.5368056 1010.7 63.049 .0210 8.0 NA 2003-10-07 13:53 2452920.57847221011 .461 .050 .019011 .0 NA 2003-10-07 14:53 2452920.6201389 1011.9 60.0 50.0 200 9.0 NA 2003-10-07 15:53 2452920.6618056 1012.2 61.0 50.0 210 10.0 NA 2003-10-07 16:53 2452920.7034722 1012.7 63.0 50.0 220 11.0 NA

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| 0 | 120 | 10 | NA | 48.0 | NA | M | M | M |
| 0 | 120 | 10 | NA | 54.6 | NA | M | M | M |
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| 0 | 120 | 10 | NA | 52.2 | NA | M | M | M |
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| 8 | 75 | 10 | NA | 60.2 | NA | M | M | M |
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| 8 | 46 | 10 | NA | 60.2 | NA | M | M | M |
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| 6 | 85 | 10 | NA | 62.5 | NA | M | M | M |



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| 8 | 60 | 10 |
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| 6 | 60 | 10 |
| 1 | 120 | 10 |
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69.9
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0.910 .063
 NA NA NA NA NA NA NA NA NA NA NA
NA NA NA 69.4
$M$
 46.2

## $\omega$

2003-10-09 17:53 2452922.74513891015 .657 .037 .0230 10.0 NA 2003-10-09 18:53 2452922.78680561015 .560 .037 .0220 11.0 NA 2003-10-09 19:53 2452922.82847221015 .161 .035 .026010 .015 .0 2003-10-09 20:53 2452922.87013891014 .461 .035 .023011 .016 .0 2003-10-09 21:53 2452922.9118056 1014.2 62.037 .0260 12.0 NA 2003-10-09 22:53 2452922.95347221014 .062 .036 .0220 10.0 NA 2003-10-09 23:53 2452922.9951389 1013.8 61.0 34.0240 13.0 NA 2003-10-10 00:53 2452923.0368056 1013.8 59.0 34.0 260 8.0 NA 2003-10-10 01:53 2452923.07847221014 .155 .035 .0210 5.0 NA 2003-10-10 02:53 2452923.12013891014 .552 .035 .0180 9.0 NA 2003-10-10 $03: 532452923.16180561015 .250 .036 .017011 .0$ NA 2003-10-10 04:53 2452923.20347221015 .651 .037 .020013 .0 NA 2003-10-10 05:53 2452923.2451389 1015.4 50.0 36.0 200 12.0 NA 2003-10-10 06:53 2452923.2868056 1015.4 49.0 36.0170 10.0 NA 2003-10-10 07:53 2452923.3284722 1015.7 49.0 37.0 170 10.0 NA 2003-10-10 08:53 2452923.37013891016 .148 .038 .0180 9.0 NA 2003-10-10 09:53 2452923.41180561016 .548 .039 .0180 8.0 NA 2003-10-10 10:53 2452923.4534722 1017.0 48.038 .019012 .0 NA 2003-10-10 11:53 2452923.4951389 1017.6 46.0 38.0 180 8.0 NA 2003-10-10 12:53 2452923.5368056 1018.0 46.037 .019010 .0 NA 2003-10-10 13:53 2452923.57847221018 .846 .037 .0200 10.0 NA 2003-10-10 14:53 2452923.62013891019 .548 .038 .019011 .0 NA 2003-10-10 15:53 2452923.6618056 1020.4 50.0 38.0210 9.0 NA 2003-10-10 16:53 2452923.70347221020 .751 .038 .019010 .0 NA 2003-10-10 17:53 2452923.74513891020 .754 .038 .022012 .0 NA 2003-10-10 18:53 $2452923.78680561020 .457 .0 \quad 38.021014 .0$ NA 2003-10-10 19:53 2452923.82847221020 .358 .037 .021013 .018 .0 2003-10-10 20:53 2452923.8701389 1020.2 60.0 36.0210 11.0 NA 2003-10-10 21:53 2452923.9118056 1020.2 61.0 36.0230 9.0 NA 2003-10-10 22:53 2452923.9534722 1020.1 60.0 35.0230 6.0 NA 2003-10-10 $23: 532452923.99513891020 .061 .034 .0240$ 10.0 NA 2003-10-11 00:53 2452924.0368056 1020.1 59.0 33.0 230 6.0 NA 2003-10-11 01:53 2452924.0784722 1020.3 56.034 .0180 4.0 NA 2003-10-11 02:53 2452924.12013891020 .7 50.0 33.0120 6.0 NA 2003-10-11 03:53 2452924.1618056 1020.8 49.032 .01306 .0 NA 2003-10-11 04:53 2452924.2034722 1021.0 49.0 33.0 120 8.0 NA 2003-10-11 $05: 532452924.2451389$ 1020.5 47.032 .0100 7.0 NA 2003-10-11 06:53 2452924.2868056 1020.3 46.0 32.0100 7.0 NA 2003-10-11 08:53 2452924.37013891019 .544 .032 .090 9.0 NA 2003-10-11 08:53 2452924.3701389 1019.5 44.0 32.0 60 9.0 NA 2003-10-11 09:53 2452924.4118056 1018.6 51.0 32.0110 7.0 NA 2003-10-11 10:53 2452924.45347221018 .051 .031 .0100 3.0 NA 2003-10-11 11:53 2452924.4951389 1017.0 50.0 32.0 90 3.0 NA 2003-10-11 $12: 532452924.53680561015 .954 .030 .0 \quad 0 \quad 0.0$ NA 2003-10-11 13:53 2452924.57847221015 .155 .029 .0 NA 4.0 NA 2003-10-11 15:53 2452924.66180561014 .760 .027 .017016 .019 .0 2003-10-11 16:53 2452924.7034722 1015.3 58.0 31.0 260 7.0 NA 2003-10-11 17:53 2452924.74513891015 .657 .032 .0250 6.0 NA




2003-10-11 18:53 2452924.7868056 1015.758 .036 .0230 9.0 NA 2003-10-11 19:53 2452924.82847221015 .458 .036 .0220 8.0 NA 2003-10-11 20:53 2452924.87013891014 .561 .035 .018013 .0 NA 2003-10-11 21:53 2452924.9118056 1013.5 62.0 36.0210 11.0 NA 2003-10-11 22:53 2452924.9534722 1012.8 61.0 37.0 210 9.0 NA 2003-10-11 $23: 532452924.99513891012 .761 .035 .0200$ 9.0 NA 2003-10-12 00:53 2452925.0368056 1013.3 53.0 46.0 170 11.0 NA 2003-10-12 01:53 2452925.07847221012 .954 .047 .0190 8.0 NA 2003-10-12 02:53 2452925.12013891012 .854 .048 .018013 .019 .0 2003-10-12 03:53 2452925.16180561012 .855 .047 .018016 .0 NA 2003-10-12 04:53 2452925.20347221013 .855 .046 .019012 .0 NA 2003-10-12 05:53 2452925.24513891014 .853 .047 .0210 10.0 NA 2003-10-12 06:53 2452925.2868056 1015.6 53.0 47.0 210 8.0 NA 2003-10-12 07:53 2452925.3284722 1016.7 52.0 47.0220 7.0 NA 2003-10-12 08:53 2452925.3701389 1017.8 52.0 47.0 210 8.0 NA 2003-10-12 09:12 2452925.3833333 NA 52.0 46.0 200 10.0 NA 2003-10-12 09:53 2452925.4118056 1018.7 50.0 45.0200 8.0 NA 2003-10-12 10:53 2452925.4534722 1019.3 50.0 44.0190 9.0 18.0 2003-10-12 11:53 2452925.49513891019 .949 .044 .019012 .0 NA 2003-10-12 12:53 2452925.5368056 1020.0 47.042 .0180 9.0 NA 2003-10-12 $13: 532452925.57847221020 .648 .040 .019011 .0$ NA 2003-10-12 14:53 2452925.62013891021 .3 50.0 40.0 19012.0 NA 2003-10-12 15:53 2452925.66180561021 .754 .040 .0200 12.0 NA 2003-10-12 16:53 2452925.70347221022 .156 .038 .021019 .0 NA 2003-10-12 17:53 2452925.74513891022 .257 .037 .0220 13.0 NA 2003-10-12 18:53 2452925.78680561022 .257 .040 .020013 .0 NA 2003-10-12 19:53 2452925.8284722 1022.1 57.0 40.0 190 12.0 NA 2003-10-12 20:53 2452925.87013891021 .959 .041 .019010 .0 NA 2003-10-12 21:53 2452925.91180561021 .960 .040 .0230 15.0 NA 2003-10-12 $22: 532452925.9534722$ 1022.1 58.043 .0200 7.0 NA 2003-10-12 $23: 532452925.99513891022 .5$ 57.0 43.0230 7.0 NA 2003-10-13 00:53 2452926.0368056 1022.2 57.0 40.0 220 11.0 NA 2003-10-13 01:53 2452926.07847221022 .957 .042 .0210 12.0 NA 2003-10-13 02:53 2452926.1201389 1023.5 55.0 40.0 210 15.0 NA 2003-10-13 03:53 2452926.1618056 1023.9 54.0 40.0 210 11.0 NA 2003-10-13 04:53 2452926.20347221023 .853 .039 .020011 .0 NA 2003-10-13 $05: 532452926.24513891024 .253 .039 .020012 .0$ NA 2003-10-13 06:53 2452926.28680561024 .752 .039 .020013 .0 NA 2003-10-13 07:53 2452926.32847221025 .451 .038 .019010 .020 .0 2003-10-13 08:53 2452926.37013891025 .851 .038 .0200 12.0 NA 2003-10-13 09:53 2452926.41180561026 .252 .038 .020013 .0 NA 2003-10-13 10:53 2452926.45347221026 .551 .037 .020011 .0 NA 2003-10-13 11:53 2452926.4951389 1026.9 51.0 37.0 200 10.0 NA 2003-10-13 12:53 2452926.5368056 1027.4 49.036 .0170 9.0 NA 2003-10-13 13:53 2452926.57847221027 .848 .036 .017010 .0 NA 2003-10-13 14:53 2452926.6201389 1028.2 49.036 .0180 9.0 NA 2003-10-13 15:53 2452926.66180561028 .550 .038 .0180 8.0 NA 2003-10-13 16:53 2452926.70347221028 .954 .039 .0200 9.0 NA


