Meander Wavelength
Detailed studies of the meander wavelength have not occurred, but Makar and AuBuchon (2012) and Klein et al. (2018a) have noted a shift in the planform from predominantly braided to a single channel that is beginning to show signs of meandering (e.g. alternating river bars becoming more stable). As this transition becomes more established, meandering may become more pronounced. This shift suggests a decrease in the meander wavelength, assuming that a braided planform could be thought of as having a meander wavelength that is large.

Channel Depth
How channel depth has changed is more complicated through the study reach. Assessing channel depth as the relative bed elevation of the active channel provides one means of assessing changes with time in the channel depth. Klein et al. (2018a) found that subreach 3a tends to have a decreasing channel depth between the decades, whereas subreach 3b and 4 tend to have an increasing channel depth trend. Hydraulic modeling trends of the reach average hydraulic radius, which can be used as a surrogate for channel depth for alluvial systems with large width to depth ratios like the MRG, show a slight decreasing trend between 1962 and 1992 and an increasing trend from 1992 to 2012 (Klein et al. (2018b). A review of the graphical representations of the aggradation-degradation lines within the B2B study reach between 1972 and 2012 (see attached figures), focusing on the thalweg locations, indicated that the channel depth has generally increased in this time frame. Subreaches 1, 2, and 3a oscillate between cycles of channel depth increases and decreases within the decades, while subreach 3b and 4 tend to primarily show increasing channel depth trends. Trends from 2002 to 2012 indicate a decrease in the channel depth for subreach 1, no discernible trends in subreach 2 and 3a, and a channel depth increase for subreach 3b and 4. Klein et al. (2018a) found a decreasing channel depth trend for subreach 3a and an increasing channel depth trend for subreaches 3b and 4 based on rangeline surveys at select locations. The rangeline surveys directly measure the underwater bathymetry, as opposed to the agg-deg line surveys which infer an underwater prism through calibration.

Channel depth is also dependent on bank height. The bank height can be affected by active channel trends which lower or raise the bed elevation of the active channel, and also affected by erosion or deposition in the floodplain. Deposition in the floodplain may be uniformly distributed, but is often located adjacent to the active channel, in essence creating a natural berm between the active channel and the rest of the floodplain. Klein et al. (2018b) found that the average bank height (measured from the channel thalweg to the top of bank) decreased between 1962 and 1992 for the Isleta Diversion Dam to the Rio Puerco confluence reach. The reach average bank height increased between 1992 and 2012, with the difference between 1962 and 2012 indicating a slight bank height decrease. Because floodplain deposition varied throughout the study reach, an average change in the deposition or erosion was calculated for each subreach from 1972 to 2012. The analysis was pursued for the agg-deg line dataset, with the resulting adjustment reflective of a representative cross section line deposition or erosion.

The agg-deg analysis used the station and elevation data from these surveys. The 1962, 1972, and 1992 data were collected in the National Geodetic Vertical Datum (NGVD) of 1929, while the 2012 data was collected in the North American Vertical Datum (NAVD) 1988. To minimize the amount of conversion, the NGVD 1929 datum was chosen. The 2012 elevation data was adjusted using the formula shown in Equation 4. The correction factors were obtained by using the USACE Corpscon software (version 6.0.1).

Equation 4. Conversion from NAVD 1988 to NGVD 1929 datums

$$E_{NGVD} = E_{NAVD} - A$$

Where E_{NGVD} is the elevation data in the HGVD 1929 datum,
E_{NAVD} is the elevation data in the NAVD datum, and
A is a correction factor that varied from 2.671 to 2.402 going from north to south within the study reach.

The station and elevation data were entered into an Excel spreadsheet. Station 0 represents the left end point for each of the agg-deg line surveys (Varyu 2013). Graphical representations of each of the evaluated agg-deg lines within the survey reaches were plotted and compared to ensure common landmarks, such as top of spoil levees, were aligned. This evaluation was done concurrently with an assessment of the aerial photography to ensure the physical location of the spoil levees hadn't been modified. Stationing was adjusted on lines where features did not align well and for which the concurrent aerial photography indicated no change in the spoil levees had occurred. Generally only one or two years required adjustments. The decision on which years to adjust was based on adjusting the fewest number of years. Stationing was adjusted by using the formula shown in Equation 5.

Equation 5. Station adjustment to align common landmarks

$$Sta_{new} = Sta_{old} * \left(\frac{Sta_{N-land}}{Sta_{O-land}}\right)$$

Where Sta_{new} is the adjusted agg-deg line station for a given year,
Sta_{old} is the original agg-deg line station for a given year,
$Sta_{O\text{-}land}$ is the original agg-deg line station at the discernible landmark, and
$Sta_{N\text{-}land}$ is the desired agg-deg line station at the discernible landmark.

Once the agg-deg line stations were aligned for all of the evaluated years (1972, 1992, 2002, and 2012), an evaluation of each cross section plot showed that there were some variations between the years that were due to anthropogenic changes (e.g. placement of flood berms) or variable ending extents (e.g. top of spoil levee, riverside levee slope, drain invert, etc.). Because of these variations between the years that aren't due to fluvial influences, each of the agg-deg lines in the analysis were bounded between a left and right station. An example agg-deg line cross section showing bounding stations is shown in Figure 3. Table 4 shows the agg-deg lines that were used in the analysis and their bounding stations.

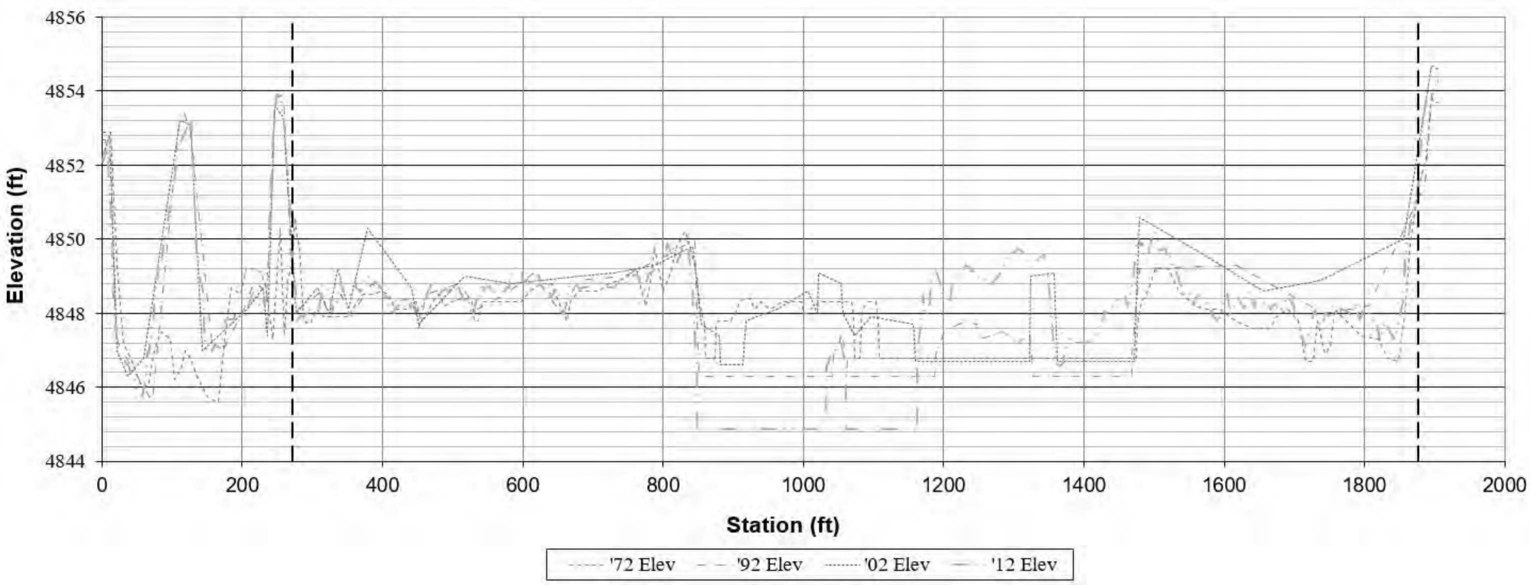

Figure 3. Agg-deg line 741, looking downstream. Cross section plot shows bounding stations (dark, vertical dashed lines) set to avoid a series of berms on river left that were constructed between the 1972 and 1992 agg-deg data collections. The bounding station on river right was set to avoid changes in the ending point for the spoil levee on river right.

Table 5. Agg-deg lines used for representative cross section evaluation of vertical change within the B2B reach. Listed left and right stations are the bounding stations between each year for which the analysis was conducted.

Agg-deg Line #	**Subreach Designation**	**Left bounding station**	**Right bounding station**
514	1	150	1320
549	1	0	1487
569	1	0	1205
580	1	0	1430
601	2	37	1682
626	2	11	1761
653	2	18	1217
658	3a	314	1750
678	3a	0	2813
705	3a	149	1920
741	3b	271	1876
772	3b	18	2088
801	3b	0	1708
833	4	30	1613
841	4	0	1642
864	4	37	1393
899	4	12	2100

929	4	28	1515
959	4	22	1339
967	4	22	1670
982	4	26	1394
1000	4	15	1427

Between the bounding stations, an algorithm (see Equation 6) was used to calculate the area between a datum (5500 ft) and the agg-deg line cross section elevations for each year. The difference in the cross sectional areas between the evaluated years was coupled with the distance between the bounding stations at each agg-deg line (see Equation 7) to estimate an average agg-deg cross sectional depth between the evaluated years. Shows the average depth results for each of the evaluated agg-deg lines. Positive values indicate a reduction in the area between evaluated years, implying that the reach has been depositional. Negative values indicate an increase in the area between evaluated years, suggesting a net erosional trend.

Equation 6. Iterative computation for agg-deg lines to calculate area below a reference datum

$$A_{xs} = \sum_{i=LB}^{RB} (sta_{i+1} - sta_i) * \left[\frac{(Elev_{ref} - Elev_i) + (Elev_{ref} - Elev_{i+1})}{2}\right]$$

Where A_{xs} is the area between the agg-deg line and a reference datum,
i is an increment counter for a given agg-deg line,
LB is the left bounding station for a given agg-deg line,
RB is the right bounding station for a given agg-deg line,
sta is the stationing across a given agg-deg line,
$Elev_{ref}$ is a reference elevation in the NGVD datum (5500 feet was used for this analysis), and
$Elev_i$ and $Elev_{i+1}$ are elevations associated with the station at those counters.

Equation 7.Average vertical change between two years for agg-deg lines

$$d_{avg} = \frac{A_{y1} - A_{y2}}{sta_{RB} - sta_{LB}}$$

Where d_{avg} is the average cross-sectional depth results for a given agg-deg line,
A_{y1} is the area between the agg-deg line and a reference line for the temporally lower year,
A_{y2} is the area between the agg-deg line and a reference line for the temporally higher year,
STA_{LB} is the left bounding station for a given agg-deg line, and
STA_{RB} is the right bounding station for a given agg-deg line,

Table 6. Average agg-deg cross sectional depth values between evaluated years. Depth values rounded to nearest tenth of a foot. Length values are rounded to nearest whole foot. Negative depth values indicate erosion between years, while positive depth values indicate deposition.

Agg-deg line #	**Subreach Designation**	**Agg-deg line length (feet)**	**Average cross sectional depth (feet)**		
			1972 to 1992	**1992 to 2002**	**2002 to 2012**
514	1	1170	-0.8	0.0	0.7

549	1	1480	-1.5	0.0	0.9
569	1	1205	-1.1	0.0	0.7
580	1	1430	-0.4	-0.6	1.2
601	2	1645	0.2	-0.4	0.1
626	2	1750	0.0	-0.3	0.6
653	2	1199	0.6	-0.8	0.0
658	3a	1436	0.5	-0.6	0.6
678	3a	2813	0.1	0.3	0.0
705	3a	1771	3.6	-1.2	0.2
741	3b	1605	0.1	0.5	-0.6
772	3b	2070	0.4	0.0	0.1
801	3b	1708	0.7	-0.5	-0.3
833	4	1583	0.1	-0.6	0.6
841	4	1642	-0.4	0.1	0.1
864	4	1356	0.3	-0.7	0.4
899	4	2088	0.2	-0.3	-0.1
929	4	1487	0.3	-0.6	-0.1
959	4	1317	0.3	-0.8	0.5
967	4	1648	0.6	-0.6	-0.3
982	4	1368	-0.5	-0.2	-0.3
1000	4	1412	0.5	-0.4	-0.5

A review of the trends associated with looking at cross sectional average depths indicates some similarity to the previously discussed depth trends. Between 1972 and 2012, only subreach 3a has a strong depositional trend, while the other reaches tend to show incisional or minimal change. Between the assessed time periods there is some oscillation between deposition and erosion occurring. The recent 2002 to 2012 results indicate a depositional trend for subreaches 1, 2, and 3a and an incisional trend for subreaches 3b and 4. These recent trends are similar to the graphical assessment of thalweg trends and the analyses pursued by Klein et al. (2018a).

Sinuosity

The sinuosity of the MRG is typically low compared to other fluvial systems. Subreach 1 has a slightly higher sinuosity than the other subreaches, with a general trend of increasing sinuosity for the entire B2B project area (Makar 2010; Makar and AuBuchon 2012; Klein et al. 2018a). Klein et al. (2018a) estimated the reach average sinuosity between the Isleta Diversion Dam and the Rio Puerco confluence as increasing from 1.04 to close to 1.12 between 1992 and 2012.

Future Channel Response on the Middle Rio Grande

A summary of the current geomorphology parameter trends on the MRG within the B2B reach is summarized in Table 7.

Table 7. Current geomorphic responses observed on the MRG within the B2B reach. Plus (+) indicates an increase in the geomorphic parameter, while a minus (–) implies decrease. An indeterminate answer has both a plus and minus indication.

Subreach Designation	Geomorphic Parameters									
	Q_H*	Q_L*	$Q_{s,recent}$†	$Q_{s, long term}$†	S	d_{50}	b	λ	d	P
1	-	+	slight +	-	-	+	slight -	-	-	+
2	-	+	slight +	-	-	+	-	-	-	+
3a	-	+	slight +	-	-	+	-	-	-	+
3b	-	+	slight +	-	-	+	-	-	+	+
4	-	+	slight +	-	-	+	-	-	+	+

Notes:
*—H refers to peak flow conditions while L refers to low flow conditions
†—recent refers to the increase in suspended sediment concentration observed since early 1990s. Long term refers to the significantly larger decrease in the suspended sediment load since the 1930s.

