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7  
8 SUPERIOR COURT OF THE STATE OF CALIFORNIA  
9 COUNTY OF LOS ANGELES  
10

11 Coordination Proceeding  
Special Title (Rule 1550(b))

Judicial Council Coordination  
Proceeding No. 4408

12 ANTELOPE VALLEY GROUNDWATER  
13 CASES

**DECLARATION OF BRUCE N.  
NELSON, P.E. FOR HEARING ON  
JURISDICTIONAL BOUNDARIES  
(U.S. BORAX)**

14 Included Actions:

15 Los Angeles County Waterworks District No. 40  
v. Diamond Farming Co.  
16 Superior Court of California,  
County of Los Angeles, Case No. BC 325 201

Date: July 24, 2006  
Time: 10:00 a.m.  
Dept: 1

17 Los Angeles County Waterworks District No. 40  
18 v. Diamond Farming Co.  
Superior Court of California,  
19 County of Kern, Case No. S-1500-CV-254-348

20 Wm. Bolthouse Farms, Inc. v. City of Lancaster  
Diamond Farming Co. v. City of Lancaster  
21 Diamond Farming Co. v. Palmdale Water Dist.  
Superior Court of California, County of  
22 Riverside, consolidated actions, Case  
Nos. RIC 353 840, RIC 344 436, RIC 344 668  
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1 I, Bruce N. Nelson, declare as follows:

2 1. I am Bruce N. Nelson, a consultant and expert in groundwater hydrology and  
3 engineering hydrology. I have been retained by U.S. Borax to provide technical assistance with  
4 surface and groundwater hydrology, including assessment of the groundwater supply important to  
5 their operations in Boron, California.

6 2. I am a Registered Professional Engineer (#11710) nationally via the National Council  
7 of Engineering Examiners, and individually registered in six western states for the past 21 years. I  
8 am currently a licensed monitoring well constructor, and a member of the Association of  
9 Groundwater Scientists and Engineers, a division of the American Water Well Association. My  
10 education includes a Master of Science degree from Montana State University in Civil/Environmental  
11 Engineering, specializing in water resources engineering, with a minor in chemistry. My work  
12 experience in the field of hydrology and water resources engineering covers the past 24 years.

13 3. This declaration addresses the pending establishment of administrative boundaries to  
14 define the extent of the "Antelope Valley Groundwater Adjudication" in southern California.  
15 Specifically, this declaration discusses the area that should be included for a comprehensive  
16 adjudication and possible solution for the management of the groundwater regime in the Antelope  
17 Valley. U.S. Borax currently uses groundwater extracted from the North Muroc Basin as an  
18 important water source in the processing of borate ore at their Boron California mine and processing  
19 plant. For this reason, the adjudication area is of importance to U.S. Borax in the management of  
20 their water supply.

21 4. As an aid to discussion, attached as Exhibit A, is a map of the general area of interest.  
22 This map is based upon Geographical Information Systems (GIS) data and base map obtained from  
23 the California Department of Water Resources (DWR) and dated May, 2006. The map depicts the  
24 Antelope Valley and adjacent area. The map also depicts significant cultural features and legal  
25 boundaries such as the Public Land Survey (PLS) and Counties boundaries. The map also shows the  
26 Antelope Valley Adjudication area as proposed by this declaration. Though the area of principal  
27 interest to U.S. Borax is the North Muroc Basin, the nature of complex hydrologic systems generally  
28 requires that consideration be given to immediately surrounding areas at a minimum, and potentially

1 to very large areas to understand the broader and long-term hydrologic consequences of water  
2 development or management.

3 5. The region of interest is addressed by a substantial number of published technical  
4 reports and work associated with the geology and hydrology of the groundwater regime. During my  
5 investigation of the regional groundwater hydrology, I have reviewed many references to gain an  
6 understanding of the groundwater hydrology within the Antelope Valley Watershed. Not all of these  
7 references are cited in this declaration, however they are included as pertinent sources of information  
8 in **Exhibit B**.