〕 NA

| 43.6 | NA | M | M | M |
| :---: | :---: | :---: | :---: | :---: |
| 43.6 | NA | M | M | M |
| 37.6 | NA | M | M | M |
| 37.8 | NA | M | M | M |
| 40.7 | NA | M | M | M |
| 37.6 | NA | 62 | 57 | 68. |
| 77.0 | NA | M | M | M |
| 77.1 | NA | M | M | M |
| 80.1 | NA | M | M | M |
| 74.3 | NA | M | M | M |
| 71.6 | NA | M | M | M |
| 80.0 | NA | 61 | 53 | M |
| 80.0 | NA | M | M | M |
| 83.0 | NA | M | M | M |
| 83.0 | NA | M | M | M |
| 79.9 | NA | M | M | M |
| 82.8 | NA | M | M | M |
| 79.7 | NA | M | M | M |
| 82.8 | 0.08 | 54 | 49 | M |
| 82.6 | NA | M | M | M |
| 73.6 | NA | M | M | M |
| 68.3 | NA | M | M | M |
| 59.0 | NA | M | M | M |
| 50.7 | NA | M | M | M |
| 47.0 | NA | 57 | 47 | M |
| 52.9 | NA | M | M | M |
| 52.9 | NA | M | M | M |
| 51.2 | NA | M | M | M |
| 47.5 | NA | M | M | M |
| 57.3 | NA | M | M | M |
| 59.4 | NA | 60 | 57 | 67. |
| 52.9 | NA | M | M | M |
| 57.1 | NA | M | M | M |
| 56.8 | NA | M | M | M |
| 59.0 | NA | M | M | M |
| 58.8 | NA | M | M | M |
| 58.8 | NA | 58 | 51 | M |
| 61.0 | NA | M | M | M |
| 60.9 | NA | M | M | M |
| 60.9 | NA | M | M | M |
| 58.7 | NA | M | M | M |
| 58.5 | NA | M | M | M |
| 58.5 | 0.00 | 53 | 51 | M |
| 60.6 | NA | M | M | M |
| 62.9 | NA | M | M | M |
| 60.6 | NA | M | M | M |
| 63.2 | NA | M | M | M |
| 56.7 | NA | M | M |  |



2003-10-13 17:53 2452926.7451389 1028.6 57.0 40.0 220 10.0 NA 2003-10-13 18:53 2452926.78680561028 .059 .040 .0190 13.0 NA 2003-10-13 19:53 2452926.8284722 1027.0 61.038 .021010 .0 NA 2003-10-13 20:53 2452926.87013891026 .163 .038 .022011 .0 NA 2003-10-13 21:53 2452926.9118056 1025.1 62.0 37.0 280 5.0 NA 2003-10-13 22:53 2452926.9534722 1024.3 63.0 37.0 NA 3.0 NA 2003-10-13 23:53 2452926.9951389 1023.2 63.0 37.0 360 3.0 NA 2003-10-14 00:53 2452927.0368056 1022.2 57.0 38.0 30 9.0 NA 2003-10-14 01:53 2452927.0784722 1021.5 54.0 37.0 70 9.0 NA 2003-10-14 02:53 2452927.1201389 1020.7 54.0 $37.0 \quad 80$ 9.0 NA 2003-10-14 03:53 2452927.16180561019 .754 .037 .080 8.0 NA 2003-10-14 04:53 2452927.2034722 1018.4 55.0 35.0 80 8.0 NA 2003-10-14 05:53 2452927.2451389 1017.6 53.0 38.0 140 4.0 NA 2003-10-14 06:53 2452927.2868056 1017.2 52.0 38.0 150 4.0 NA 2003-10-14 07:53 2452927.3284722 1017.0 51.0 38.0 180 3.0 NA 2003-10-14 08:53 2452927.3701389 1016.1 51.0 38.0 160 3.0 NA 2003-10-14 09:53 2452927.41180561016 .050 .038 .0100 5.0 NA 2003-10-14 10:53 2452927.4534722 1016.2 $49.039 .0 \quad 0 \quad 0.0$ NA 2003-10-14 11:53 2452927.4951389 1015.4 50.0 40.0170 2003-10-14 12:53 2452927.53680561016 .548 .041 .0280 2003-10-14 14:53 2452927. 6201389 1010.1 48.0 43.0 $\begin{array}{llllllll}2003-10-14 & 15: 53 & 2452927.6618056 & 1020.1 & 48.0 & 45.0 & 200 & 8.0 \\ \text { NA }\end{array}$ 2003-10-14 16:53 2452927.7034722 1020.4 48.0 45.0 220 7.0 NA 2003-10-14 17:03 2452927.7104167 NA 48.0 45.0 210 7.0 NA 2003-10-14 17:42 2452927.7375000 NA 48.0 45.0 200 5.0 NA 2003-10-14 17:53 2452927.74513891021 .049 .046 .0210 5.0 NA 2003-10-14 18:31 2452927.7715278 NA 48.0 46.0 220 4.0 NA 2003-10-14 18:53 2452927.7868056 1021.3 48.046 .0250 3.0 NA 2003-10-14 19:14 2452927.8013889 NA 48.0 46.0 180 4.0 NA 2003-10-14 19:53 2452927.8284722 1021.4 49.0 47.0200 4.0 NA 2003-10-14 20:53 2452927.87013891021 .451 .048 .0180 8.0 NA 2003-10-14 21:53 2452927.9118056 1021.4 53.0 48.0 160 8.0 NA 2003-10-14 $22: 532452927.95347221021 .455 .047 .017011 .0$ NA 2003-10-14 23:53 2452927.99513891021 .155 .046 .01708 .0 NA 2003-10-15 00:53 2452928.0368056 1021.1 53.0 45.0180 6.0 NA 2003-10-15 01:53 2452928.0784722 1021.2 50.0 45.0 150 4.0 NA 2003-10-15 02:53 2452928.1201389 1021.3 48.042 .0120 7.0 NA 2003-10-15 03:53 2452928.1618056 1021.1 47.0 41.0 110 7.0 NA 2003-10-15 04:53 2452928.2034722 1020.7 46.0 40.0 100 8.0 NA 2003-10-15 05:53 2452928.24513891020 .745 .039 .01008 .0 NA 2003-10-15 06:53 2452928.2868056 1020.1 46.038 .0110 8.0 NA 2003-10-15 07:53 2452928.3284722 1019.8 44.0 38.0 90 8.0 NA 2003-10-15 08:53 2452928.3701389 1019.2 44.0 38.0 100 8.0 NA 2003-10-15 09:53 2452928.4118056 1018.5 $43.037 .0 \quad 9010.0$ NA 2003-10-15 10:53 2452928.4534722 1017.8 41.0 36.0 90 7.0 NA 2003-10-15 11:53 2452928.4951389 1017.0 41.0 36.0160 5.0 NA 2003-10-15 12:53 $2452928.53680561016 .741 .035 .0 \quad 0 \quad 0.0$ NA