A comparison of the current geomorphic parameter response listed in Table 7 with the proposed geomorphic responses suggested by Lane (1954) and Schumm (1969; 1977) indicate that the observed response of the MRG within the B2B reach is most similar to an alluvial channel's response to a combination of a reduction in the sediment load and the water discharge. This would suggest that the long term sediment load reduction and the peak flow reduction are primary drivers of the observed geomorphic change on the MRG within the B2B reach. The combination of a reduction of sediment load and water discharge has a strong influence on the active channel width, which on the MRG through the B2B reach has a strong decreasing trend through the last century. This trend has continued to be strong through recent observations within the B2B reach except for subreach 1. The width-depth ratio has also been noted to decrease with time (Klein et al. 2018b), going from a value close to 300 in 1962 to just over 50 in 2012 for a reach of the MRG between Isleta Diversion Dam and the Rio Puerco confluence. Schumm (1969) found that the width-depth ratio is significantly related to the type of sediment load and would be expected to follow a similar trend as the long term bed material load. Because of the strong width reduction, the depth trend may be masked, but would be expected to over the long term remain constant or potentially decrease. This suggests that the recently observed depth trends may oscillate between degradation and aggradation as the MRG planform adjusts. The increase in sinuosity would be expected to be manifested in a reduction in slope as well, since the meandering increases the channel length.

While the overall planform adjustments are driven by the larger drivers of a decreased sediment load and decreased peak flows, it is also likely that the MRG planform response is complicated by the observed increases in the low flow conditions and the recent increase in the suspended sediment load. The increase in vegetation encroachment may be a combination of the larger planform adjustment to a narrower active channel width, but it could also be a reflection of the increased availability of water at lower flows, which would tend to encourage vegetation growth on lower fluvial surfaces. The lack of higher shear stresses associated with the peak flows would prevent the removal of seedlings, especially during an extended drought period, which the MRG has recently experienced (Makar and AuBuchon 2012). Once established, vegetation would increase the erosion resistance of the banks (Pollen and Simon 2005; Pollen 2007), and provide a control on channel adjustments. MEI (2002) also evaluated the stability of sand, the predominant bed material on the MRG within the B2B reach, and found that the combination of morphological channel adjustments and the increased level of the lower flows produced a greater mobility of the sand fraction. This would support the observation of a bed material coarsening and when coupled with the vegetation encroachment suggest that the bed is less erosion resistant than the banks.

So while the channel response is complex, the relationships proposed by Schumm (1969; 1977) and Lane (1954) are helpful and indicate that the observed changes in the geomorphic parameters on the MRG are complex responses as the river dynamically adjusts to the changing inputs of sediment and water. These processes occur on the inter-decadal scale, but are also manifested in fluctuations that can be observed locally on an annual basis with fluctuations in channel parameters like channel depth as the river adjusts to a channel planform that matches the longer term trends of sediment reduction and lower peak flows.

It is also helpful to look at channel classification and planform models (Schumm 1977, 1981; Massong et al. 2010) to better understand future potential changes on the MRG. Schumm (1977; 1981) suggested a channel classification schema as shown in Figure 4 based on observations of alluvial rivers. Schumm also suggested that adjustments in the planforms of alluvial rivers provide insight into future conditions. Klein et al. (2018a), through a comparison of historical aerial photography, found that the MRG between Isleta Diversion Dam and the Rio Puerco Confluence has shifted from channel planforms dominated by the bedload (classifications 4, 3, and 2 in Figure 4) to ones characterized by a mixed load (classifications 9, 8, and 7 in Figure 4). These are characterized by changes in geomorphic parameters that are observed on the MRG within the B2B reach, such as increased sinuosity and a decreased width-depth ratio. There are deviations, such as the observed bed material seems to be getting coarser, which is an opposite trend than suggested by Figure 4. This may indicate that future channel adjustments may be likely to reach this future condition. So while the current shift to the higher classification numbers would suggest an increased stability, future adjustments towards the right of the figure, manifested by increased lateral migration, may increase the instability.

Massong et al. (2010) developed a planform evolution model, shown in Figure 5, of the MRG based on observations of the MRG and an assessment of historical aerial photography. This planform model breaks the planform evolution into two phases depending on whether the transport capacity is greater or less than the sediment supply. The initial stage of both these phases looks similar, but the future response is quite different. Klein et al. (2018a) suggested that the river reach between Isleta Diversion Dam and the Rio Puerco confluence has a transport capacity greater than the supply based on observed geomorphic parameters (Bauer 2000; MEI 2002; Makar and AuBuchon 2012). Klein et al (2018a) further identified the current planform stage as being M4 on Figure 5. This stage on the MRG's planform evolution model is predicted to result in continued bed erosion, followed by lateral migration. The lateral migration was noted by Massong et al. (2010) to be locally dependent on vegetation, and observations on the MRG indicate that often the river will incise its bed to a point that is below the root-reinforcement zone of the bank vegetation, causing undercutting of the banks and allowing for lateral migration. There have been areas within the B2B study area, notably subreaches 3b and 4, which were noted by Klein et al. (2018a) to have the potential for lateral migration due to the increased bank height.

Based on the relationships describing river metamorphosis suggested by Lane (1954) and Schumm (1969; 1977) and the river classification/planform evolution models (Schumm 1977;

1981; Massong et al. 2010) the MRG through the B2B reach is undergoing a series of adjustments in response to the decreased sediment supply and the reduction in the peak flows. The responses in morphological parameters may vary cyclically as the river dynamically adjusts, but the longer term trends are expected to result in a channel that is narrower, more sinuous, and less steep than before. This assumes that the sediment and water drivers continue following the same trend as currently observed. This is a reasonable assumption given the upstream reservoir controls on the flow and the currently observed morphological adjustments on major tributaries to the MRG, like the Rio Puerco, that suggest the initial incision and widening that brought in significant sediment loadings to the MRG earlier in the twentieth century are decreasing as the upper portions of the tributaries adjust and bring in a sediment load that is being stored in the overly widened downstream portions (Friedman et al. 2015).

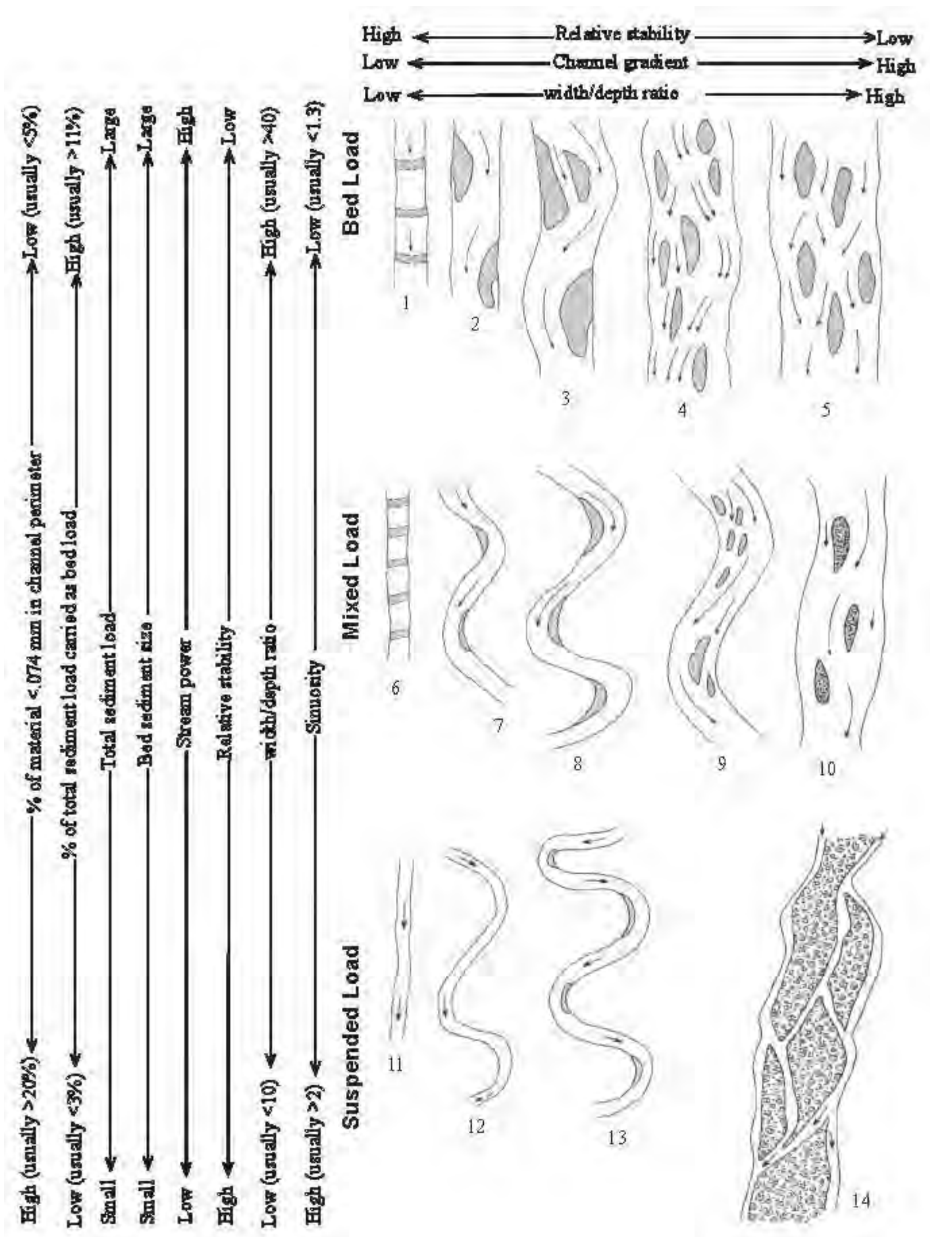

Figure 4. Classification of channel pattern (after Schumm 1977, 1981)

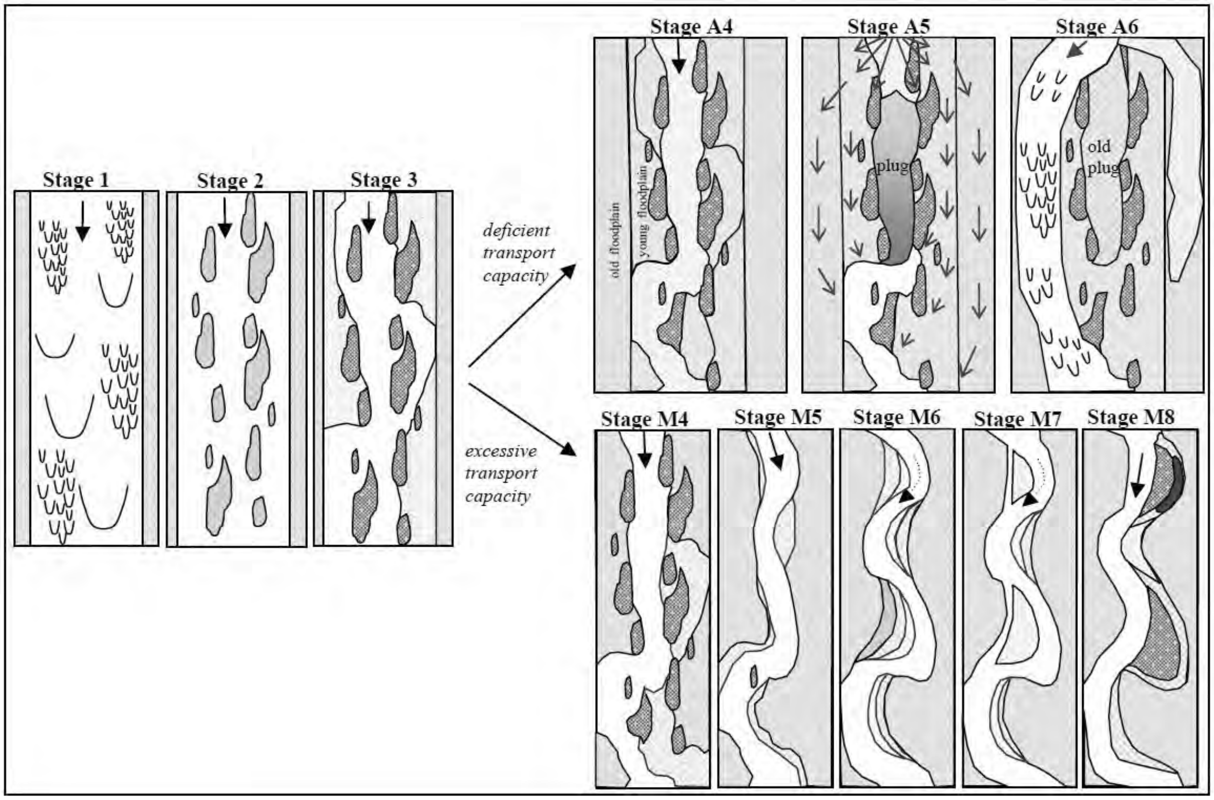

Figure 5. MRG planform evolution model (used with permission of Massong et al. 2010).

Risk assessment

An assessment of future conditions facilitates a qualitative assessment of risks associated with constructing a static structure, such as the proposed engineering levee to replace the existing spoil levee within the B2B project reach, within a dynamic system. Three potential risks for the B2B project are: loss of channel/floodway conveyance, increased frequency of channel overbanking, and potential channel migration towards the constructed engineered levee. These risks are described in more detail in the following sections.

Loss of channel/floodway conveyance

The observed geomorphic parameters and the estimated future channel tendencies based on relationships developed by Lane (1954) and Schumm (1969; 1977) and channel classifications/planform evolution models (Schumm 1977; 1981; Massong et al. 2010) suggest that the long term trend for the MRG regarding geomorphic changes within the B2B reach is for an increase in the channel and floodway conveyance. These changes would likely be manifested through episodic periods of aggradation and degradation as the channel iteratively adjusts from the reduction in sediment and peak flows from the previous decades. Climatic variations could affect this, causing more rapid geomorphic adjustments if there is an increase in the basin precipitation, and possibly increasing sediment yield if there is a long term continuation of drought conditions within the MRG basin that cause both upland and riparian vegetation to dessicate.

An estimate of this risk can be obtained by annualizing the calculated cross-sectional depth changes evaluated in the channel depth section described under MRG morphological adjustments. The annualized depth changes were calculated using Equation 8. Results are shown in Table 8 and Figure 6.

Equation 8. Annualized, average cross sectional depth changes between two evaluated time periods

$$d_{annual} = \frac{d_{avg}}{Time_e}$$

Where d_{annual} is the average annual cross-sectional depth results for a given agg-deg line,
Where d_{avg} is the average cross-sectional depth results between two evaluated time periods for a given agg-deg line, and
$Time_e$ is the elapsed time between two evaluated time periods.

Table 8. Annualized average cross section depth changes within the B2B reach. Negative depth values indicate erosion between years, while positive depth values indicate deposition. Depth values are rounded to the nearest hundredth of a foot.

