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MEMORANDUM

TO: **Board of Directors – Frazier Park P.U.D. and Lake of the Woods M.W.C.**

FROM: **Dee Jaspar**

SUBJECT: **Water Availability Report – Update**

DATE: **April 23, 2015**

The following is a progress report on the status of the water availability studies that are underway for the regional project. Ken Schmidt is working on this report in conjunction with this office. This report should be available by mid-May.

A draft report was written in 2008 by the Galli Group, of Grant Pass, Oregon that addressed estimates of available groundwater storage in the Cuddy Creek Valley. The report considered the portion of the valley from Lake of the Woods to Lebec. The valley was divided into three alluvial sub-basins. The West Subbasin – from Lake of the Woods to the narrow basin area west of Frazier Park. The Middle Subbasin – from the east boundary of the West Subbasin to just upstream of a large alluvial fan that feeds into the basin from northeast of Frazier Park, near the prominent ridge protruding into the basin from the north, just east of where the Garlock Fault intersects the San Andreas Fault. It includes all of the Frazier Park P.U.D. wells. The East Subbasin – from the east boundary of the Middle Subbasin to just west of I-5. Streamflow in Cuddy Creek is a major source of recharge to groundwater in the Subbasins.

Of particular interest in this study are the groundwater conditions in the Middle and West Subbasins. The Galli study noted that for the Middle Subbasin, groundwater levels did not reflect the large water level declines expected during periods of no streamflow in Cuddy Creek, especially when compared to the decline of water levels in the East Subbasin. The study concluded that this was due to several reasons: mountain front recharge from the neighboring hillsides, subsurface groundwater inflow from the West Subbasin, and possibly reduced groundwater outflow due to the fault zones just east of Frazier Park. The study also indicated that the Middle Subbasin benefits from groundwater storage in alluvial deposits in the side valleys.

A cursory review of this information indicates that the West Subbasin and Middle Subbasin are hydraulically connected and that the Middle Subbasin benefits from groundwater inflow from the West Subbasin. The East Subbasin also benefits – however the connection between the Middle and East Subbasins appears to be slightly constricted.

The topography in the Cuddy Valley area in the study area amplifies runoff into Cuddy Creek due to the steepness of the terrain. The granitic composition of the underling basement complex serves to act as a barrier to direct recharge of the permeable deposits in the area, further enhancing flow to Cuddy Creek. The shape of the subsurface alluvium generally follows the shape of the surrounding hillsides. Galli assumed that the shape of the channel beneath the alluvium to be a truncated "V", with side slopes of 36° for the Middle Subbasin and 40° for the West Subbasin. These slopes were determined from depths of alluvial deposits penetrated by wells and from the adjacent hillside slopes. The maximum depths of alluvial deposits were estimated to be 200 feet for the West Subbasin and 400 feet for the Middle Subbasin. The West Subbasin was reported as 8,500 feet long by 600 feet wide (average width) and the Middle Subbasin was reported as 10,500 feet long by1,200 feet wide (average width).

The Galli study estimated the amount of water in storage in each of the Subbasins for specific depths to water, a specific yield of 0.12 (the portion of the deposits made up of water that will be released when pumped), and the cross sectional area of saturated deposits, and the above-stated length of the Subbasin.

For the West Subbasin, the estimated amount of groundwater in storage at a depth of 30 feet was 1,300 acre-feet and at a depth of 60 feet it was estimated to be 950 acre-feet. At a depth of 90 feet the estimated storage was 650 acre-feet. The new well that is planned for Lake of the Woods will develop valuable data on depth of alluvium and amounts of groundwater in storage in that location.

For the Middle Subbasin the estimated groundwater in storage at a depth of 30 feet was 6,500 acre-feet and at a depth of 60 feet it was estimated to be 5,700 acre-feet

The Middle Subbasin stores five times more water than the West Subbasin at a 60 foot depth to water and six times more water at 90 foot depth to water.

A survey of well owners in the Cuddy Valley was conducted several months ago. Requests were made to allow the District to measure well water levels. It is hoped that well owners in the valley will allow the District to measure the water depths in their wells to add to the amount of data that is currently available. This data is currently limited to District and Lake of the Woods wells.

Water levels in the Lake of the Woods wells were recently measured and the results indicate that average water levels in the West Subbasin at Lake of the Woods is currently about 160 feet. Last year the average water levels were about 170 feet depth.

Frazier Park water levels are indicated to be 30 feet deep. This is the same level as it was in 2014 at this time of year. If this is verified by additional data for the Middle Subbasin, it indicates the amount of water in storage did not decrease during the past year. This would indicate that there was enough recharge to balance the groundwater outflow (subsurface flow and consumptive use from pumped groundwater). If verified, it appears that the Middle Subbasin would be a good candidate to serve both Frazier Park and Lake of the Woods. Some of the groundwater entering the West Subbasin flows down to the Middle Subbasin where there is much more groundwater in storage and water losses appear to be stable.