| 6 | 42 | 10 | NA | 52.9 | NA | 57 | 48 | M |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 0 | 120 | 10 | NA | 49.2 | NA | M | M | M |
| 0 | 120 | 10 | NA | 42.4 | NA | M | M | M |
| 0 | 120 | 10 | NA | 39.5 | NA | M | M | M |
| 0 | 120 | 10 | NA | 39.3 | NA | M | M | M |
| 0 | 120 | 9 | NA | 38.0 | NA | M | M | M |
| 0 | 120 | 10 | NA | 38.0 | NA | 64 | 57 | 66.9 |
| 0 | 120 | 10 | NA | 48.9 | NA | M | M | M |
| 0 | 120 | 10 | NA | 52.4 | NA | M | M | M |
| $\bigcirc$ | 120 | 10 | NA | 52.4 | NA | M | M | M |
| $\bigcirc$ | 120 | 10 | NA | 52.4 | NA | M | M | M |
| $\bigcirc$ | 120 | 10 | NA | 46.7 | NA | M | M | M |
| $\bigcirc$ | 120 | 10 | NA | 56.6 | NA | 63 | 52 | M |
| $\bigcirc$ | 120 | 10 | NA | 58.7 | NA | M | M | M |
| 0 | 120 | 10 | NA | 60.9 | NA | M | M | M |
| 6 | 110 | 10 | NA | 60.9 | NA | M | M | M |
| 6 | 95 | 10 | NA | 63.2 | NA | M | M | M |
| 6 | 100 | 10 | NA | 68.2 | NA | M | M | M |
| 8 | 100 | 10 | NA | 68.3 | 0.00 | 53 | 49 | M |
| 8 | 75 | 10 | NA | 76.6 | NA | M | M | M |
| 8 | 70 | 10 | NA | 76.6 | NA | M | M | M |
| 8 | 60 | 10 | NA | 82.7 | NA | M | M | M |
| 8 | 48 | 10 | NA | 89.3 | NA | M | M | M |
| 8 | 43 | 10 | NA | 89.3 | NA | M | M | M |
| 8 | 20 | 10 | NA | 89.3 | NA | M | M | M |
| 8 | 35 | 10 | NA | 89.3 | NA | M | M | M |
| 8 | 16 | 10 | NA | 89.3 | NA | 50 | 47 | M |
| 8 | 14 | 10 | NA | 92.7 | NA | M | M | M |
| 8 | 14 | 10 | NA | 92.7 | NA | M | M | M |
| 8 | 44 | 10 | NA | 92.7 | NA | M | M | M |
| 8 | 42 | 10 | NA | 92.8 | NA | M | M | M |
| 8 | 60 | 10 | NA | 89.4 | NA | M | M | M |
| 6 | 85 | 10 | NA | 83.1 | NA | M | M | M |
| 1 | 120 | 10 | NA | 74.3 | NA | M | M | M |
| 0 | 120 | 10 | NA | 71.6 | NA | 56 | 48 | 66.4 |
| 0 | 120 | 10 | NA | 74.1 | NA | M | M | M |
| 0 | 120 | 10 | NA | 82.8 | NA | M | M | M |
| $\bigcirc$ | 120 | 10 | NA | 79.6 | NA | M | M | M |
| $\bigcirc$ | 120 | 10 | NA | 79.5 | NA | M | M | M |
| 0 | 120 | 10 | NA | 79.4 | NA | M | M | M |
| 0 | 120 | 10 | NA | 79.3 | NA | 55 | 45 | M |
| $\bigcirc$ | 120 | 10 | NA | 73.4 | NA | M | M | M |
| 0 | 120 | 10 | NA | 79.3 | NA | M | M | M |
| 0 | 120 | 10 | NA | 79.3 | NA | M | M | M |
| 0 | 120 | 10 | NA | 79.2 | NA | M | M | M |
| 0 | 120 | 10 | NA | 82.2 | NA | M | M | M |
| 0 | 120 | 10 | NA | 82.2 | 0.02 | 46 | 40 | M |
| $\bigcirc$ | 120 | 10 | NA | 79.0 | NA | M | M | M |



[^1] 0.290 .020

333
$M$
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2003-10-15 13:53 $2452928.57847221015 .540 .036 .0 \quad 70$ 7.0 NA 2003-10-15 14:53 2452928.62013891014 .544 .037 .0360 4.0 NA 2003-10-15 $15: 532452928.66180561014 .744 .039 .0200 \quad 5.0$ NA 2003-10-15 16:53 $2452928.70347221013 .946 .039 .0 \quad 0 \quad 0.0$ NA 2003-10-15 17:53 2452928.74513891012 .946 .041 .0190 3.0 NA 2003-10-15 18:53 2452928.78680561012 .248 .042 .0290 3.0 NA 2003-10-15 19:53 2452928.8284722 1012.3 $45.042 .0250 \quad 3.0$ NA 2003-10-15 20:53 2452928.8701389 1011.3 47.0 43.0 340 4.0 NA 2003-10-15 21:53 2452928.9118056 1012.1 46.0 44.0 210 3.0 NA 2003-10-15 22:22 2452928.9319444 NA 46.045 .0160 4.0 NA 2003-10-15 22:29 2452928.9368056 NA 46.045 .0160 4.0 NA 2003-10-15 22:53 2452928.9534722 1012.8 46.0 45.0 160 7.0 NA 2003-10-15 23:53 2452928.9951389 1012.2 52.0 48.0 190 15.0 NA 2003-10-16 00:53 2452929.03680561013 .552 .047 .021011 .0 NA 2003-10-16 01:53 2452929.07847221015 .0 50.0 45.0 220 13.0 NA 2003-10-16 02:53 2452929.1201389 1016.3 50.0 43.017011 .0 NA 2003-10-16 03:53 2452929.1618056 1017.2 49.041 .0190 9.0 NA 2003-10-16 04:53 2452929.2034722 1017.649 .042 .018010 .0 NA 2003-10-16 05:53 2452929.24513891017 .849 .041 .0170 8.0 NA 2003-10-16 06:53 2452929.2868056 1017.8 50.0 40.0 170 9.0 NA 2003-10-16 07:53 2452929.3284722 1017.9 51.0 39.0 170 8.0 NA 2003-10-16 08:53 2452929.37013891017 .752 .038 .0150 6.0 NA 2003-10-16 09:53 2452929.4118056 1017.9 50.0 39.0110 5.0 NA 2003-10-16 10:53 2452929.4534722 1017.2 51.0 38.0150 7.0 NA 2003-10-16 11:53 2452929.4951389 1016.2 52.0 40.0 0 0.0 NA 2003-10-16 12:53 $2452929.53680561016 .351 .041 .0 \quad 0 \quad 0.0$ NA 2003-10-16 $13: 532452929.57847221016 .054 .041 .0140$ 3.0 NA 2003-10-16 14:53 2452929.62013891015 .1 57.0 42.018010 .0 NA 2003-10-16 15:53 2452929.66180561015 .359 .042 .016014 .0 NA 2003-10-16 16:53 2452929.70347221016 .260 .044 .018016 .0 NA 2003-10-16 17:53 2452929.74513891016 .759 .049 .015013 .0 NA 2003-10-16 18:53 2452929.7868056 1016.8 60.0 50.0 180 9.0 NA 2003-10-16 19:53 2452929.82847221016 .760 .050 .01908 .0 NA 2003-10-16 20:53 2452929.87013891016 .161 .051 .017012 .0 NA 2003-10-16 21:53 2452929.9118056 1015.3 63.0 51.0 170 12.0 NA 2003-10-16 22:53 2452929.9534722 1015.0 64.0 50.0 170 12.0 NA 2003-10-16 23:53 2452929.99513891014 .165 .049 .018011 .021 .0 2003-10-17 00:53 2452930.0368056 1013.766 .049 .0160 11.0 NA 2003-10-17 01:53 2452930.07847221013 .764 .049 .0160 7.0 NA 2003-10-17 02:53 2452930.12013891013 .764 .048 .0180 3.0 NA 2003-10-17 03:53 2452930.1618056 1014.3 57.0 48.0300 4.0 NA 2003-10-17 04:53 2452930.20347221014 .756 .048 .0110 3.0 NA 2003-10-17 05:53 2452930.24513891014 .755 .048 .0110 5.0 NA 2003-10-17 06:53 2452930.2868056 1014.5 58.0 47.0 160 4.0 NA 2003-10-17 07:53 2452930.3284722 $1014.958 .046 .0 \quad 0 \quad 0.0$ NA 2003-10-17 08:53 2452930.3701389 1016.3 52.0 46.0 60 3.0 NA 2003-10-17 09:53 2452930.4118056 1016.7 55.0 47.0 160 7.0 NA 2003-10-17 10:53 2452930.45347221015 .657 .046 .018010 .0 NA