Agg-deg line #	**Subreach Designation**	**Annualized, average cross sectional depth (feet)**		
		1972 to 1992	**1992 to 2002**	**2002 to 2012**
514	1	-0.04	0.00	0.07
549	1	-0.07	0.00	0.09
569	1	-0.06	0.00	0.07
580	1	-0.02	-0.06	0.12
601	2	0.01	-0.04	0.01
626	2	0.00	-0.03	0.06
653	2	0.03	-0.08	0.00
658	3a	0.03	-0.06	0.06
678	3a	0.00	0.03	0.00
705	3a	0.18	-0.12	0.02
741	3b	0.01	0.05	-0.06
772	3b	0.02	0.00	0.01
801	3b	0.04	-0.05	-0.03
833	4	0.00	-0.06	0.06
841	4	-0.02	0.01	0.01
864	4	0.02	-0.07	0.04
899	4	0.01	-0.03	-0.01
929	4	0.02	-0.06	-0.01
959	4	0.02	-0.08	0.05
967	4	0.03	-0.06	-0.03

982	4	-0.03	-0.02	-0.03
1000	4	0.02	-0.04	-0.05

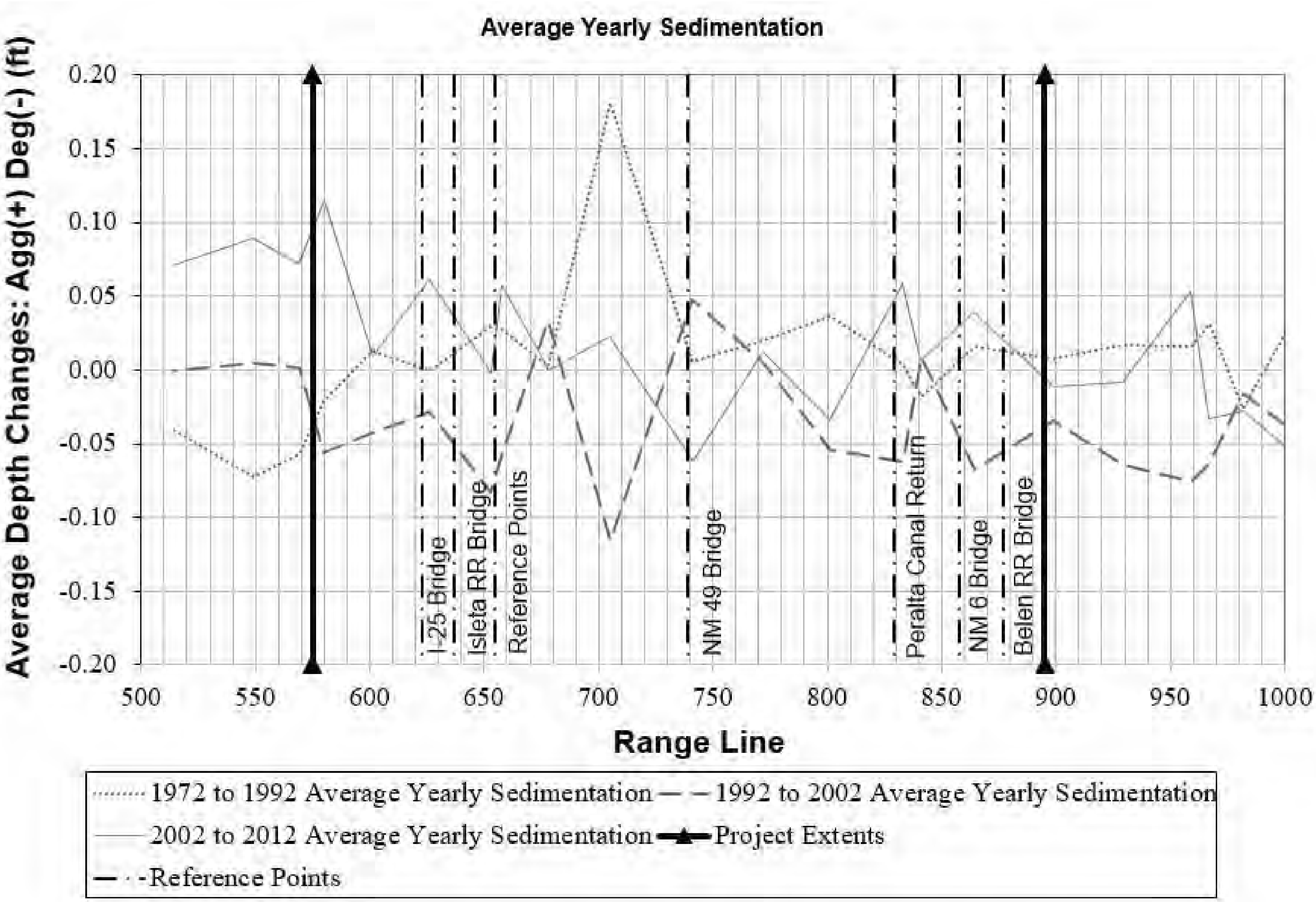

Figure 6. Annualized average cross section depth changes within the B2B reach from 1972 to 2012. Negative depth values indicate erosion between years, while positive depth values indicate deposition.

A review of Figure 6 and Table 8 shows that there are alternating patterns of deposition and incision through the B2B project area, with some dampening of the trends with time. Assessing these trends over a longer time period would provide a better representation of the long term, median tendencies for this reach. Since the last significant influence on the flood peaks occurred in the early 1970s, looking at the entire period between 1972 and 2012 would provide an average indication of geomorphic adjustments within the B2B reach. The period between 1992 and 2012 is also reasonable to evaluate since the suspended sediment record measured by the USGS gages both upstream and downstream of the B2B reach indicate a slight increase. These two time periods are plotted against the 1972 to 1992 and 2002 to 2012 time frames for reference in Figure 7. Average, maximum, and minimum subreach values are shown in Table 9. As has been previously mentioned, subreaches 1, 2, and 3a tend to have a tendency for deposition, while the opposite is true for subreaches 3b and 4.

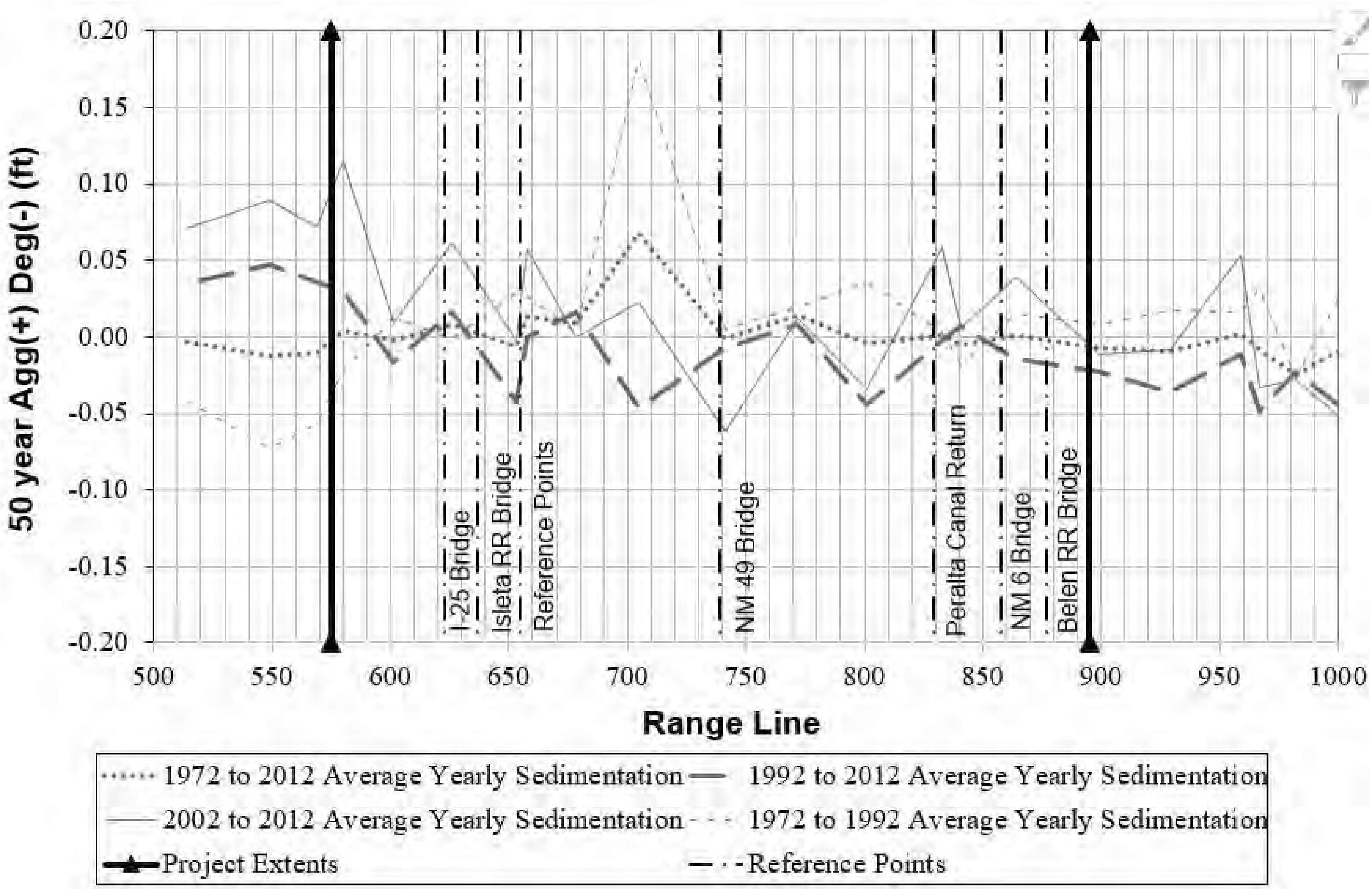

Figure 7. Annualized average cross section depth changes within the B2B reach from 1972 to 2012. Negative depth values indicate erosion between years, while positive depth values indicate deposition.

Table 9. Annualized average cross section depth changes by reach within the B2B reach. Negative depth values indicate erosion between years, while positive depth values indicate deposition. Depth values are rounded to the nearest hundredth of a foot.

Subreach Designation		**Annualized, average cross sectional depth (feet)**				
		1972 to 1992	**1992 to 2002**	**2002 to 2012**	**1972 to 2012**	**1992 to 2012**
1	Average	-0.05	-0.01	0.09	-0.01	0.04
	Maximum	-0.02	0.00	0.12	0.00	0.05
	Minimum	-0.07	-0.06	0.07	-0.01	0.03
2	Average	0.01	-0.05	0.02	0.00	-0.01
	Maximum	0.03	-0.03	0.06	0.01	0.02
	Minimum	0.00	-0.08	0.00	-0.01	-0.04
3a	Average	0.07	-0.05	0.03	0.03	-0.01
	Maximum	0.18	0.03	0.06	0.07	0.02
	Minimum	0.00	-0.12	0.00	0.01	-0.05
3b	Average	0.02	0.00	-0.03	0.00	-0.01

	Maximum	0.04	0.05	0.01	0.01	0.01
	Minimum	0.01	-0.05	-0.06	0.00	-0.04
4	Average	0.01	-0.05	0.00	-0.01	-0.02
	Maximum	0.03	0.01	0.06	0.00	0.01
	Minimum	-0.03	-0.08	-0.05	-0.02	-0.05

Since there are oscillating patterns of deposition and incision it is recommended that an average of the depositional subreaches be used to characterize the risk associated with a loss of channel/floodplain conveyance. While the reach has a long term geomorphic tendency that favors an increased channel/floodplain conveyance, incorporating an average depositional tendency over time would mitigate for geomorphic adjustments that occur between decades which may decrease the channel/floodplain conveyance. The average depositional trend, looking at the three upstream subreaches, since they tend to have the most deposition, results in an average of 0.02 feet per year or around 1.0 foot over 50 years for the evaluated time period between 1972 and 2012 and 1992 to 2012. The average cross sectional depth values between the evaluated time periods of 1972 to 1992, 1992 to 2002, and 2002 to 2012 ranges from 0.11 feet of incision to 0.14 feet of deposition or about 6 feet of incision and 7 feet of deposition over a 50 year time period. In evaluating the potential for loss of channel/floodplain conveyance it is recommended to use the estimates from the longer time period assessment between 1972 and 2012 to provide a general tendency of the reach trends. To help mitigate the risk of loss of channel/floodplain conveyance it is therefore recommended to incorporate 0.02 feet per year of aggradation into the future conditions model.

Increased frequency of channel overbanking

Sediment deposition and erosion is typically not uniform across a floodplain in alluvial systems. This creates variability in the geomorphic surface, which in turn provides different riparian environments that are important for the biota. This is especially true on the MRG, where a diversity of morphological forms provides habitat for endangered species, such as the Rio Grande Silvery Minnow and the southwestern willow flycatcher.

Klein et al. (2018a) generated relative elevation maps (REMs) between Isleta and San Acacia Diversion Dams. The REMs were constructed to show the height of topographic surfaces on the MRG relative to the 500 cfs water surface. This analysis found that the MRG tends to have an immediate bank surface that is slightly higher than the floodplain that is further away from the active channel (e.g. a perched channel). This seems reasonable, given the vegetation that has occurred along the edges of the active channel that create a higher resistance to higher flow conditions, reducing the velocity and inducing sediment deposition. As flow moves further away from the active channel there is therefore less sediment to be deposited, creating uneven deposition throughout the Floodway.

The analysis by Klein et al. (2018a) indicated that subreaches 2, 3a, and 3b have a lower terrace adjacent to the active channel, with a higher strip of land that parallels the active channel further away. This higher strip of land is often discontinuous and is adjoined by lower ground, with the ground adjacent to the current spoil levee often lower than the banks of the active channel. A typical example of this is shown in Figure 8. The Floodway labeled in Figure 8 is that area of the historical floodplain that is bounded by existing spoil berms.