9 6. Investigations conducted by the USGS and others indicate that the Antelope Valley  
10 Groundwater Basin ("AVGB") is contained within the Antelope Valley surface watershed (C.E.  
11 Lamb, 1980; Leighton et. al, 2003). It is also generally agreed by several hydrogeologic  
12 investigations that consolidated rock within the drainage basin, including volcanic, igneous and  
13 metamorphic crystalline rock, and consolidated sedimentary rock, are not significant aquifers  
14 (Kunkel, 1962; Bloyd, 1967; Carlson et. al., 1988; Leighton et. al., 2003, Phillips, Carlson et. al.,  
15 2003). "Significant" is used here to generally refer to the possibility of developing the groundwater in  
16 quantities such that it would likely be of potential interest to large water users such as agriculture,  
17 industry or municipalities. Groundwater resources of bedrock areas along the periphery of the  
18 watershed boundary such as the San Gabriel mountains and the Tehachapi mountains as well as the  
19 consolidated rock outcrops that form the Rosamond Hills, the Bissell Hills and other numerous lesser  
20 un-named outcrops within the watershed, are not known to be significant groundwater resources.

21 7. By extension, given that the consolidated rock lacks the hydraulic characteristics that  
22 allow significant water development, it would be difficult to impact the consolidated rock aquifer  
23 through development and pumping such that there would be measurable or manageable effects on the  
24 available water in the unconsolidated aquifer deposits that form the main drainage basin and the  
25 principal aquifer system. Therefore, as a general proposition, some exclusion of consolidated  
26 deposits (bedrock) areas of the watershed is technically and administratively sensible. However,  
27 inclusion of some bedrock areas and associate fluvial streambed deposits within the drainage basin  
28 defined by the San Gabriel mountains to the south and the Tehachapi mountains to the west-

1 northwest would be reasonable as these fluvial systems form the dominant recharge mechanism to the  
2 Antelope Valley aquifer system ( S.P. Phillips, C.S. Carlson, et. al, 2003)

3 8. The principal water bearing materials within the Antelope Valley watershed are  
4 unconsolidated alluvial and lakebed sediments. These materials are composed of mixes of silts,  
5 clays, sands and gravels in a wide range of proportions. Wells drilled in this material generally have  
6 moderate to high water production potential. The unconsolidated deposits are compartmentalized to  
7 some degree by geologic faulting. Several investigators, including L.C. Dutcher, G.F. Worts, 1963,  
8 Bloyd, 1967, subdivided the greater Antelope Valley groundwater basin into sub-basins based upon  
9 geologic structure including faults and bedrock outcrops/subcrops. Despite these subdivisions, it is  
10 generally recognized in the literature that these sub-basins are hydrologically connected to varying  
11 degrees and water is transmitted from one sub-basin to another depending upon gradient relationships  
12 between the basins (Kunkel, 1962).

13 9. Given the role of consolidated bedrock vs. unconsolidated sediments in the basin, the  
14 extent of the adjudication boundary should reflect the extent of the unconsolidated deposits plus  
15 significant known recharge sources. As a result, U.S. Borax proposes to include portions of the  
16 Antelope Valley drainage areas associated with the Tehachapi mountains and the San Gabriel  
17 mountains.

18 10. Commencing with the southeast corner where the San Gabriel Mountain watershed  
19 divide intersects the San Bernardino County line, the boundary follows the San Bernardino-Los  
20 Angeles county line northward for approximately 2.5 miles. This boundary area has some  
21 uncertainty regarding the groundwater resources but was assigned to avoid overlap with the Mojave  
22 Adjudication area. The boundary departs from the county line proceeding westward outlining the  
23 extents of the unconsolidated deposits along the outcropping of metamorphic consolidated rocks  
24 composing Saddleback Butte, Long Buttes and the area collectively known as the Hi Vista area  
25 (California Groundwater Bulletin 118, 2004). This delineation is technically logical as the Hi Vista  
26 area is composed predominately of consolidated metamorphic rock (Cretaceous/Jurassic Quartz  
27 Monzonite). Along the northern extent of the Hi Vista area, the boundary proceeds eastward along  
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1 the consolidated rock crop line, then northward in T9N, R8W, bounded on the east side again by  
2 consolidated bedrock and encompasses Rodgers Dry Lake and surrounding area.