2003-10-17 11:53 2452930.4951389 1015.9 59.0 45.0 NA 3.0 NA 2003-10-17 12:53 $2452930.53680561016 .252 .045 .0 \quad 50 \quad 5.0$ NA 2003-10-17 $13: 532452930.57847221016 .054 .044 .01105 .0$ NA 2003-10-17 14:53 2452930.6201389 1016.4 59.0 44.0 200 9.0 NA 2003-10-17 15:53 2452930.6618056 1016.9 64.0 47.0 200 8.0 NA 2003-10-17 16:53 2452930.7034722 1017.4 68.0 49.0 180 8.0 NA 2003-10-17 17:53 2452930.7451389 1017.3 $72.049 .0 \quad 210 \quad 7.0$ NA 2003-10-17 18:53 2452930.78680561017 .374 .047 .024010 .018 .0 2003-10-17 19:53 2452930.82847221016 .7 76.0 46.0270 8.0 NA 2003-10-17 20:53 2452930.87013891016 .077 .047 .0280 5.0 NA 2003-10-17 21:53 2452930.9118056 1015.5 78.0 $47.0 \quad 0 \quad 0.0$ NA 2003-10-17 22:53 2452930.9534722 1015.5 79.0 49.0 360 5.0 NA 2003-10-17 23:53 2452930.9951389 1015.3 76.0 50.0 340 5.0 NA 2003-10-18 00:53 2452931.0368056 1015.5 $68.054 .0 \quad 40 \quad 6.0$ NA 2003-10-18 01:53 $2452931.07847221015 .663 .052 .0 \quad 90$ 9.0 NA 2003-10-18 02:53 2452931.1201389 1015.4 61.0 50.0 100 2003-10-18 03:53 2452931.1618056 1015.1 60.0 49.0100 2003-10-18 04:53 2452931.2034722 1015.5 $55.049 .0 \quad 90 \quad 4.0$ NA 2003-10-18 05:53 2452931.2451389 1015.7 56.0 48.0110 2003-10-18 06:53 2452931.2868056 1015.8 53.0 47.0 90 $\begin{array}{rlrrrrrr}2003-10-18 & 06: 53 & 2452931.2868056 & 1015.8 & 53.0 & 4.0 & 90 & 8.0 \\ 2003-10-18 & 07: 53 & 2452931.3284722 & 1015.6 & 55.0 & 47.0 & 100 & 8.0\end{array}$ 2003-10-18 $08: 532452931.37013891015 .257 .045 .0 \quad 90 \quad 8.0$ NA 2003-10-18 09:53 2452931.4118056 1014.756 .044 .0100 8.0 NA 2003-10-18 10:53 2452931.4534722 1014.851 .044 .0110 2003-10-18 11:53 2452931.4951389 1014.6 51.0 44.0110 2003-10-18 12:53 2452931.53680561014 .352 .043 .01104 .0 NA 2003-10-18 13:53 2452931.5784722 1014.2 50.0 42.0 120 3.0 NA 2003-10-18 14:53 2452931.62013891014 .153 .043 .01006 .0 NA 2003-10-18 15:53 2452931.66180561014 .660 .046 .02704 .0 NA 2003-10-18 16:53 $2452931.70347221014 .762 .045 .0 \quad 0 \quad 0.0$ NA 2003-10-18 17:53 2452931.7451389 1014.5 64.046 .0260 3.0 NA 2003-10-18 18:53 2452931.78680561014 .166 .048 .0320 3.0 NA 2003-10-18 19:53 2452931.8284722 1013.2 $69.049 .0 \quad 0 \quad 0.0$ NA 2003-10-18 20:53 $2452931.87013891012 .571 .048 .0 \quad 0 \quad 0.0$ NA 2003-10-18 21:53 2452931.9118056 1011.9 74.0 46.0 0 2003-10-18 22:53 2452931.9534722 1011.7 76.0 47.0 330 0.0 NA 2003-10-19 01:53 2452932.0784722 1012. 468.053 .0 2003-10-19 02:53 2452932.1201389 1012.3 60.0 50.0 110 2003-10-19 03:53 2452932.16180561011 .664 .045 .010010 .0 NA 2003-10-19 04:37 2452932.1923611 NA 61.0 45.0 130 2003-10-19 04:44 2452932.1972222 NA 63.0 45.0 110 2003-10-19 05.53 24529322451389 1010.5 01.0 42.0 110 6.0 NA 2003-10-19 06:53 2452932.2868056 1009.9 57.0 43.0100 4.0 NA 2003-10-19 07:53 2452932.3284722 1009.4 58.0 40.0 140 4.0 NA 2003-10-19 08:53 2452932.3701389 1009.5 59.0 $39.0 \quad 0 \quad 0.0$ NA


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NA $72.048 .0290 \quad 4.0$ NA 2003-10-19 23:53 2452932.9951389 1018.2 69.0 49.0 0 0.0 NA 2003-10-20 00:53 2452933.0368056 1018.3 66.0 51.0 $60 \quad 3.0$ NA 2003-10-20 01:53 2452933.0784722 1018.7 $64.050 .0 \quad 90 \quad 6.0$ NA 2003-10-20 02:53 2452933.12013891018 .863 .052 .0100 7.0 NA 2003-10-20 03:53 2452933.1618056 1018.9 61.0 50.0 80 9.0 NA 2003-10-20 04:53 2452933.2034722 1018.9 61.0 51.0 $80 \quad 7.0$ NA 2003-10-20 05:53 2452933.2451389 1018.9 60.0 51.0 90 5.0 NA 2003-10-20 06:53 2452933.2868056 1017.6 61.0 50.0 90 7.0 NA 2003-10-20 07:53 2452933.3284722 1016.8 60.0 49.0 100 6.0 NA 2003-10-20 08:53 2452933.37013891016 .560 .050 .0190 4.0 NA 2003-10-20 09:53 $2452933.41180561016 .459 .049 .0130 \quad 5.0$ NA 2003-10-20 10:53 2452933.4534722 1015.4 58.0 49.0 0 0.0 NA 2003-10-20 11:53 2452933.4951389 1014.8 58.0 49.0 $90 \quad 6.0$ NA 2003-10-20 12:53 2452933.53680561014 .858 .049 .0130 3.0 NA 2003-10-20 13:53 $2452933.57847221014 .761 .048 .0 \quad 0 \quad 0.0$ NA 2003-10-20 14:53 2452933.62013891014 .866 .046 .02005 .0 NA 2003-10-20 15:53 2452933.6618056 1015.0 66.0 50.0 NA 4.0 NA 2003-10-20 16:53 2452933.70347221015 .168 .051 .0220 6.0 NA 2003-10-20 17:53 2452933.74513891015 .668 .050 .02604 .0 NA 2003-10-20 18:53 2452933.7868056 1015.9 72.0 50.0 0 0.0 NA 2003-10-20 19:53 2452933.8284722 1016.0 75.0 50.0 220 9.0 NA 2003-10-20 20:53 2452933.8701389 1016.1 77.049 .0260 7.0 NA 2003-10-20 21:53 2452933.91180561016 .079 .050 .0210 10.0 NA 2003-10-20 22:53 2452933.9534722 1016.3 78.0 51.0 210 7.0 NA 2003-10-20 23:53 2452933.9951389 1015.9 78.0 49.0 190 11.0 NA 2003-10-21 00:53 2452934.0368056 1016.5 77.049 .0210 9.0 NA 2003-10-21 01:53 2452934.07847221017 .574 .049 .0200 4.0 NA 2003-10-21 02:53 2452934.1201389 1018.2 73.0 50.0 220 4.0 NA 2003-10-21 03:53 2452934.1618056 1019.1 71.054 .0180 9.0 NA 2003-10-21 05:53 2452934.2451389 1020.3 66.0 53.0 120 6.0 NA 2003-10-21 05:53 2452934.2451389 1020.3 66.0 53.0 120 6.0 NA 2003-10-21 06:53 2452934.2868056 1020.6 68.0 52.0 170 7.0 NA 2003-10-21 07:53 2452934.3284722 1020.6 67.0 52.0 180 8.0 NA