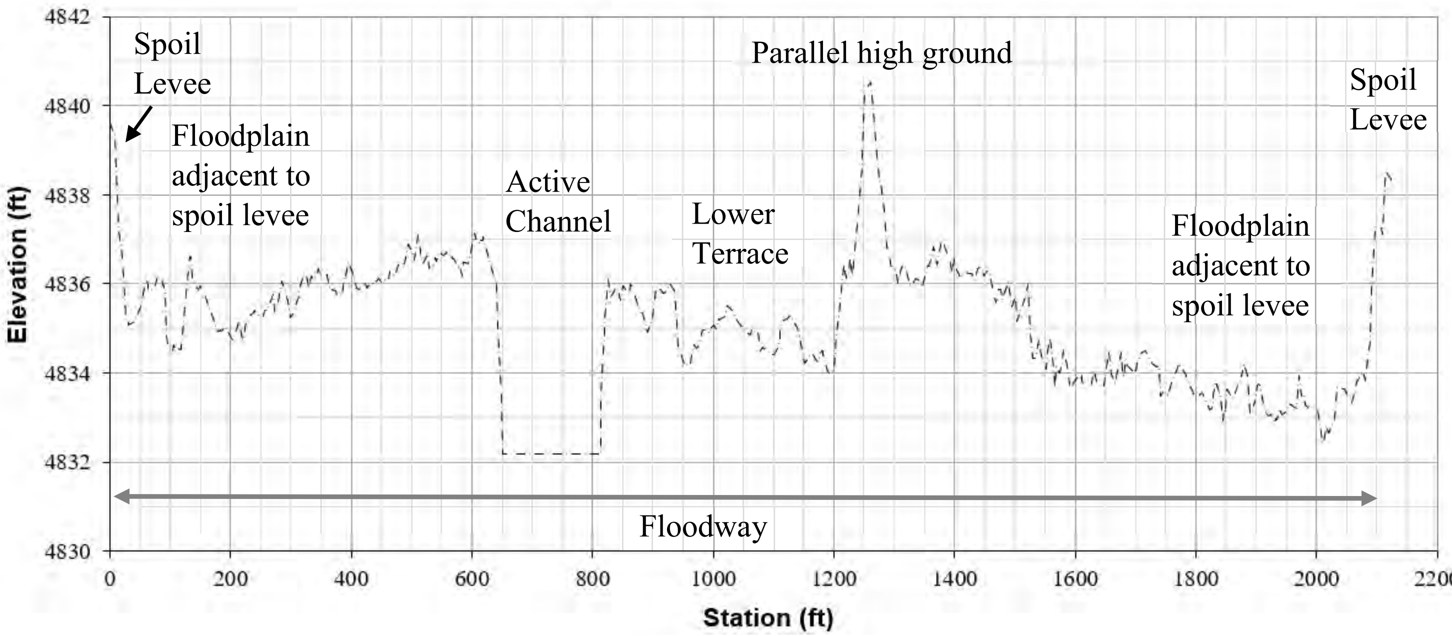

Figure 8. Typical agg-deg cross section, looking downstream, showing typical channel conditions for subreaches 2, 3a, and 3b. Shown is the 2012 agg-deg, line number 772.

Subreach 4 is similar but the floodplain adjacent to the spoil levee is typically not as low (Klein et al. 2018a). A review of the generated REMs shows that there are patches of lower ground in this subreach that may be remnants of historical active channels. A typical example from subreach 4 is shown in Figure 9.

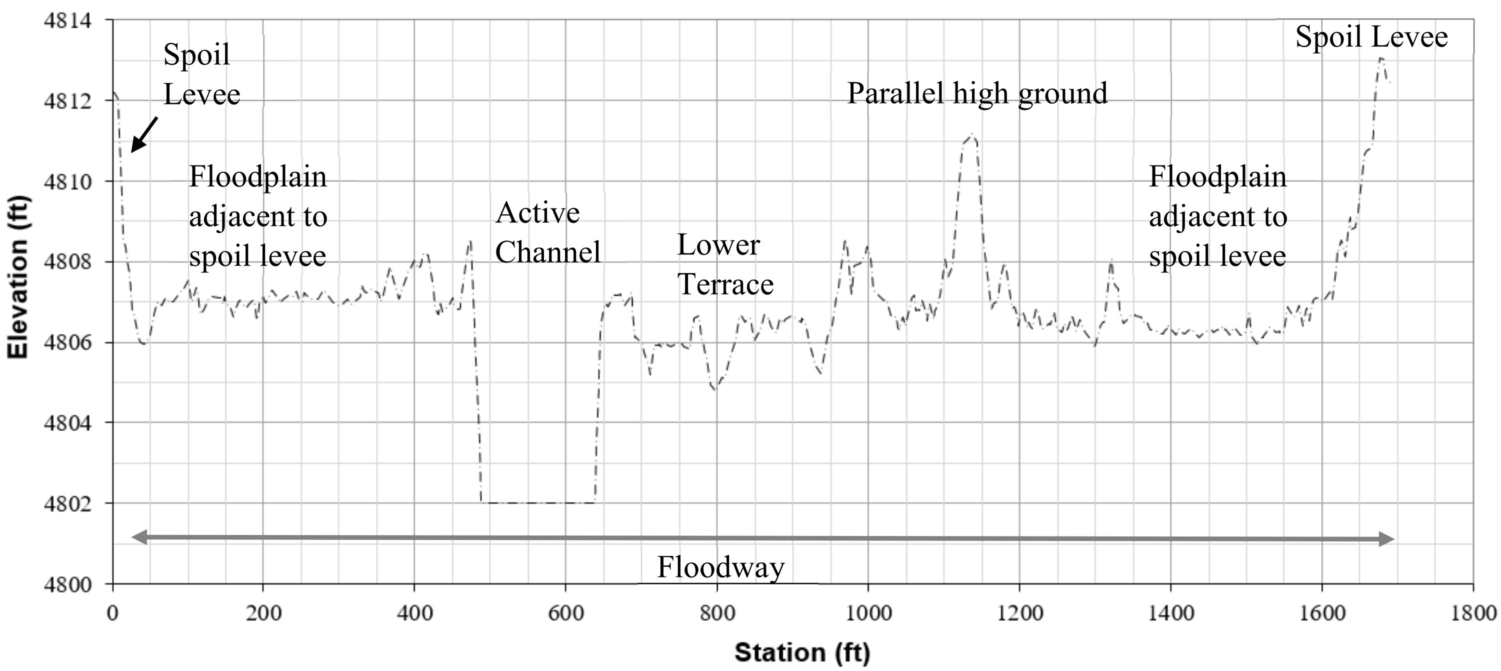

Figure 9. Typical agg-deg cross section, looking downstream, showing typical channel conditions for subreach 4. Shown is the 2012 agg-deg, line number 841.

Looking at the agg-deg cross section lines in subreach 1 indicates more uniform sediment deposition, as the active channel is adjoined by floodplain that extends to the existing spoil levees with no apparent higher depositional surface present. A typical example from subreach 1 is shown in Figure 10.

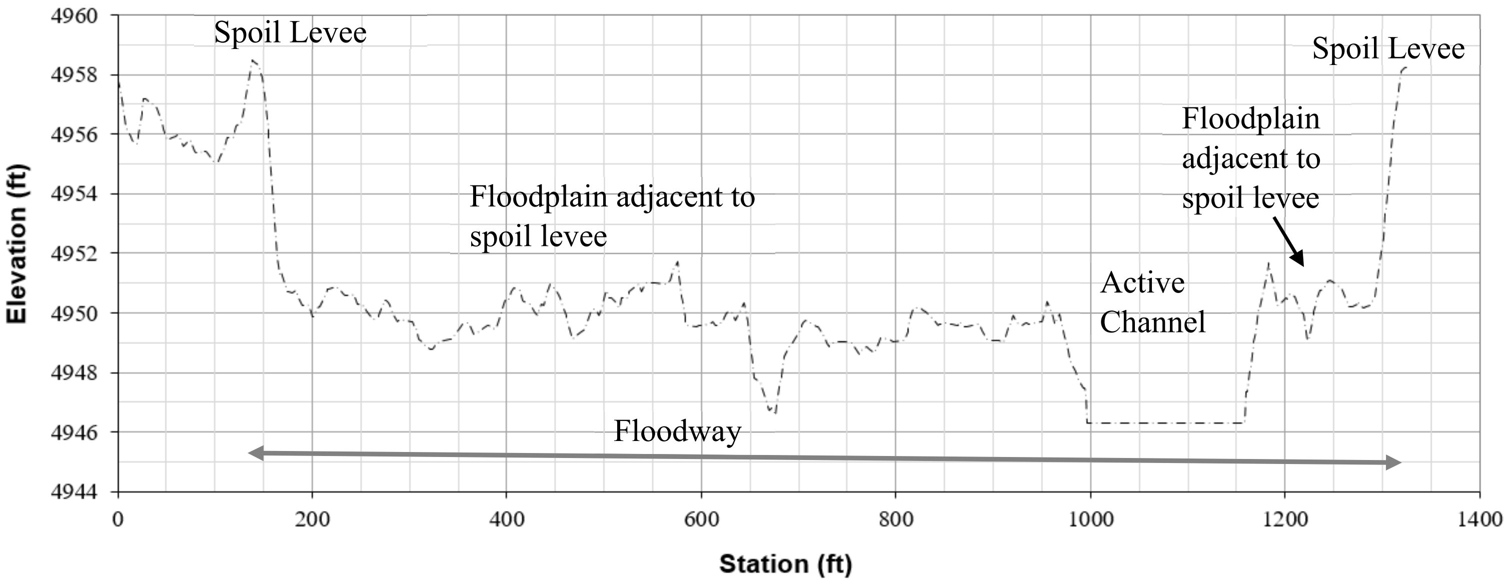

Figure 10. Typical agg-deg cross section, looking downstream, showing typical channel conditions for subreach 1. Shown is the 2012 agg-deg, line number 514.

The risk of increased frequency of inundation was evaluated during analyses conducted for environmental consultation on the B2B project. This analysis (AuBuchon 2018) developed 1-dimensional numerical hydraulic models based on the 2002 and the 2012 agg-deg datasets. One of the comparisons made in this analysis was with regard to the differences in the discharge needed to initiate overbanking. The analysis indicated that there was significant variation throughout the B2B study area (see Figure 11) with a tendency for most of the subreaches to have a higher discharge needed to overbank. Subreach 4 is the exception, where the tendency is for a reduced discharge required to initiate overbanking. This may indicate an increased risk of inundation frequency in the lower portions of the B2B project area.

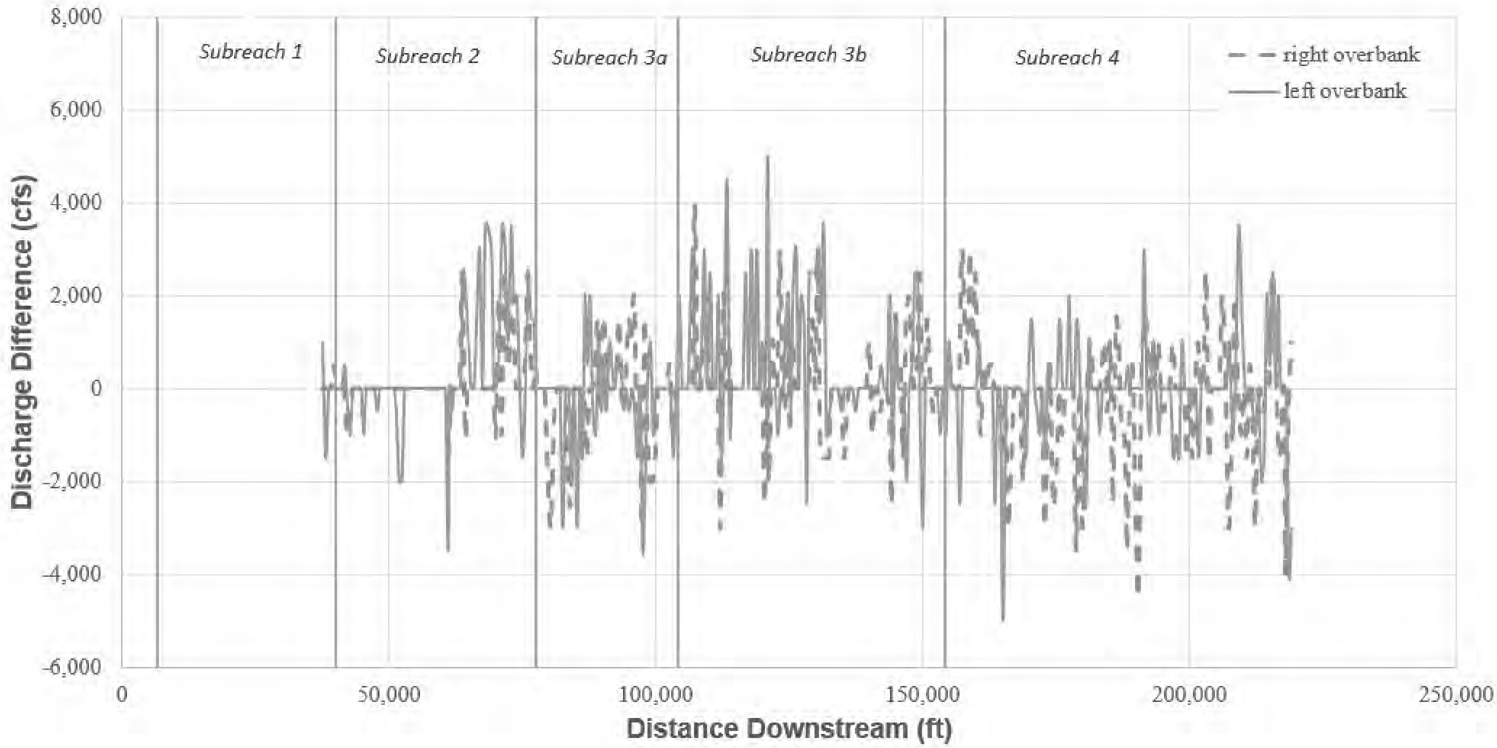

Figure 11. Differences in overbanking discharges between 2012 and 2002. Positive values indicate a higher discharge was required in 2012 than 2002 for overbanking to occur. A negative value required a lower discharge in 2012 than 2002.

While the long term geomorphic adjustment within the B2B reach would create increased transport capacity within the active channel, which would reduce the frequency of inundation, geomorphic oscillations in this adjustment process may create conditions where certain discharges may inundate the floodplain within the Floodway more often. The observed variations between the 2002 and 2012 datasets are likely more in line with the geomorphic concept of steady state equilibrium (Charlton 2008;) where there are fluctuations of aggradation and degradation around a relatively constant value. Others (Leopold et al. 1992) have referred to this within the context of the fluvial system as dynamic equilibrium.

For subreaches 2, 3a, and 3b flooding in the overbank creates problems with water pooling near the toe of the existing spoil levee, creating the potential for seepage. Because the active channel depth is currently increasing in subreach 3b, this is likely less of an immediate concern for this area compared to subreaches 2 and 3a. Subreaches 1 and 4 may have similar issues as upstream channel adjustments temporarily increase the local sediment load and cause aggradation. Flooding in these subreaches could also create seepage issues along the toe of the existing spoil levees, but the flood surface would more evenly distribute throughout the Floodway.

Existing geomorphic conditions that have created lower surfaces away from the floodplain and oscillations of aggradation and degradation through the B2B project pose risks and also potential habitat restoration options. The variability of the geomorphic surface within the Floodway provides opportunities to re-connect or take advantage of existing geomorphic features in the

Floodway to facilitate a better connection to the active channel, which may improve conditions for endangered species within this reach.

Potential channel migration towards the constructed engineered levee

The evaluated planform classification/evolution models discussed previously (Schumm 1977; 1981; Massong et al. 2010) suggest that the MRG through the B2B reach may develop a tendency to laterally migrate. Klein et al. (2018a) indicated that subreaches 3b and 4 are currently most at risk for potential channel migration. There are some areas of the MRG where the active channel is currently in close proximity to the existing spoil levee, especially around Belen, NM. This risk can be mitigated by identifying potential areas prone to lateral migration and designing erosion protection that can dynamically adjust, such as incorporating toe stone.