3 11. The proposed boundary then continues north, then arcs to the west along intermittent  
4 consolidated bedrock outcrops in T11N, R8W to form the eastern and northern boundaries of the  
5 North Muroc sub-basin. Two notable features are present in this area as gaps between consolidated  
6 bedrock outcrops. These features are possible groundwater pathways and interconnections between  
7 the North Muroc basin and the Peerless basin and the Freemont Valley and have been mapped as  
8 such in U.S. Geological Survey reports and groundwater models (Kunkel, 1962; Leighton, 2003). In  
9 particular, the potential pathway between the North Muroc basin and the Freemont basin has been  
10 mapped as a discharge area from the North Muroc. The area discharges an estimated 2000 acre feet  
11 per year into the Freemont Basin, which is a relatively small amount of water (USGS Water Supply  
12 Paper 2046; and Water Resources Investigations Report 03-4016, Leighton et. al; and Hydrologic  
13 Investigations Atlas HA-31, Kunkel, 1962). Given this apparent minor effect on the Antelope  
14 Valley groundwater basin system, the Fremont basin should not be included as part of the AVGB.

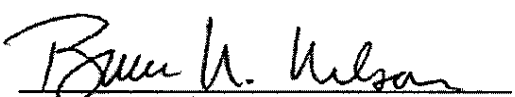
15 12. The proposed boundary then courses to the southwest interfingering between a series  
16 of consolidated rock hills (predominately quartz monzonite) including the Bissell Hills and the  
17 Rosamond Hills and bordered on the interior of the boundary by Rodgers Dry Lake. The boundary  
18 then turns west between the Rosamond Hills and Rosamond Dry Lake lying just to the north of the  
19 Willow Springs Fault (aka Rosamond Fault). The boundary then turns northwest aligning  
20 approximately along the watershed drainage divide up to the drainage divide of the Tehachapi  
21 Mountain Range. As explained prior, inclusion of the area up to the drainage divide in the  
22 mountainous areas assures that potential significant recharge areas of fluvial channels that  
23 communicate with the greater Antelope Valley groundwater basin are considered.

24 13. The proposed boundary then follows the Antelope Valley watershed drainage divide  
25 southwesterly to just northeast of the intersection with the San Gabriel mountains watershed drainage  
26 divide. A boundary delineated as such includes the area between the Randsburg-Mojave fault and the  
27 Garlock Fault, including the Cottonwood fault and Willow Creek fault, which are identified in USGS  
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1 Water Supply Paper 2046 as a recharge area to the AVGB. This is also true of the southern boundary  
2 as well, along a series of faults running parallel to the San Andreas fault.

3 14. Though there are a number of small alluvial channels that may contribute recharge to  
4 the basin from the San Gabriel Mountains, only the fluvial systems of Armagosa Creek, Little Rock  
5 Creek, and Big Rock Creek are known to contribute significant volumes of recharge (Phillips,  
6 Carlson and Metzger et. al, 2003). However, the smaller fluvial channels may collectively contribute  
7 recharge to the AVGB. The proposed boundary includes all of these potential recharge areas by  
8 setting the boundary along the San Gabriel mountains watershed divide to the starting point of this  
9 description where the drainage divide intersects with the San Bernardino County Line.

10 I declare under penalty of perjury under the laws of the State of California that the foregoing  
11 is true and correct. Executed this 28th day of June, 2006, at Sheridan, Wyoming.

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15 Bruce N. Nelson, P.E.  
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