| 0 | 120 | 10 | NA | 61.4 | NA | M | M | M |
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| 0 | 120 | 10 | NA | 68.8 | NA | M | M | M |
| 0 | 120 | 10 | NA | 59.6 | 0.00 | 65 | 53 | M |
| 0 | 120 | 10 | NA | 59.8 | NA | M | M | M |
| 0 | 120 | 10 | NA | 59.8 | NA | M | M | M |
| 8 | 110 | 10 | NA | 64.3 | NA | M | M | M |
| 3 | 120 | 10 | NA | 62.2 | NA | M | M | M |
| 8 | 90 | 5 | NA | 64.7 | NA | M | M | M |
| 6 | 90 | 10 | NA | 56.0 | NA | 64 | 59 | M |
| 8 | 80 | 10 | NA | 52.2 | NA | M | M | M |
| 6 | 110 | 10 | NA | 48.7 | NA | M | M | M |
| 1 | 120 | 10 | NA | 45.3 | NA | M | M | M |
| 0 | 120 | 10 | NA | 42.3 | NA | M | M | M |
| 6 | 100 | 8 | NA | 45.5 | NA | M | M | M |
| 6 | 100 | 10 | NA | 42.5 | NA | M | M | 63.8 |
| 1 | 120 | 10 | NA | 48.9 | NA | 71 | 64 | 63.8 |
| 3 | 120 | 10 | NA | 58.4 | NA | M | M | M |
| 8 | 100 | 10 | NA | 60.3 | NA | M | M | M |
| 6 | 100 | 10 | NA | 67.3 | NA | M | M | M |
| 0 | 120 | 10 | NA | 67.1 | NA | M | M | M |
| 0 | 120 | 10 | NA | 69.6 | NA | M | M | M |
| 6 | 110 | 10 | NA | 72.1 | NA | 69 | 59 | M |
| 8 | 100 | 10 | NA | 67.1 | NA | M | M | M |
| 3 | 120 | 10 | NA | 66.9 | NA | M | M | M |
| 0 | 120 | 10 | NA | 69.5 | NA | M | M | M |
| 0 | 120 | 10 | NA | 69.4 | NA | M | M | M |
| 0 | 120 | 10 | NA | 71.9 | NA | M | M | M |
| 0 | 120 | 10 | NA | 71.9 | 0.00 | 62 | 56 | M |
| 1 | 120 | 10 | NA | 71.9 | NA | M | M | M |
| 0 | 120 | 10 | NA | 62.2 | NA | M | M | M |
| 6 | 90 | 10 | NA | 48.4 | NA | M | M | M |
| 0 | 120 | 10 | NA | 56.3 | NA | M | M | M |
| 1 | 120 | 10 | NA | 54.5 | NA | M | M | M |
| 0 | 120 | 10 | NA | 52.5 | NA | 74 | 56 | M |
| 0 | 120 | 10 | NA | 45.8 | NA | M | M | M |
| 0 | 120 | 10 | NA | 41.4 | NA | M | M | M |
| 0 | 120 | 10 | NA | 37.3 | NA | M | M | M |
| 0 | 120 | 10 | NA | 36.3 | NA | M | M | M |
| 6 | 90 | 10 | NA | 38.9 | NA | M | M | M |
| 1 | 120 | 10 | NA | 36.1 | NA | 79 | 68 | 63.2 |
| 3 | 120 | 10 | NA | 37.3 | NA | M | M | M |
| 0 | 120 | 10 | NA | 41.3 | NA | M | M | M |
| 0 | 120 | 10 | NA | 44.3 | NA | M | M | M |
| 6 | 110 | 10 | NA | 54.9 | NA | M | M | M |
| 1 | 120 | 10 | NA | 62.9 | NA | 78 | 6 | M |
| 1 | 120 | 10 | NA | 62.9 | NA | 78 | 66 | M |
| 0 | 120 | 10 | NA | 56.5 | NA | M | M | M |
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2003-10-21 08:53 2452934.3701389 1020.6 69.0 52.0 170 6.0 NA 2003-10-21 09:53 2452934.4118056 1021.0 66.0 52.0 0 0.0 NA 2003-10-21 10:53 2452934.4534722 1021.3 $65.051 .0 \quad 0 \quad 0.0$ NA 2003-10-21 11:53 2452934.49513891021 .763 .052 .0110 7.0 NA 2003-10-21 12:53 2452934.53680561021 .963 .052 .0110 7.0 NA 2003-10-21 13:53 $2452934.57847221022 .560 .0 \quad 51.0 \quad 70 \quad 5.0$ NA 2003-10-21 14:53 $2452934.62013891022 .663 .053 .0100 \quad 6.0$ NA 2003-10-21 15:53 2452934.6618056 1022.8 $69.056 .0 \quad 0 \quad 0.0$ NA 2003-10-21 16:53 2452934.70347221023 .075 .056 .0280 3.0 NA 2003-10-21 17:53 $2452934.74513891023 .076 .054 .0300 \quad 5.0$ NA 2003-10-21 18:53 2452934.7868056 1022.4 80.0 54.0 NA 3.0 NA 2003-10-21 19:53 2452934.8284722 1021.3 82.0 53.0 0 0.0 NA 2003-10-21 20:53 2452934.87013891019 .984 .052 .0350 4.0 NA 2003-10-21 21:53 2452934.91180561018 .9 85.0 52.0 350 6.0 NA 2003-10-21 $22: 532452934.95347221017 .986 .054 .0 \quad 20$ 9.0 NA 2003-10-21 23:53 2452934.9951389 1017.1 84.0 54.0 40 12.0 NA 2003-10-22 00:53 2452935.0368056 1016.2 77.0 52.0 50 12.0 NA 2003-10-22 01:53 2452935.0784722 1016.2 $73.052 .0 \quad 90$ 8.0 NA 2003-10-22 02:53 2452935.12013891015 .969 .050 .0100 7.0 NA 2003-10-22 03:53 2452935.1618056 1015.2 68.0 49.0 90 4.0 NA 2003-10-22 04:53 2452935.2034722 1014.7 66.0 48.0 90 5.0 NA 2003-10-22 05:53 2452935.2451389 1014.2 67.0 46.0 40 3.0 NA 2003-10-22 06:53 2452935.2868056 1013.6 67.0 45.0 30 5.0 NA 2003-10-22 07:53 2452935.3284722 1013.2 65.0 42.0 40 6.0 NA 2003-10-22 08:53 2452935.37013891013 .3 59.0 47.0190 7.0 NA 2003-10-22 09:53 2452935.41180561013 .5 59.0 51.0 $170 \quad 6.0$ NA 2003-10-22 10:53 2452935.4534722 1013.6 60.0 52.0 160 9.0 NA 2003-10-22 11:53 2452935.4951389 1013.4 60.0 51.0 170 6.0 NA 2003-10-22 12:53 2452935.53680561013 .5 57.0 50.0 160 4.0 NA 2003-10-22 13:53 2452935.5784722 1014.3 55.0 49.0 0 0.0 NA 2003-10-22 14:53 $2452935.62013891014 .556 .050 .090 \quad 5.0$ NA 2003-10-22 15:53 $2452935.66180561014 .762 .052 .0 \quad 90$ 7.0 NA 2003-10-22 16:53 $2452935.70347221014 .669 .052 .0 \quad 90 \quad 3.0$ NA 2003-10-22 17:53 2452935.74513891014 .173 .051 .0180 3.0 NA 2003-10-22 18:53 2452935.7868056 1013.9 77.0 50.0 240 2003-10-22 19:53 2452935.8284722 1013.4 79.0 49.0300 2003-10-22 21:53 2452935.9118056 1013.2 78.054 .0250 8.0 NA 2003-10-22 22:53 2452935.9534722 1013.1 76.0 54.0 230 6.0 NA 2003-10-22 $23: 532452935.99513891013 .075 .056 .0270$ 7.0 NA 2003-10-23 00:53 2452936.0368056 1013.5 70.0 55.0 250 7.0 NA 2003-10-23 01:53 2452936.07847221014 .668 .052 .0220 9.0 NA 2003-10-23 02:53 2452936.12013891015 .166 .051 .0190 10.0 NA 2003-10-23 03:53 2452936.1618056 1015.3 64.0 51.0 170 7.0 NA 2003-10-23 04:53 2452936.2034722 1015.6 64.0 51.0 170 6.0 NA 2003-10-23 05:53 2452936.2451389 1017.4 64.051 .0200 10.0 NA 2003-10-23 06:53 2452936.28680561018 .564 .051 .020013 .0 NA 2003-10-23 07:53 2452936.3284722 1020.5 62.0 47.0 200 9.0 17.0



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\begin{aligned}
& \text { NA } \\
& \text { NA }
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$$


33
$\Sigma \Sigma$
 52.7 NA 65.7 NA 65 5.7 NA 68.2 NA 60.9 NA $\begin{array}{llll}58.8 & \text { NA } & M & M \\ 2.7 & \text { NA } & 56 & 47\end{array}$ $\qquad$
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## 41.8



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| 51.2 | NA | 74 | 66 | 58.7 |



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| 2003-10-29 | 00:33 | 2452942.0229167 | NA | 72.0 | 52.0 | 230 | 31.0 | 41.0 | 8 | 11 | 2 | NA | 49.3 | NA | M | M | M | M | M | M | M | M |
| 2003-10-29 | 00:53 | 2452942.0368056 | 1002.1 | 71.0 | 52.0 | 240 | 30.0 | 40.0 | 8 | 11 | 2 | NA | 51.0 | NA | M | M | M | M | M | M | M | M |
| 2003-10-29 | 01:01 | 2452942.0423611 | NA | 72.0 | 52.0 | 240 | 26.0 | 38.0 | 8 | 9 | 2 | NA | 49.3 | NA | M | M | M | M | M | M | M | M |
| 2003-10-29 | 01:09 | 2452942.0479167 | NA | 70.0 | 52.0 | 250 | 28.0 | 36.0 | 8 | 7 | 75 | NA | 52.8 | NA | M | M | M | M | M | M | M | M |
| 2003-10-29 | 01:36 | 2452942.0666667 | NA | 70.0 | 54.0 | 230 | 20.0 | 31.0 | 8 | 17 | 5 | NA | 56.8 | NA | M | M | M | M | M | M | M | M |
| 2003-10-29 | 01:43 | 2452942.0715278 | NA | 70.0 | 54.0 | 230 | 21.0 | 25.0 | 8 | 75 | 7 | NA | 56.8 | NA | M | M | M | M | M | M | M | M |
| 2003-10-29 | 01:53 | 2452942.0784722 | 1001.9 | 70.0 | 53.0 | 230 | 20.0 | 27.0 | 8 | 75 | 8 | NA | 54.8 | NA | M | M | M | M | M | M | M | M |
| 2003-10-29 | 02:53 | 2452942.1201389 | 1001.6 | 68.0 | 52.0 | 240 | 13.0 | 19.0 | 8 | 60 | 9 | NA | 56.5 | NA | M | M | M | M | M | M | M | M |
| 2003-10-29 | 03:53 | 2452942.1618056 | 1001.2 | 66.0 | 53.0 | 240 | 24.0 | 36.0 | 8 | 70 | 8 | NA | 62.9 | NA | M | M | M | M | M | M | M | M |
| 2003-10-29 | 04:53 | 2452942.2034722 | 1001.5 | 63.0 | 50.0 | 240 | 20.0 | 26.0 | 8 | 60 | 10 | NA | 62.5 | NA | M | M | M | M | M | M | M | M |
| 2003-10-29 | 05:53 | 2452942.2451389 | 1003.6 | 58.0 | 36.0 | 310 | 23.0 | 27.0 | 8 | 19 | 6 | NA | 43.6 | NA | 72 | 58 | M | M | M | M | M | M |
| 2003-10-29 | 06:04 | 2452942.2527778 | NA | 54.0 | 30.0 | 300 | 19.0 | NA | 8 | 19 | 7 | NA | 39.6 | NA | M | M | M | M | M | M | M | M |
| 2003-10-29 | 06:24 | 2452942.2666667 | NA | 54.0 | 32.0 | 280 | 10.0 | NA | 3 | 120 | 9 | NA | 42.9 | NA | M | M | M | M | M | M | M | M |
| 2003-10-29 | 06:53 | 2452942.2868056 | 1005.9 | 52.0 | 32.0 | 230 | 9.0 | NA | 0 | 120 | 8 | NA | 46.2 | NA | M | M | M | M | M | M | M | M |
| 2003-10-29 | 07:53 | 2452942.3284722 | 1006.8 | 50.0 | 32.0 | 290 | 6.0 | NA | 0 | 120 | 10 | NA | 49.8 | NA | M | M | M | M | M | M | M | M |
| 2003-10-29 | 08:53 | 2452942.3701389 | 1006.5 | 49.0 | 25.0 | 300 | 18.0 | NA | 0 | 120 | 10 | NA | 38.8 | NA | M | M | M | M | M | M | M | M |
| 2003-10-29 | 09:53 | 2452942.4118056 | 1007.3 | 47.0 | 26.0 | 190 | 10.0 | NA | 6 | 65 | 10 | NA | 43.6 | NA | M | M | M | M | M | M | M | M |
| 2003-10-29 | 10:53 | 2452942.4534722 | 1007.3 | 45.0 | 36.0 | 200 | 9.0 | NA | 3 | 120 | 10 | NA | 70.5 | NA | M | M | M | M | M | M | M | M |
| 2003-10-29 | 11:53 | 2452942.4951389 | 1007.4 | 45.0 | 36.0 | 210 | 10.0 | NA | 8 | 65 | 10 | NA | 70.5 | 0.00 | 57 | 44 | M | 40.1 | M | 19 | M | M |