Recommendations for PED

Additional detailed studies to evaluate the impacts and geomorphic effects related to the B2B project would include the following recommendations:

1. *Evaluation of the variability of channel response to future climatic changes*. A one-dimensional sediment model of the MRG is being developed and is expected to be completed in 2018. This model could provide quantitative estimates of future channel deposition and incision that could be coupled with the geomorphic tools (relationships and planform classifications/evolution models) that have been discussed previously to bracket a range of future conditions. Understanding this variability would be useful to understand future risks with regard to climatic changes. Looking at relative changes in a long term model simulation would help provide insight into expected aggradation tendencies that could be incorporated into the final design to help mitigate for future channel/floodplain conveyance losses and increased frequency of inundation.
2. *REM development to facilitate habitat restoration*. The development of more detailed REM surfaces for the B2B project area would provide the opportunity to maximize access to a diversity of geomorphic features, creating opportunities for habitat restoration to fulfill mitigation requirements.
3. *Identification of lateral erosion risk areas*. This would include identifying active channel locations that are within close proximity of the proposed engineered levee. This would also include close coordination with other Federal agencies that are working on the MRG, such as the Bureau of Reclamation, to identify areas most at risk for channel migration. This would include identifying suitable erosion control protection to protect the proposed engineered levee.

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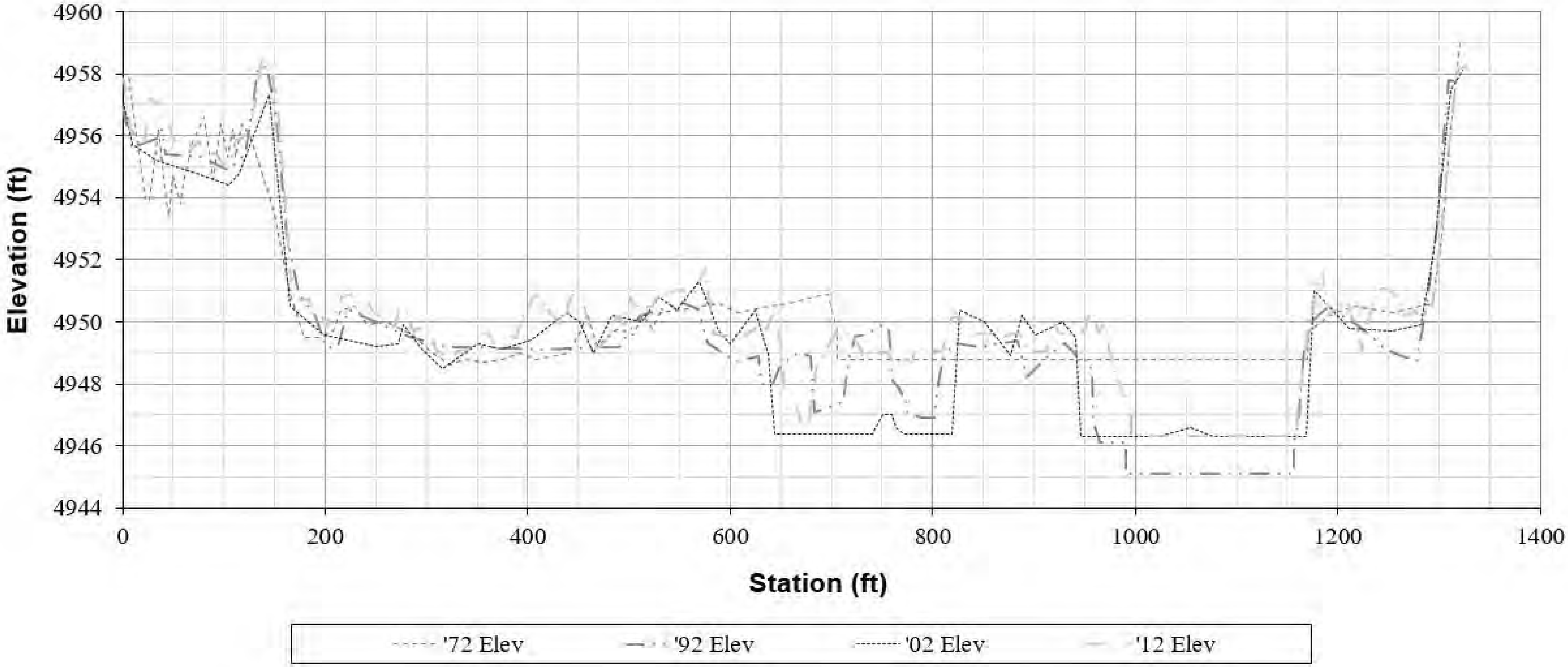
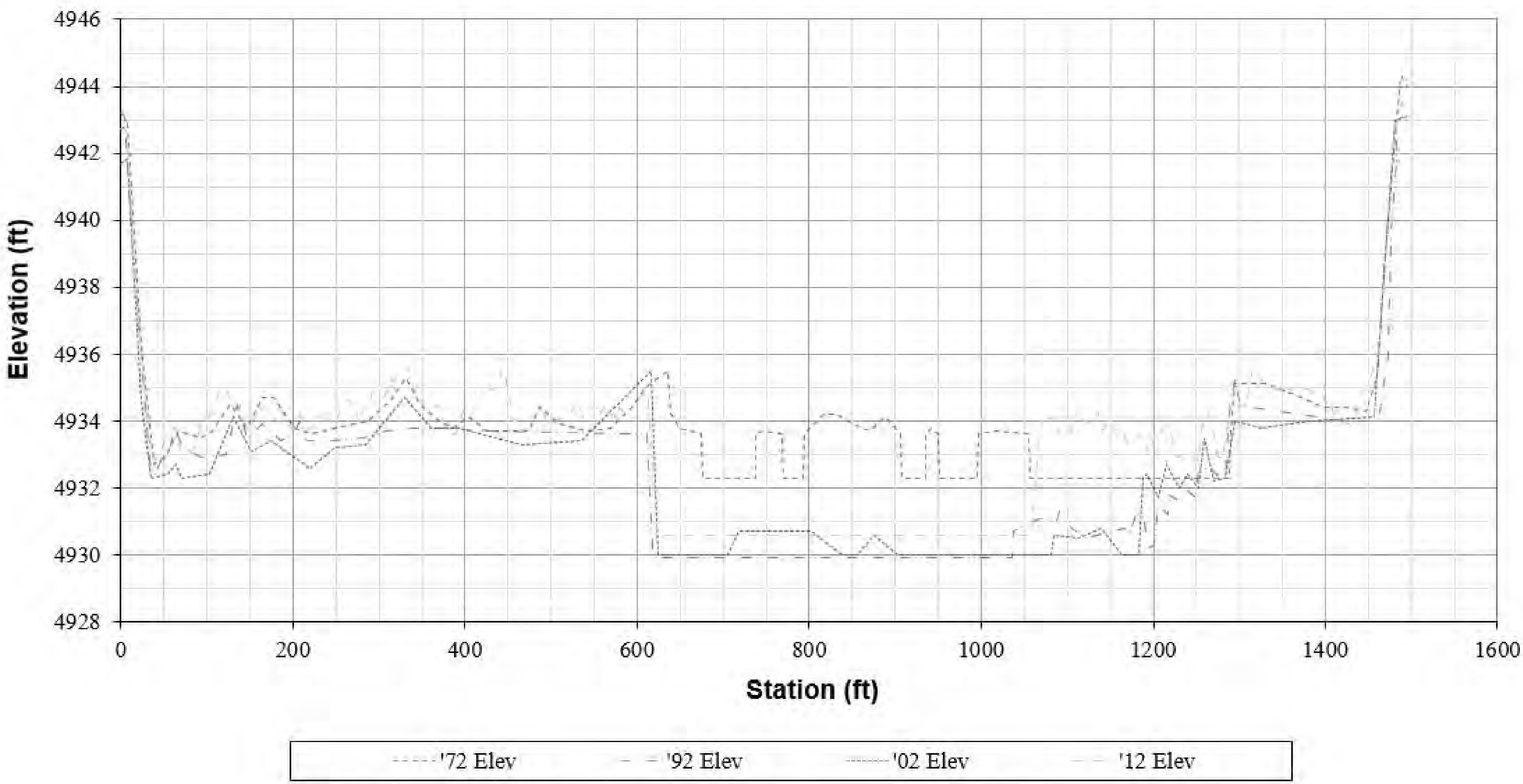


Figure 12. Cross Section of Aggradation-Degradation Line 514. Elevations are given in the NGVD NAD 29 datum.



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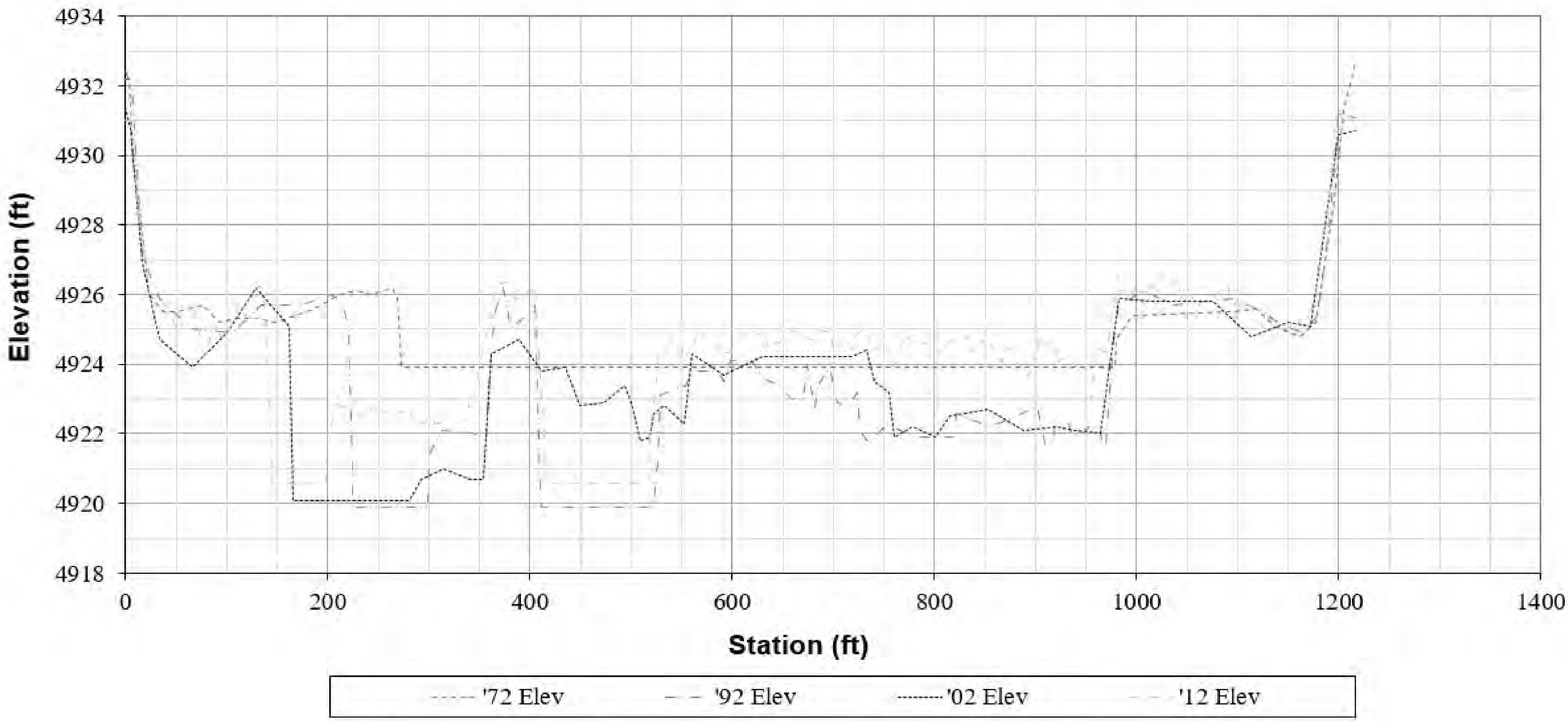

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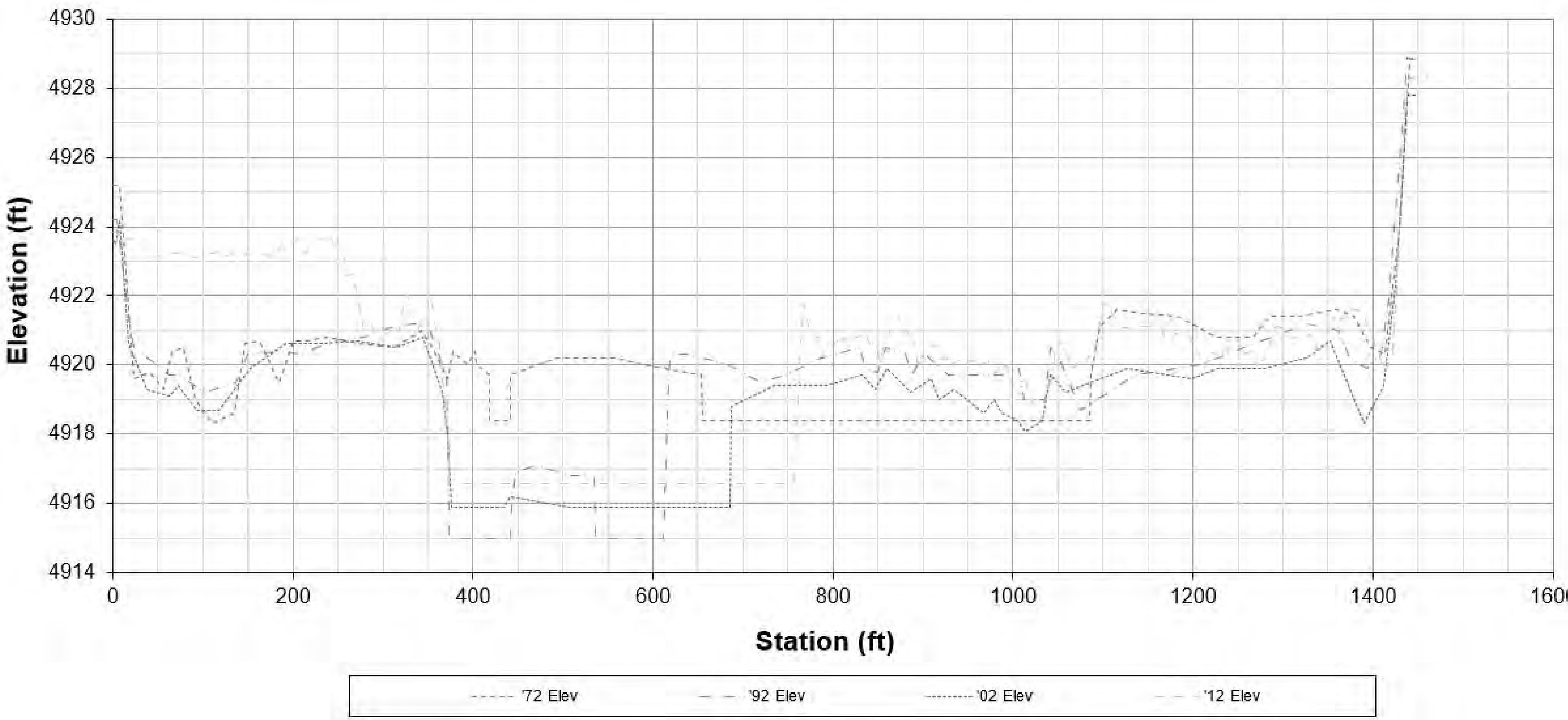