Data Extracted:2004-04-12 14:28:46
COLLEGE PLACE, 1 MI S of College Place, Wa
Lat:46.0 Lng:118.3 elevation:691
Dates Range From 1992-04-28 To 2004-04-11

Total
DATE Precip
Gregorian inches
2003-09-27.00
2003-09-28.00
2003-09-29.00
2003-09-30.00
2003-10-01.00
2003-10-02.00
2003-10-03 . 00
2003-10-04.00
2003-10-05 .00
2003-10-06 . 00
2003-10-07.00
2003-10-08.00
2003-10-09.00
2003-10-10.00
2003-10-11.04
2003-10-12 . 00
2003-10-13 NA
2003-10-14 . 00
2003-10-15 . 18
2003-10-16 . 06
2003-10-17.00
2003-10-18.00
2003-10-19 . 00
2003-10-20.00
2003-10-21.00
2003-10-22 .00
2003-10-23 . 00
2003-10-24.00
2003-10-25 . 00
2003-10-26.00
2003-10-27.00
2003-10-28 .00

Data Extracted:2004-04-12 14:28:46
R. EBY, 6 MI S of Finley, Wa

Lat:46.0 Lng:119.0 elevation:1176
Dates Range From 1989-03-31 To 2004-04-11

```
    Total
DATE Precip
Gregorian inches
------- ------
2003-09-27 .00
2003-09-28.00
2003-09-29 .00
2003-09-30 .00
2003-10-01 .00
2003-10-02 .00
2003-10-03 .00
2003-10-04 .00
2003-10-05 .00
2003-10-06 .00
2003-10-07 .00
2003-10-08 .00
2003-10-09 .00
2003-10-10 .00
2003-10-11 . 02
2003-10-12 .00
2003-10-13 .00
2003-10-14 .08
2003-10-15 .09
2003-10-16 .00
2003-10-17 . 00
2003-10-18.00
2003-10-19 .00
2003-10-20 .00
2003-10-21 .00
2003-10-22 .00
2003-10-23 .00
2003-10-24 .00
2003-10-25 .00
2003-10-26 .00
2003-10-27 .00
2003-10-28 .00
```

Data Extracted:2004-04-12 14:28:47
FINLEY, 1.5 MI S of Finley, Wa
Lat:46.1 Lng:119.0 elevation:755
Dates Range From 1992-06-02 To 2004-04-11

```
    Total
DATE Precip
Gregorian inches
------- ------
2003-09-27 .00
2003-09-28.00
2003-09-29 .00
2003-09-30.00
2003-10-01 .00
2003-10-02 .00
2003-10-03 .00
2003-10-04 .00
2003-10-05 .00
2003-10-06 .00
2003-10-07 .00
2003-10-08.00
2003-10-09 .00
2003-10-10.00
2003-10-11 . 00
2003-10-12 .00
2003-10-13 .00
2003-10-14 .00
2003-10-15 .00
2003-10-16 .00
2003-10-17 . 00
2003-10-18.00
2003-10-19 .00
2003-10-20 .00
2003-10-21 .00
2003-10-22 .00
2003-10-23 .00
2003-10-24 .00
2003-10-25 .00
2003-10-26 .00
2003-10-27.00
2003-10-28 .00
```

Total
DATE Precip
Gregorian inches
------- -----

2003-09-27.00
2003-09-28.00
2003-09-29 . 00
2003-09-30.00
2003-10-01 .00
2003-10-02.00
2003-10-03 . 00
2003-10-04.00
2003-10-05.00
2003-10-06.00
2003-10-07.00
2003-10-08 . 00
2003-10-09.00
2003-10-10.00
2003-10-11 . 00
2003-10-12 . 00
2003-10-13.00
2003-10-14.00
2003-10-15 . 00
2003-10-16.00
2003-10-17.00
2003-10-18 . 00
2003-10-19.00
2003-10-20.00
2003-10-21.00
2003-10-22 . 00
2003-10-23 . 00
2003-10-24.00
2003-10-25 . 00
2003-10-26 . 00
2003-10-27.00
2003-10-28 .00

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| :--- | :--- | :--- | :--- | Feedback

This page was generated on 2004-04-12

## WSU Public Agricultural Weather System

Data Extracted:2004-04-13 12:51:13
BADGER CANYON (Sleater), 4.0 MI SW of Kennewick, Wa
Lat:46.1 Lng:119.2 elevation:591
Dates Range From 1995-07-13 To 2004-04-12

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Mean Precipitation |  |  |  |  |  |  |  |  |  |  |  |
| 1.1 | . 9 | . 6 | . 4 | . 4 | . 3 | . 3 | . 0 | . 1 | . 7 | 1.0 | 1.4 |
| Min Precipitation |  |  |  |  |  |  |  |  |  |  |  |
| . 5 | . 3 | . 0 | . 0 | . 2 | . 0 | . 0 | . 0 | . 0 | . 0 | . 3 | . 5 |
| 2002 | 1997 | 2004 | 2003 | 2001 | 2003 | 2003 | 2003 | 2003 | 2003 | 2003 | 1999 |
| Data Extracted:2004-04-13 12:51:14 |  |  |  |  |  |  |  |  |  |  |  |
| COLLEGE PLACE, 1 MI S of College Place, Wa |  |  |  |  |  |  |  |  |  |  |  |
| Lat:46.0 Lng:118.3 elevation:691 |  |  |  |  |  |  |  |  |  |  |  |
| Dates Range From 1992-04-28 To 2004-04-12 |  |  |  |  |  |  |  |  |  |  |  |
| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| $\begin{aligned} & \text { Mean } \\ & 1.8 \end{aligned}$ | $\begin{gathered} \text { Precip } \\ 1.3 \end{gathered}$ | $\begin{gathered} i t a t i \\ 1.2 \end{gathered}$ | $1.4$ | 1.3 | . 9 | . 5 | . 5 | . 5 | . 9 | 1.5 | 1.5 |
| Min Precipitation |  |  |  |  |  |  |  |  |  |  |  |
| . 6 | . 4 | . 3 | . 5 | . 4 | . 0 | . 0 | . 0 | . 0 | . 2 | . 4 | . 6 |
| 2002 | 1997 | 2004 | 2002 | 1992 | 2003 | 2003 | 2003 | 1993 | 2002 | 1997 | 1994 |
| Data Extracted:2004-04-13 12:51:16 |  |  |  |  |  |  |  |  |  |  |  |
| R. EBY, 6 MI S of Finley, Wa |  |  |  |  |  |  |  |  |  |  |  |
| Lat:46.0 Lng:119.0 elevation:1176 |  |  |  |  |  |  |  |  |  |  |  |
| Dates Range From 1989-03-31 To 2004-04-12 |  |  |  |  |  |  |  |  |  |  |  |
| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| Mean Precipitation |  |  |  |  |  |  |  |  |  |  |  |
| 1.1 | . 8 | . 8 | . 8 | . 9 | . 6 | . 5 | . 4 | . 2 | . 8 | 1.3 | 1.2 |
| Min Precipitation |  |  |  |  |  |  |  |  |  |  |  |
| . 0 | . 0 | . 0 | . 2 | . 0 | . 0 | . 0 | . 0 | . 0 | . 0 | . 2 | . 6 |
| 2003 | 2003 | 2000 | 2000 | 1992 | 2003 | 2003 | 2003 | 2003 | 2003 | 2002 | 1992 |