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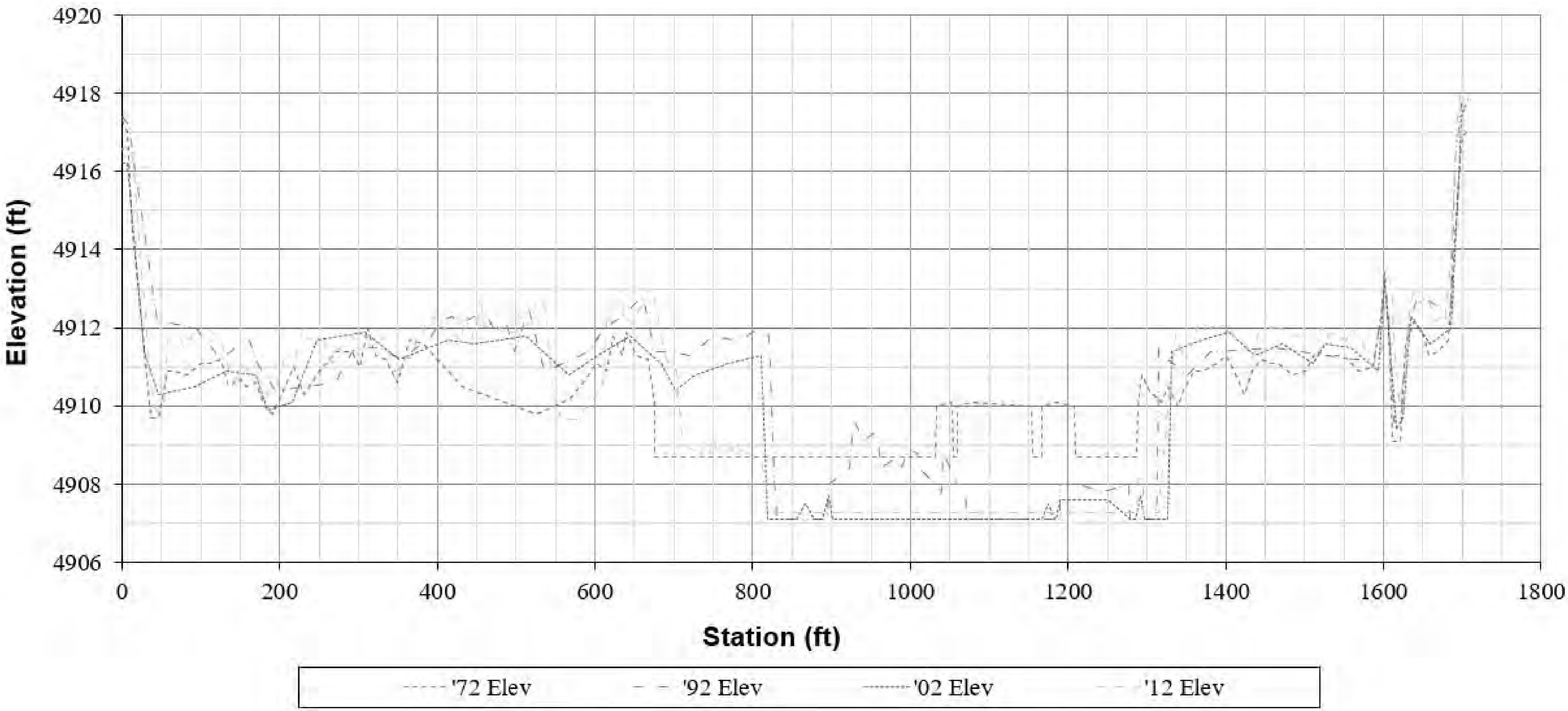

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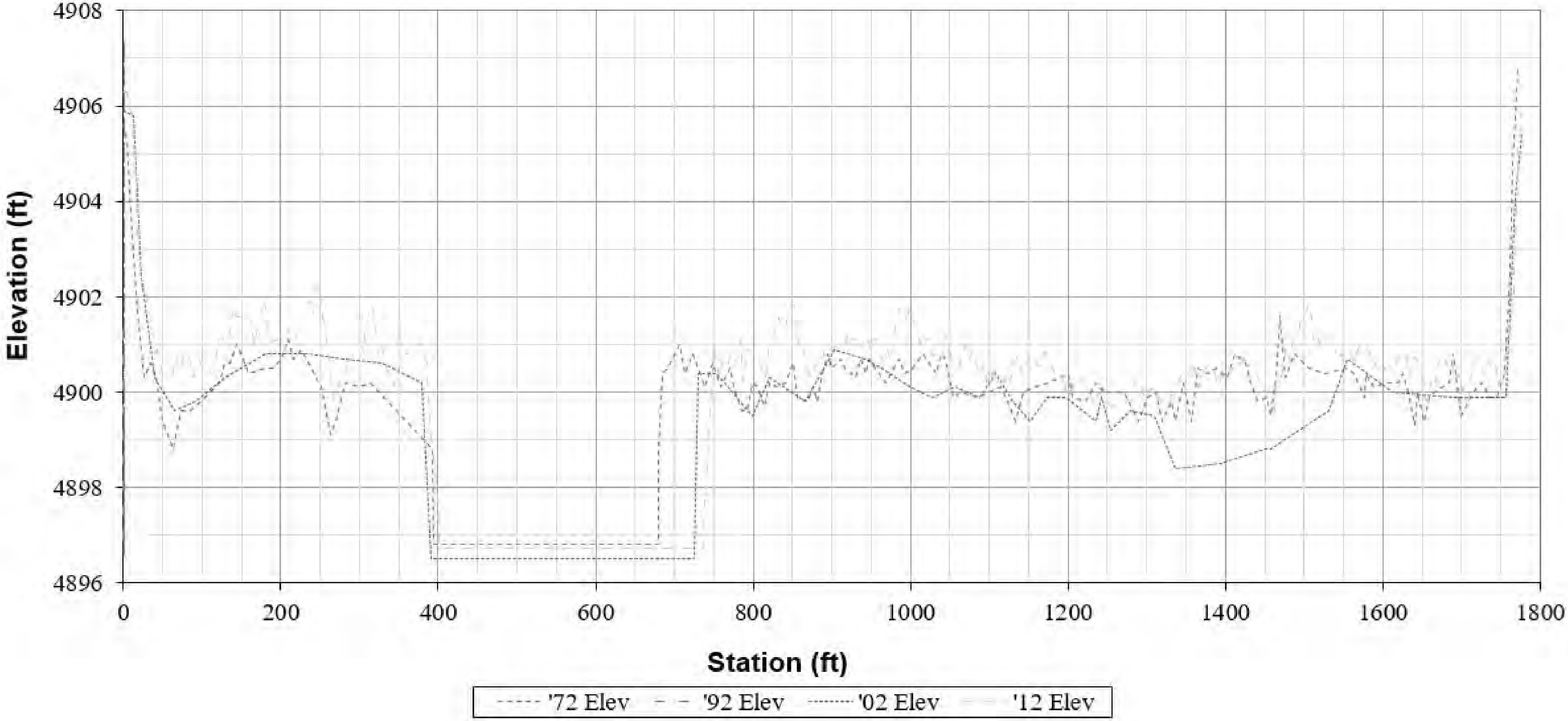

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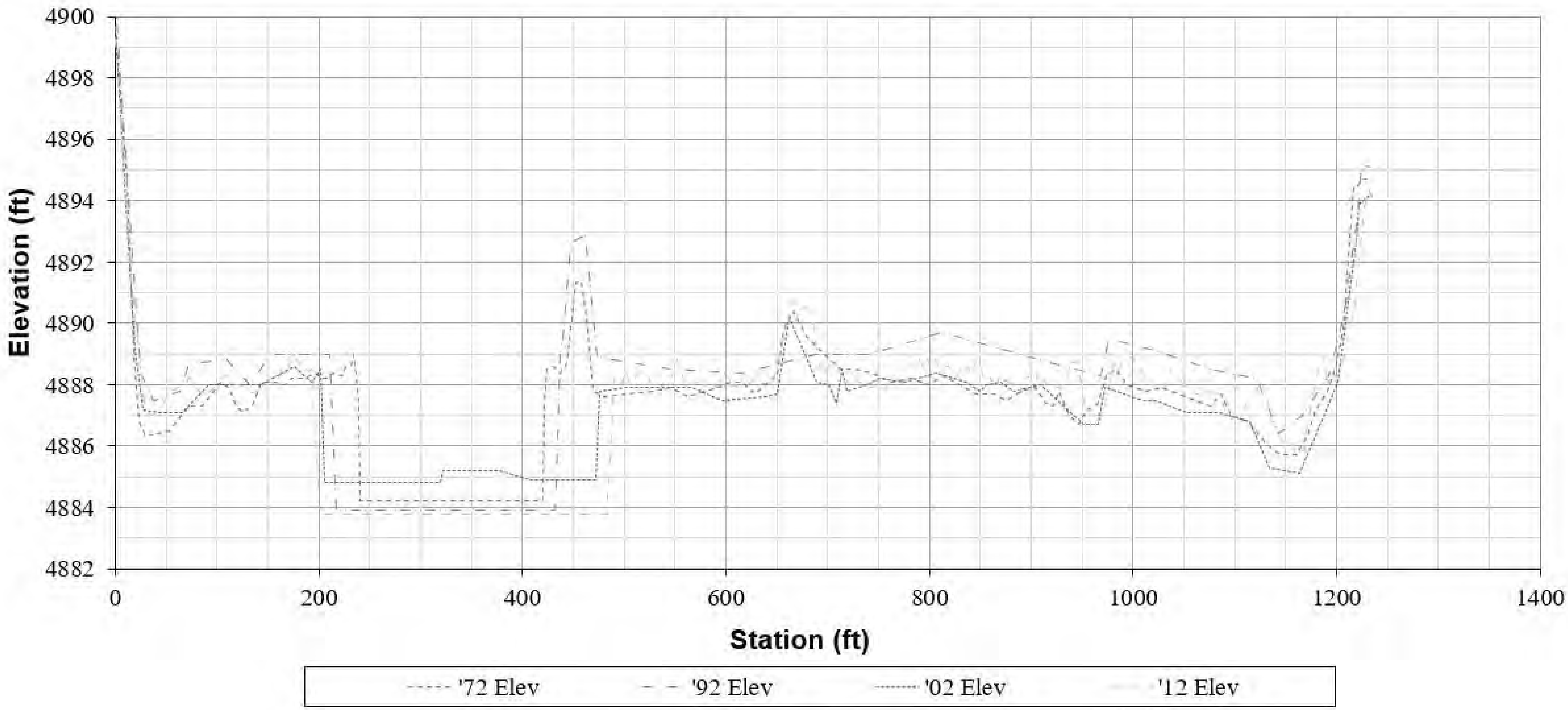

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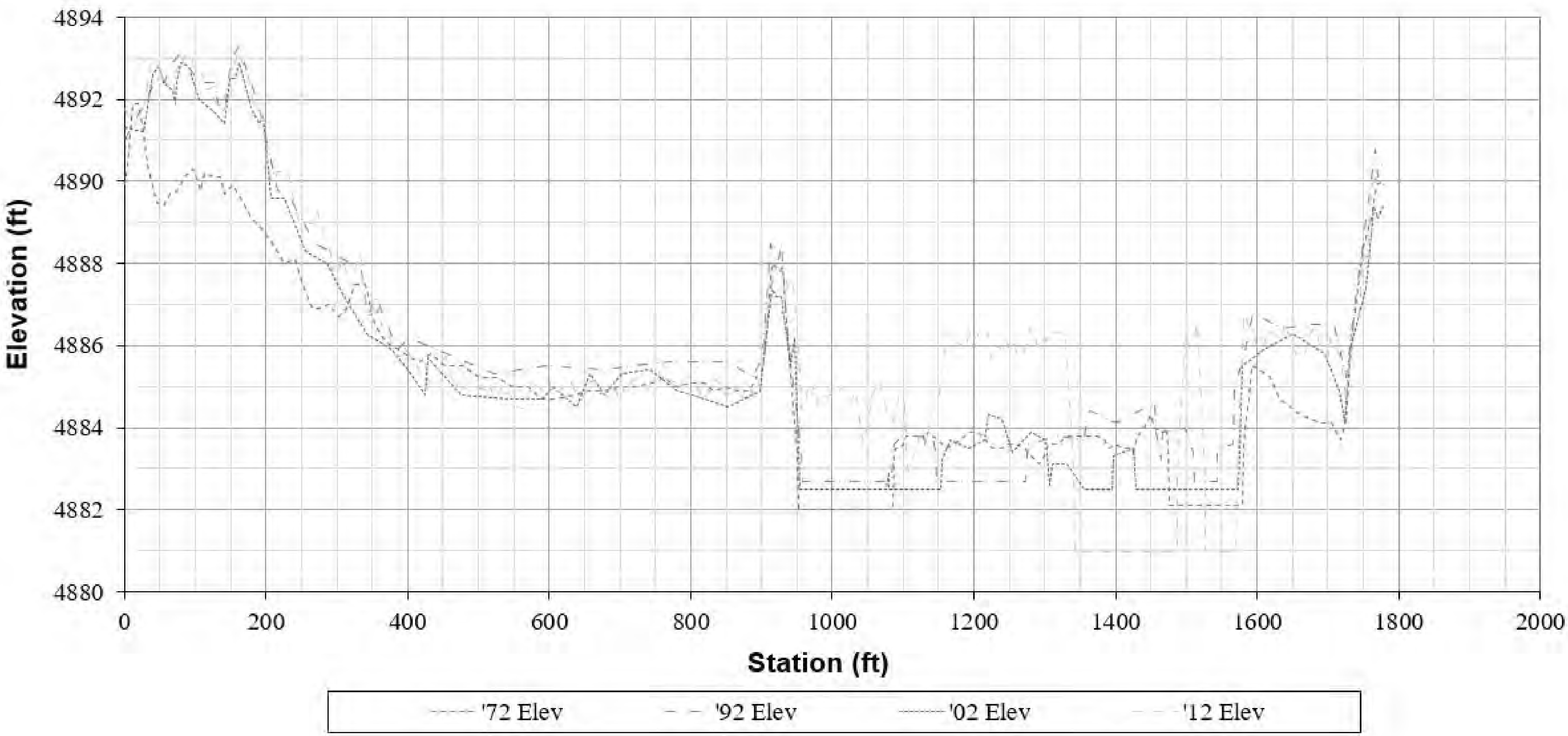