Data Extracted:2004-04-13 12:51:17
FINLEY, 1.5 MI S of Finley, Wa
Lat:46.1 Lng:119.0 elevation:755
Dates Range From 1992-06-02 To 2004-04-12
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Mean Precipitation

| . 9 | . 7 | . 7 | . 6 | . 5 | . 4 | . 2 | . 3 | . 2 | . 5 | . 9 | . 9 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Min Precipitation |  |  |  |  |  |  |  |  |  |  |  |
| . 0 | . 0 | . 0 | . 0 | . 0 | . 0 | . 0 | . 0 | . 0 | . 0 | . 0 | . 0 |
| 2004 | 2004 | 2004 | 2001 | 2004 | 2003 | 2003 | 2003 | 2003 | 2004 | 2003 | 2003 |
| Data Extracted:2004-04-13 12:51:19 |  |  |  |  |  |  |  |  |  |  |  |
| KENNEWICK (Stewart), Edison and 8th, Kennewick, Wa |  |  |  |  |  |  |  |  |  |  |  |
| Lat:46.2 Lng:119.1 elevation:429 |  |  |  |  |  |  |  |  |  |  |  |
| Dates Range From 1995-07-11 To 2004-04-12 |  |  |  |  |  |  |  |  |  |  |  |
| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| Mean Precipitation |  |  |  |  |  |  |  |  |  |  |  |
| 1.0 | . 8 | . 6 | . 6 | . 8 | 1.0 | . 7 | . 8 | 1.1 | . 9 | . 9 | 1.2 |
| Min Precipitation |  |  |  |  |  |  |  |  |  |  |  |
| . 4 | . 3 | . 0 | . 0 | . 0 | . 0 | . 0 | . 0 | . 0 | . 1 | . 0 | . 3 |
| 2002 | 1997 | 2004 | 2003 | 2001 | 2003 | 2004 | 2004 | 2004 | 2003 | 2003 | 2002 |
| Data Extracted:2004-04-13 12:51:20 |  |  |  |  |  |  |  |  |  |  |  |
| TOUCHET, 1.5 MI S of Touchet, Wa |  |  |  |  |  |  |  |  |  |  |  |
| Lat:46.0 Lng:118.6 elevation:492 |  |  |  |  |  |  |  |  |  |  |  |
| Dates Range From 1989-01-01 To 2004-04-12 |  |  |  |  |  |  |  |  |  |  |  |
| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| Mean Precipitation |  |  |  |  |  |  |  |  |  |  |  |
| 1.2 | . 9 | . 8 | . 7 | . 8 | . 6 | . 3 | . 4 | . 2 | . 5 | 1.0 | 1.0 |
| Min Precipitation |  |  |  |  |  |  |  |  |  |  |  |
| . 0 | . 0 | . 0 | . 0 | . 0 | . 0 | . 0 | . 0 | . 0 | . 0 | . 1 | . 4 |
| 2003 | 2003 | 2004 | 2003 | 1994 | 2003 | 2003 | 2003 | 2003 | 2003 | 2003 | 1989 |

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# WALLA WALLA FAA AIRPORT, WASHINGTON (458928) <br> <br> Period of Record Monthly Climate Summary <br> <br> Period of Record Monthly Climate Summary Period of Record : 12/1/1949 to 12/31/2003 

 Period of Record : 12/1/1949 to 12/31/2003}

Average Total
Precipitation (in.)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Annual
2.291 .751 .961 .651 .801 .180 .580 .750 .881 .682 .512 .3019 .34

Check Station Metadata or Metadata graphics for more detail about data completeness.

## Appendix C

# STATUS REPORT 2003 Best Available Control Measures for Columbia Plateau Agriculture January, 2004 

## Summary

This report fulfills Ecology's commitment to review and report annually on the use of Best Available Control Measures (BACM) in the Columbia Plateau. Ecology committed to provide such a report to the Environmental Protection Agency (EPA) in the revised Natural Events Action Plan (NEAP).

The level of Conservation Reserve Program (CRP) and Best Management Practice (BMP) use has increased from 68 to 70 percent in the priority counties of the Columbia Plateau. Seventy percent of the total farmable acres in these counties are now part of a United States Department of Agriculture (USDA) conservation program, use one of the minimum till practices, or contain $15-30 \%$ residue. Washington State finds this level of CRP and BMP implementation fulfills BACM criteria.

## Background

EPA issued the policy on "Areas Affected by PM-10 Natural Events," or the Natural Events Policy (NEP), on May 30, 1996. Under the NEP, ambient $\mathrm{PM}_{10}$ concentrations raised by unusually high winds may be treated as uncontrollable natural events when the dust originates from nonanthropogenic sources, or when the dust originates from contributing anthropogenic sources controlled with BACM. After natural events cause the $\mathrm{PM}_{10}$ concentration to violate the $\mathrm{PM}_{10}$ National Ambient Air Quality Standard, the NEP allows a state to develop a natural events action plan (NEAP) to deal with future exceedances.

A number of exceedances of the 24 -hour standard for $\mathrm{PM}_{10}$ were recorded in eastern Washington in the late 1980s and early 1990s. Examination of the exceedances showed a close correlation to high wind events and upwind agricultural fields were identified as the chief source of the windblown dust. The Washington State Department of Ecology (Ecology) developed the Natural Events Action Plan for High Wind Events in the Columbia Plateau in March 1998, and submitted it to Region 10 EPA, in accordance with the NEP.

The 1998 NEAP included Ecology's commitment to re-evaluate the NEAP at the end of 2001. The 2001 evaluation is embodied in the revised NEAP submitted to EPA in July, 2003. Several changes were incorporated into the revised NEAP including Ecology's commitment to review and report to EPA annual BACM implementation.

BACM Definition and Tracking Mechanism

The revised NEAP defines BACM for agricultural fields as USDA Conservation Title Programs supplemented by incentive based implementation of wind erosion conservation practices or BMPs. In short, the BACM definition recognizes the critical role of agricultural agencies in defining and instituting BACM on the Columbia Plateau. The primary agencies include those directly reporting to the USDA such as the Natural Resources Conservation Service (NRCS), the Farm Service Agency (FSA), and the Agricultural Research Service (ARS). Additional agricultural agencies include the Washington State Conservation Commission, local Conservation Districts and various agriculture related departments of the Washington State University. The NEAP acknowledges the combined expertise of these agencies and relies on the various programs of these agencies in implementing the conservation practices that constitute BACM.

For defining BACM, the NEAP uses the USDA's CRP program and the wind erosion BMPs encouraged by NRCS and/or the Columbia Plateau Wind Erosion /Air Quality Project (referred to as the CP3). Use of these practices is tracked by the Conservation Technology Information Center's (CTIC), Core 4 program. The CTIC’s Core 4 program tracks conservation tillage (NoTill, Ridge-Till, Mulch-Till) and conventional tillage ( $0-15 \%$ and $15-30 \%$ residue) practices and CRP enrollment on a county by county basis.

A full discussion on Ecology's BACM definition and tracking mechanism may be found in the revised NEAP.

## STATUS REPORT: 2003 BACM

The 2003 NEAP determined BACM is implemented in the Columbia Plateau based on 68 percent use of conservation practices. Attachment 1 shows the implementation of conservation practices for the seven priority counties, as defined in the NEAP. These counties have the lowest rainfall and thus are the most susceptible to windblown dust.

Data evaluated is for the year 2002, the most recent year for which data is available. The evaluation includes data on CRP, minimum tillage, and residue remaining on the field for the lowest rainfall counties of the Columbia Plateau - counties Ecology finds to be high priority in terms of addressing wind blown dust. Ecology identified Adams, Douglas, Franklin, Grant and Lincoln as priority counties in the 1998 NEAP. Benton and Walla Walla counties were added to the list more recently. The Core 4 data shows 70 percent of the priority counties' total farmable acres are in a USDA conservation program, use one of the minimum till practices, or contain 15$30 \%$ residue.

Similarly, attachment 2 shows the implementation of conservation practices for all counties of the Columbia Plateau NEAP. The data shows 71 percent use of conservation practices throughout the Columbia Plateau.

The results are consistent with the 2003 NEAP determination and show that we continue to meet BACM requirements.

## Additional Efforts to Enhance Wind Erosion Conservation Measures

Ecology is continuing to work with the various agricultural agencies to enhance the use of conservation practices in the Columbia Plateau. In doing so, implementation of wind erosion conservation measures is enhanced beyond that tracked and reported by the Core 4. For example, Ecology contracted with the Benton Conservation District (BCD) for tasks associated with a special funds grant from the EPA. The goal of the project is twofold: to provide immediate, temporary treatment to critical areas and to promote other options for longer-term or permanent wind erosion control measures identified in the CP3.

The first goal is addressed by the purchase of a straw mulcher and cost share straw for use in the Horse Heaven Hills of Benton County. To date, the straw mulcher has been used by eight different farm operators. They have applied roughly 556 tons of grass straw on about 275 acres of "hot spots" (highly erodible areas). An additional 150 tons was applied without projectsupplied cost-share. In total, roughly 706 tons of straw were applied to highly erodible areas in an effort to protect against the occurrence of windblown dust.