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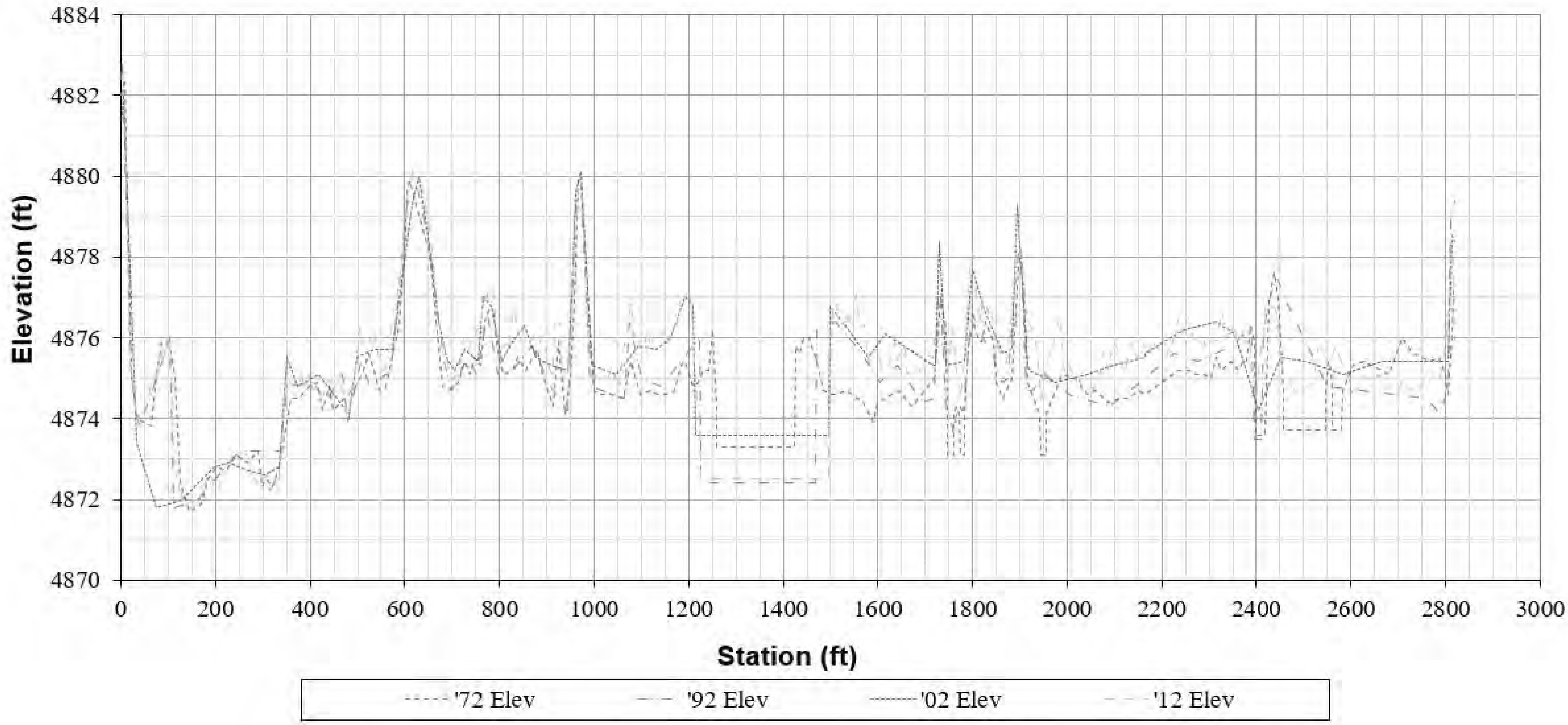

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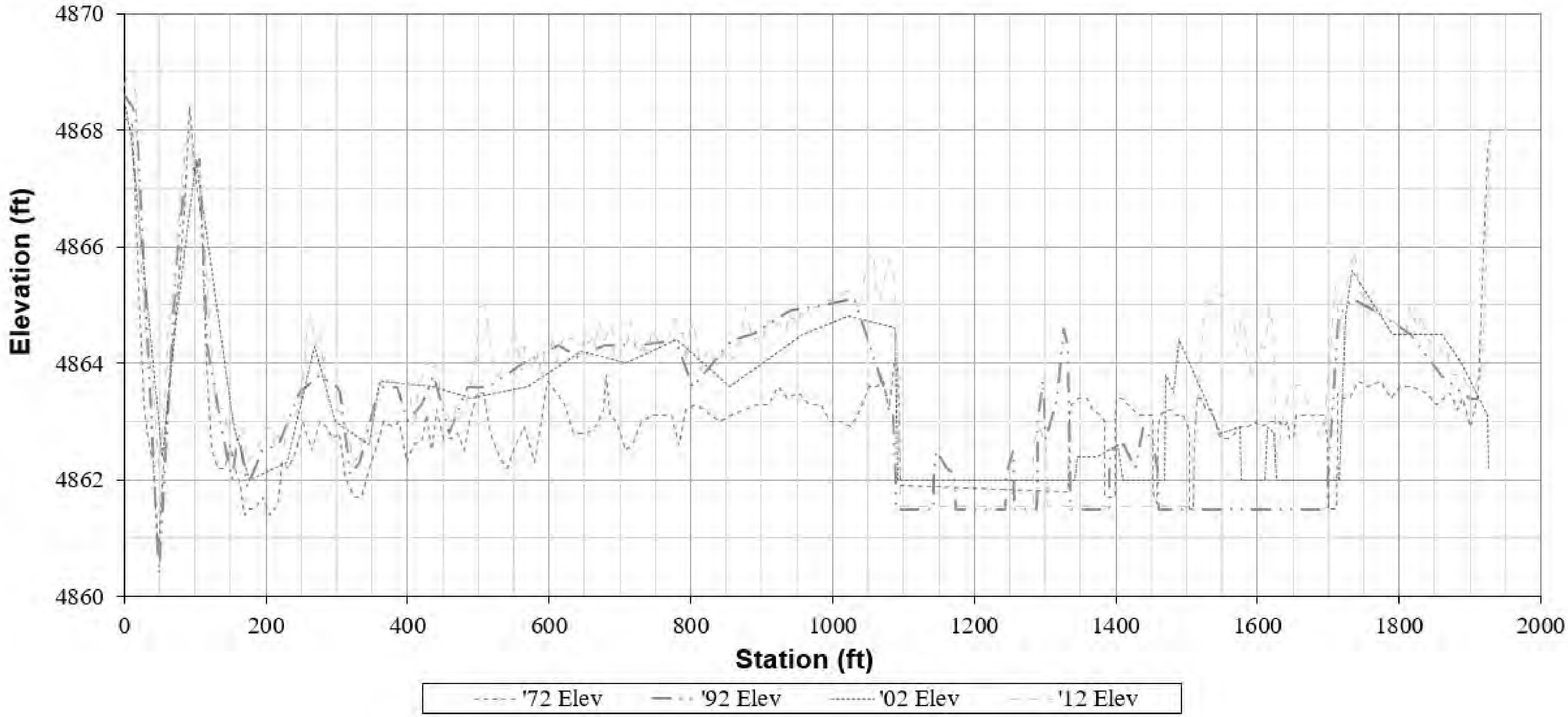
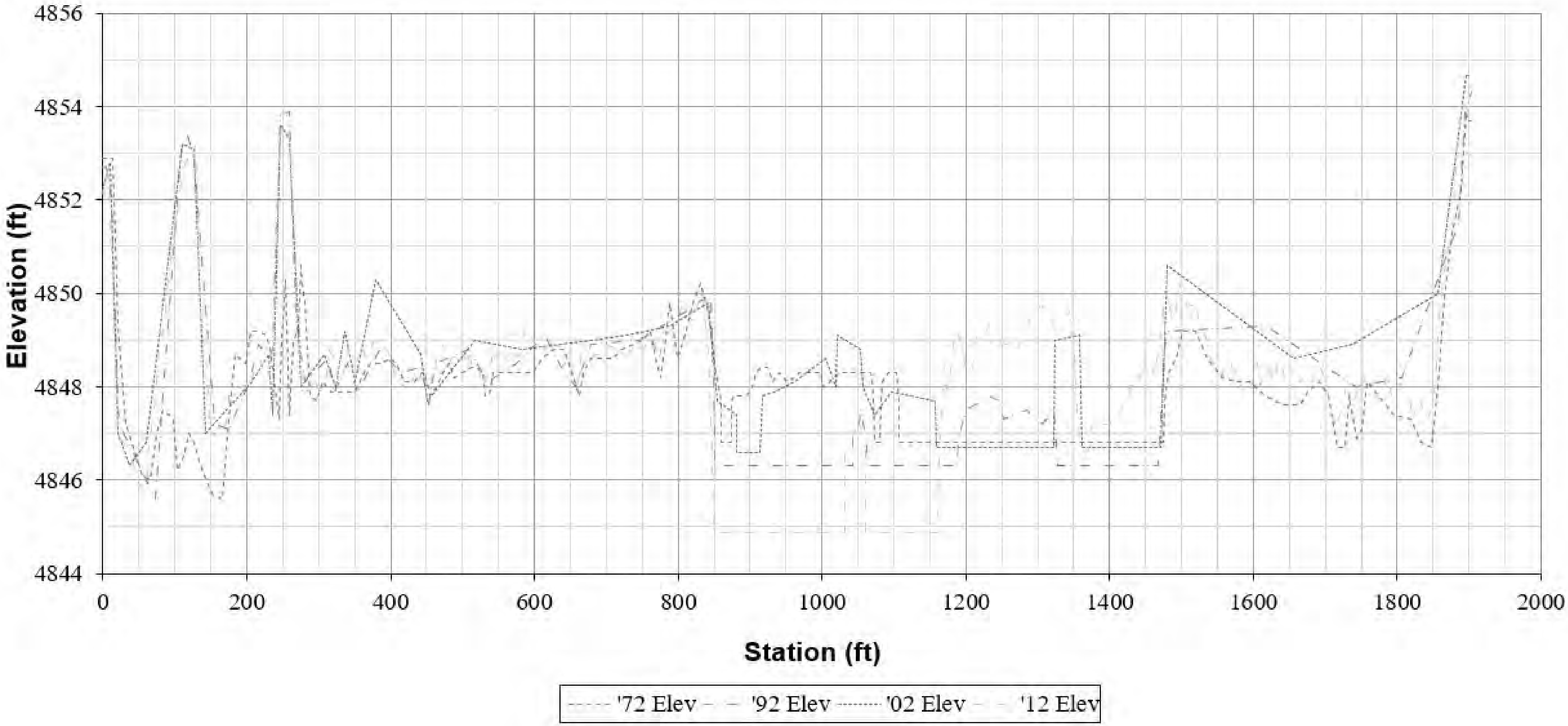


Figure 21. Cross Section of Aggradation-Degradation Line 705. Elevations are given in the NGVD NAD 29 datum.



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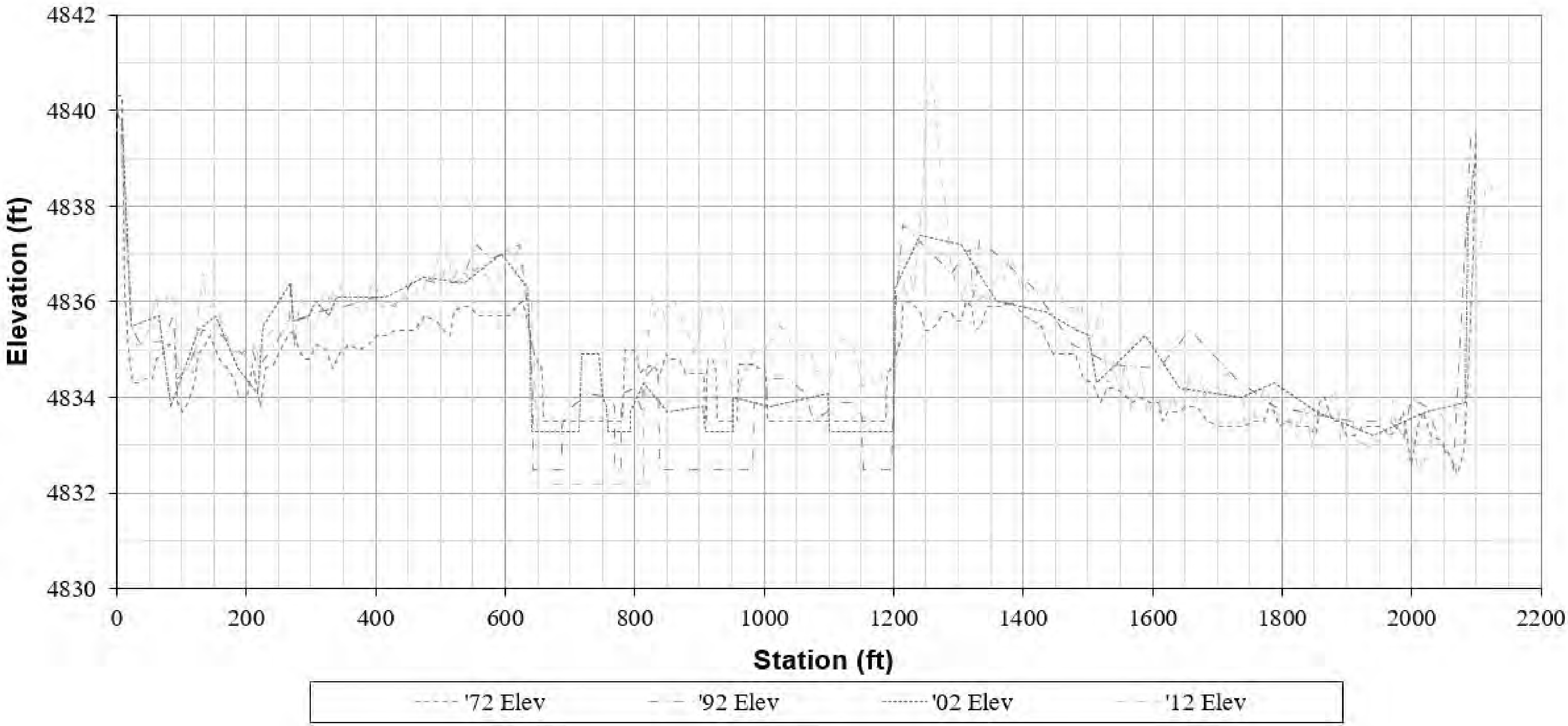