Education and outreach will address the second goal. The outreach will focus on installing wind erosion conservation buffers as a longer-term solution to wind erosion. Ecology, the BCD, the NRCS and the CTIC will conduct the outreach in the winter of 2004.

Moreover, Ecology’s Water Quality Program recently awarded two funding requests that will enhance wind erosion control measures on the Columbia Plateau. The objectives of both water and wind erosion control are to prevent or minimize soil particle detachment and entrainment by the medium (air or water.) Consequently, conservation practices to reduce the effects from both types of erosion are substantially similar. For this reason, air quality is improved when conservation measures to reduce water erosion are increased.

The Water Quality Program awarded the Spokane County Conservation District a $\$ 2,000,000$ low interest State Revolving Fund loan for its Eastern Washington Conservation Tillage Program. This program promotes the implementation of direct seeding in Whitman and Asotin Counties, resulting in decreased erosion and improved water infiltration. The low interest loans provided to agricultural producers will facilitate the purchase of direct seeding equipment, making the transition to conservation tillage economically feasible. Direct seeding is recognized by both the CP3 and the NRCS as an effective wind erosion control measure.

Similarly, the Franklin Conservation District was awarded a $\$ 250,000$ Centennial Clean Water Fund grant to install perennial wheat erosion buffers. This project is designed to address water and soil runoff from fallow fields in dryland farm areas of Franklin and Whitman Counties. Erosion events increase sediments and contaminants in eastern Washington streams. Perennial wheat will be evaluated as an erosion control method, compared to conventional wheat/fallow and CRP cultivations. Conservation buffers, too, are recognized by both the CP3 and the NRCS as an effective wind erosion control measure.

## Conclusion

Ecology and the identified agricultural agencies continue to carry out the Columbia Plateau NEAP. Ecology finds the level of CRP and BMP implementation identified in this report continues to fulfill BACM criteria. Ecology will continue to document natural events and flag exceedances when justified under the terms of the 2003 NEAP.

## 2003 BACM Status Report: Columbia Plateau



| Kittitas |  | CRP | No-Till | Ridge-Till | Mulch-Till | 15-30\% Residue. | acres | \% acres |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| HEL withdrawn from production | 3,294 | 3,294 |  |  |  |  | 3,294 | 100.00\% |
| Fallow acres | 3,100 |  | 0 | 0 | 0 | 2,480 | 2,480 | 80.00\% |
| Planted acres | 18,300 |  | 0 | 0 | 0 | 5,738 | 5,738 | 31.36\% |
| Total farmable acres | 24,694 | 13\% | 0 | 0 | 0 | 8,218 | 11,512 | 46.62\% |
|  |  |  |  |  |  |  |  |  |
| Klickitat |  | CRP | No-Till | Ridge-Till | Mulch-Till | 15-30\% Residue. | acres | \% acres |
| HEL withdrawn from production | 57,925 | 57,925 |  |  |  |  | 57,925 | 100.00\% |
| Fallow acres | 22,028 |  | 0 | 0 | 0 | 16,080 | 16,080 | 73.00\% |
| Planted acres | 69,451 |  | 30,963 | 0 | 0 | 31,003 | 61,966 | 89.22\% |
| Total farmable acres | 149,404 | 39\% | 30,963 | 0 | 0 | 47,083 | 135,971 | 91.01\% |
|  |  |  |  |  |  |  |  |  |
| Lincoln |  | CRP | No-Till | Ridge-Till | Mulch-Till | 15-30\% Residue. | acres | \% acres |
| HEL withdrawn from production | 86,330 | 86,330 |  |  |  |  | 86,330 | 100.00\% |
| Fallow acres | 239,832 |  | 23,983 | 0 | 83,941 | 119,916 | 227,840 | 95.00\% |
| Total planted acres | 483,639 |  | 47,182 | 0 | 175,071 | 230,057 | 452,310 | 93.52\% |
| Total farmable acres | 809,801 | 11\% | 71,165 | 0 | 259,012 | 349,973 | 766,480 | 94.65\% |
|  |  |  |  |  |  |  |  |  |
| Okanogan |  | CRP | No-Till | Ridge-Till | Mulch-Till | 15-30\% Residue. | acres | \% acres |
| HEL withdrawn from production | 4,057 | 4,057 |  |  |  |  | 4,057 | 100.00\% |
| Fallow acres | 7,151 |  | 0 | 0 | 0 | 3,933 | 3,933 | 55.00\% |
| Total planted acres | 25,425 |  | 0 | 0 | 0 | 18,372 | 18,372 | 72.26\% |
| Total farmable acres | 36,633 | 11\% | 0 | 0 | 0 | 22,305 | 26,362 | 71.96\% |
|  |  |  |  |  |  |  |  |  |
| Pend Oreille |  | CRP | No-Till | Ridge-Till | Mulch-Till | 15-30\% Residue. | acres | \% acres |
| HEL withdrawn from production | 0 | 0\% |  |  |  |  | 0 | NA |
| Fallow acres | 184 |  | 0 | 0 | 0 | 0 | 0 | 0.00\% |
| Total planted acres | 641 |  | 0 | 0 | 0 | 315 | 315 | 49.14\% |
| Total farmable acres | 825 | 0\% | 0 | 0 | 0 | 315 | 315 | 38.18\% |
|  |  |  |  |  |  |  |  |  |
| Spokane |  | CRP | No-Till | Ridge-Till | Mulch-Till | 15-30\% Residue. | acres | \% acres |
| HEL withdrawn from production | 32,033 | 32,033 |  |  |  |  | 32,033 | 100.00\% |
| Fallow acres | 225,203 |  | 11,260 | 0 | 45,041 | 135,122 | 191,423 | 85.00\% |
| Total planted acres | 224,672 |  | 17,133 | 0 | 53,535 | 104,542 | 175,210 | 77.98\% |
| Total farmable acres | 481,908 | 7\% | 28,393 | 0 | 98,576 | 239,664 | 398,666 | 82.73\% |
|  |  |  |  |  |  |  |  |  |
| Stevens |  | CRP | No-Till | Ridge-Till | Mulch-Till | 15-30\% Residue. | acres | \% acres |
| HEL withdrawn from production | 3,552 | 3,552 |  |  |  |  | 3,552 | 100.00\% |
| Fallow acres | 6,000 |  | 0 | 0 | 0 | 4,020 | 4,020 | 67.00\% |
| Total planted acres | 29,100 |  | 711 | 0 | 7,061 | 15,699 | 23,471 | 80.66\% |
| Total farmable acres | 38,652 | 9\% | 711 | 0 | 7,061 | 19,719 | 31,043 | 80.31\% |
|  |  |  |  |  |  |  |  |  |
| Walla Walla |  | CRP | No-Till | Ridge-Till | Mulch-Till | 15-30\% Residue. | acres | \% acres |
| HEL withdrawn from production | 148,578 | 148,578 |  |  |  |  | 148,578 | 100.00\% |
| Fallow acres | 120,084 |  | 12,000 | 0 | 60,042 | 33,023 | 105,065 | 87.49\% |
| Total planted acres | 295,888 |  | 29,343 | 0 | 99,662 | 91,884 | 220,889 | 74.65\% |
| Total farmable acres | 564,550 | 26\% | 41,343 | 0 | 159,704 | 124,907 | 474,532 | 84.05\% |
|  |  |  |  |  |  |  |  |  |
| Whitman |  | CRP | No-Till | Ridge-Till | Mulch-Till | 15-30\% Residue. | acres | \% acres |
| HEL withdrawn from production | 135,755 | 135,755 |  |  |  |  | 135,755 | 100.00\% |
| Fallow acres | 172,000 |  | 30,000 | 0 | 20,000 | 61,000 | 111,000 | 64.53\% |
| Total planted acres | 733,170 |  | 90,650 | 0 | 96,000 | 281,800 | 468,450 | 63.89\% |
| Total farmable acres | 1,040,925 | 13\% | 120,650 | 0 | 116,000 | 342,800 | 715,205 | 68.71\% |
|  |  |  |  |  |  |  |  |  |
| Yakima |  | CRP | No-Till | Ridge-Till | Mulch-Till | 15-30\% Residue. | acres | \% acres |
| HEL withdrawn from production | 53,727 | 53,727 |  |  |  |  | 53727 | 100.00\% |
| Fallow acres | 9,175 |  | 0 | 0 | 0 | 3,853 | 3,853 | 41.99\% |
| Total planted acres | 66,770 |  | 0 | 0 | 4,224 | 16,903 | 21,127 | 31.64\% |
| Total farmable acres | 129,672 | 41\% | 0 | 0 | 4,224 | 20,756 | 78,707 | 60.70\% |
|  |  |  |  |  |  |  |  |  |
| SUMMARY |  | CRP | No-Till | Ridge-Till | Mulch-Till | 15-30\% Residue. | acres | \% acres |
| Total farmable acres | 6,560,808 | 1,279,599 | 444,341 | 2,675 | 929,469 | 2,013,352 | 4,669,436 |  |
|  |  | 20\% | 7\% | 0\% | 14\% | 31\% |  | 71\% |

## 2003 BACM Status Report: Columbia Plateau Priority Counties




[^0]:    Printed on Recycled Paper

[^1]:    3 $M$
    $M$
    $\square$