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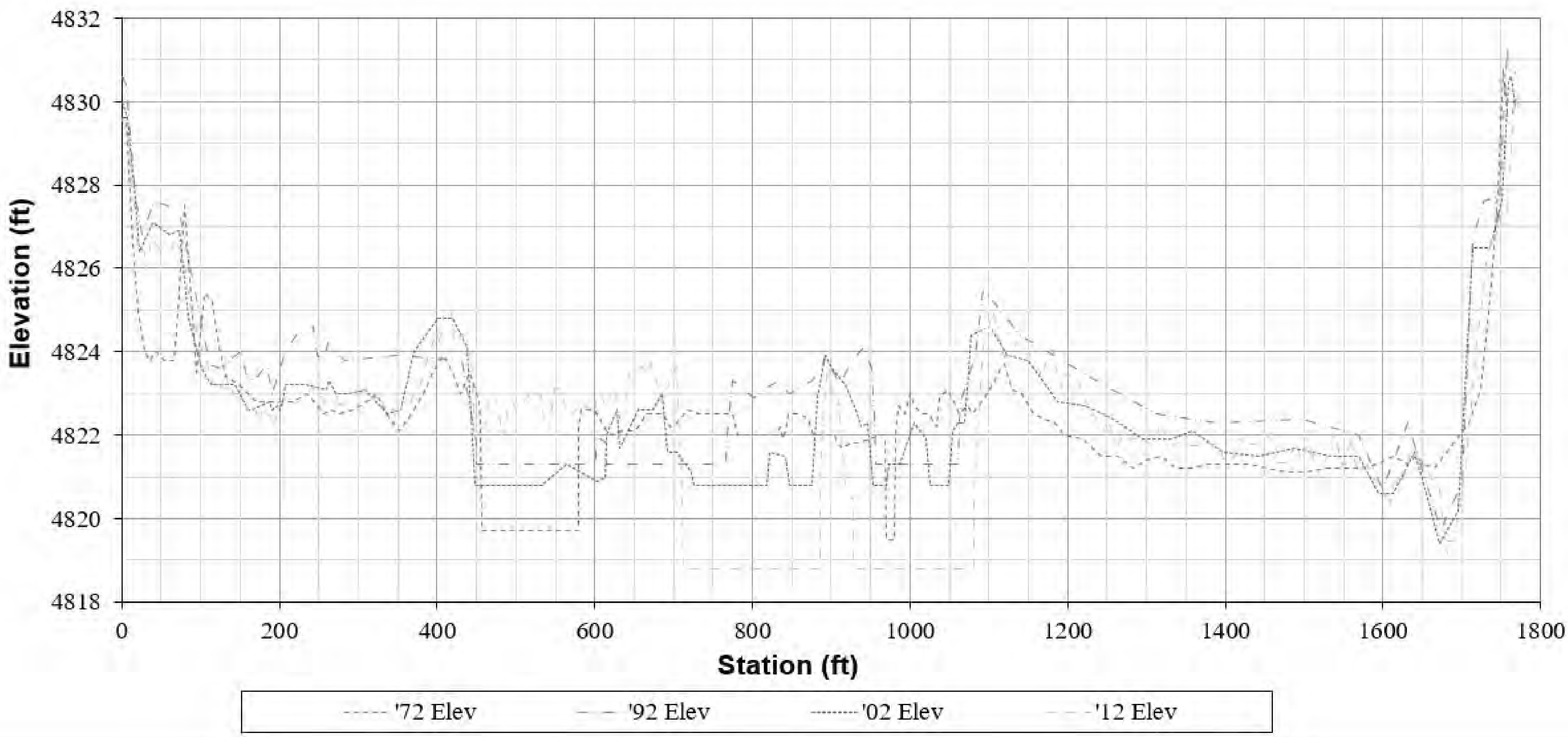

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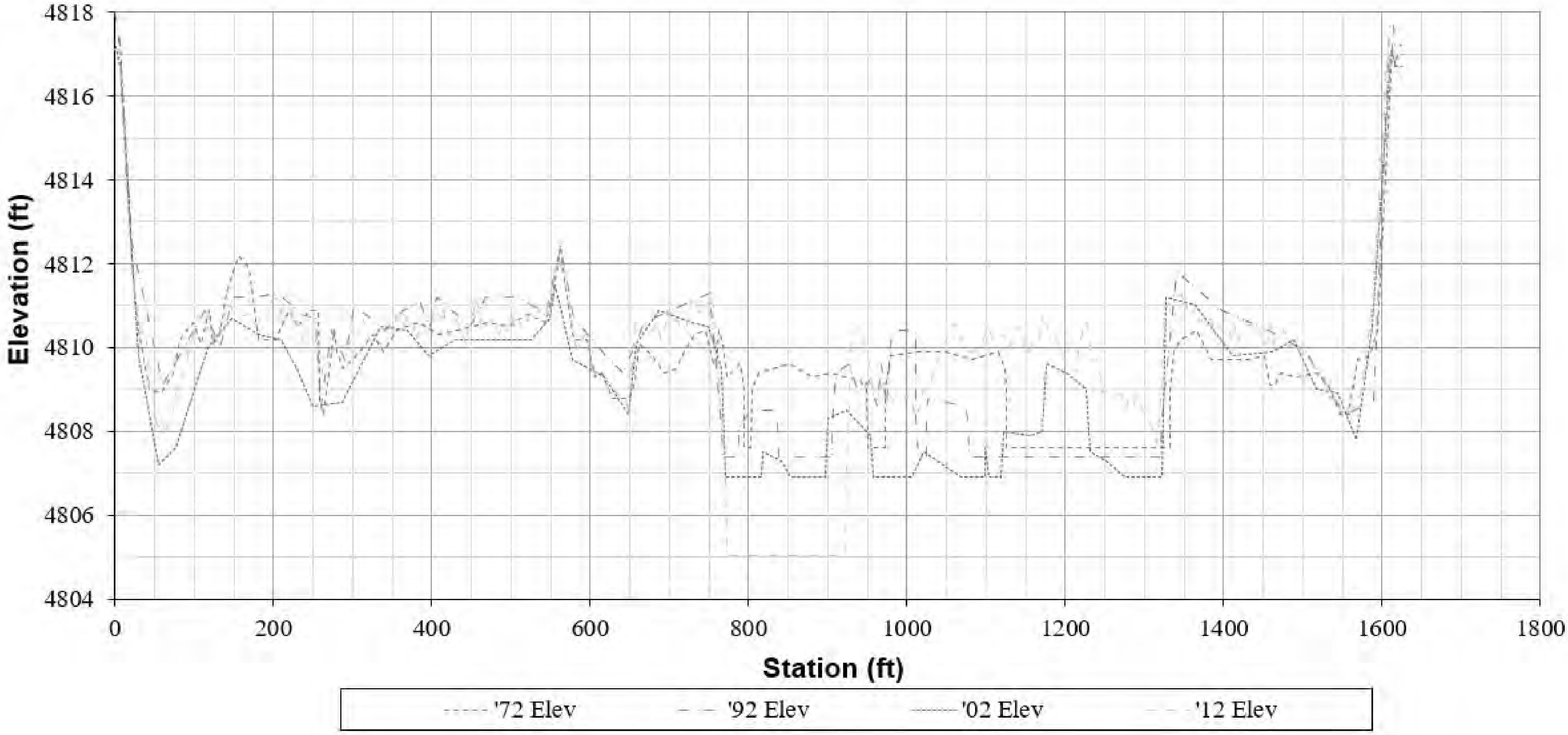

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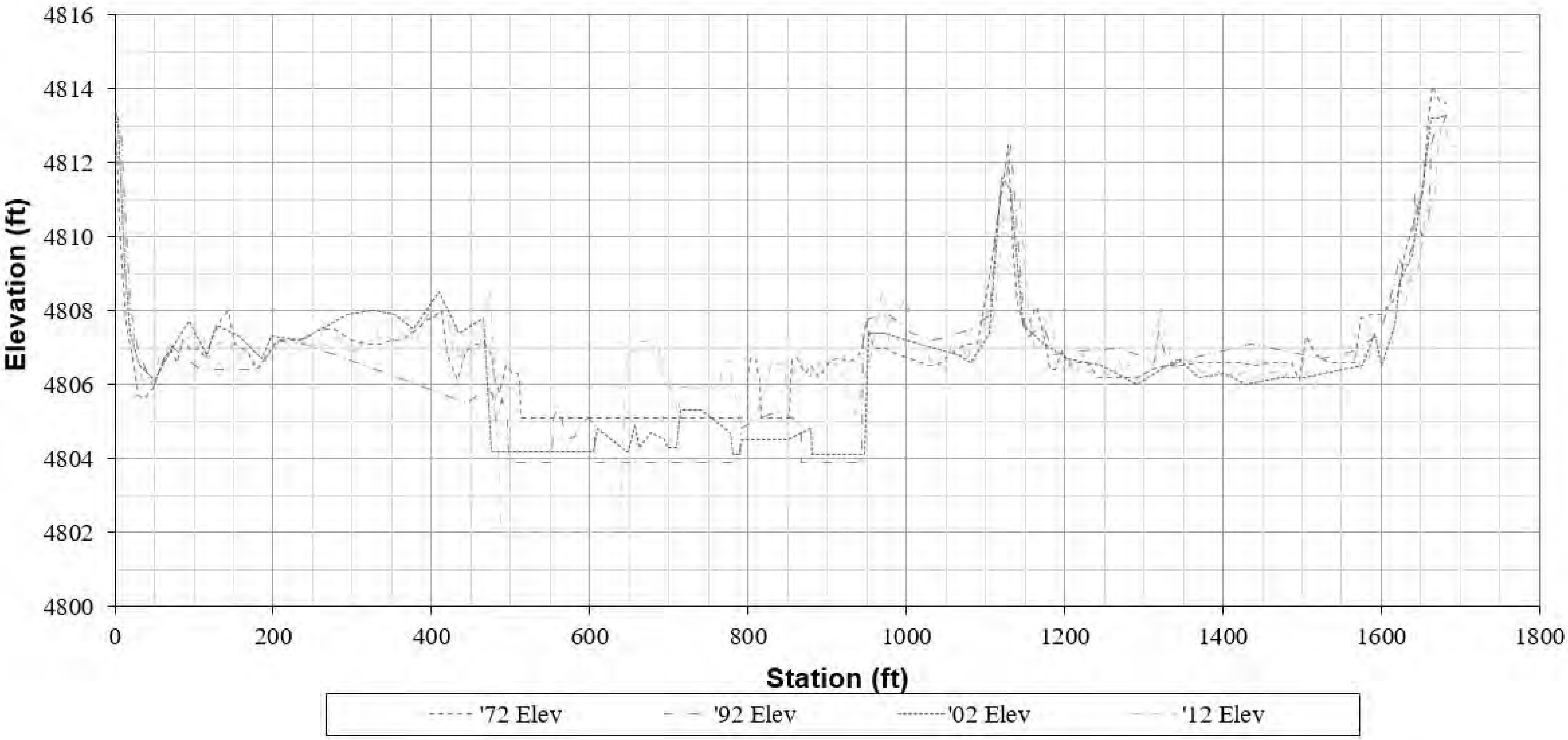

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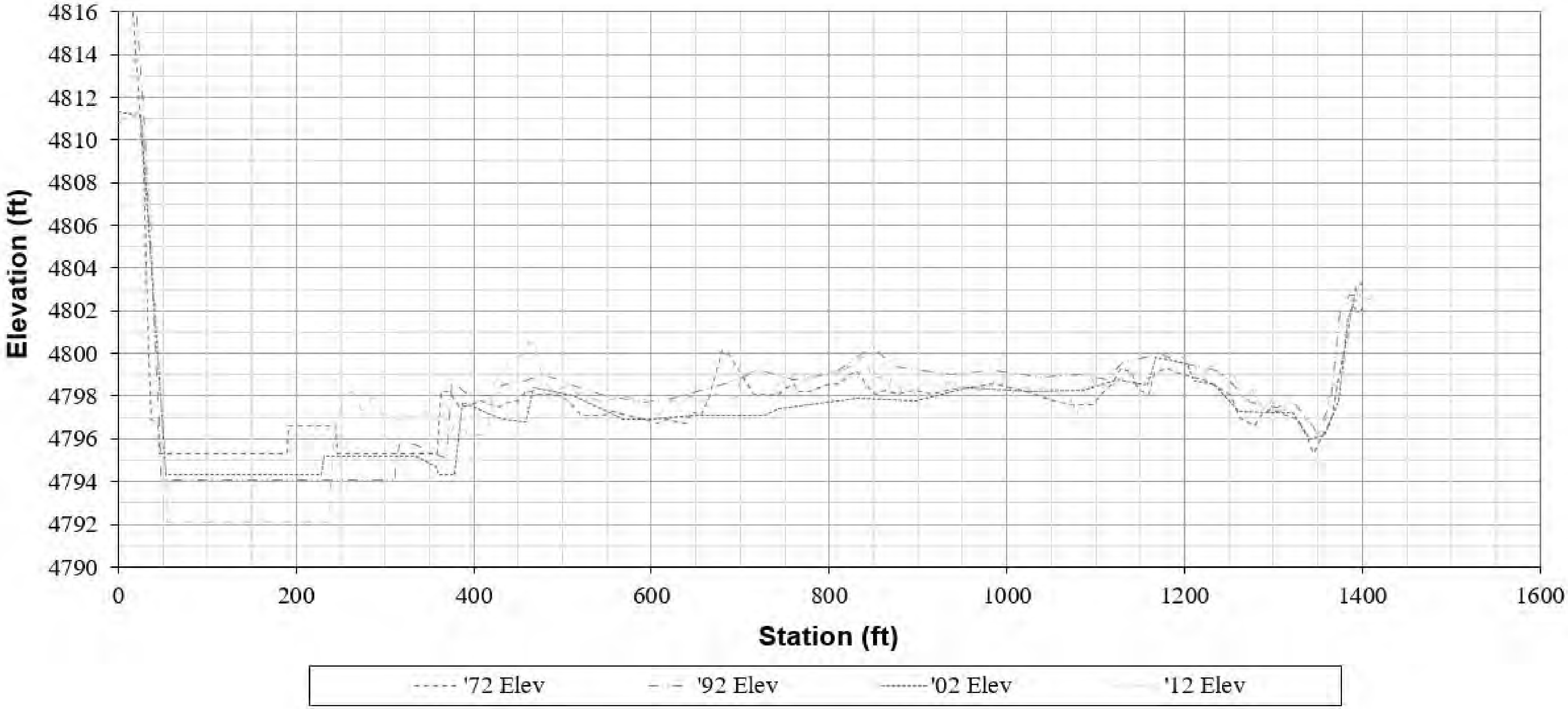

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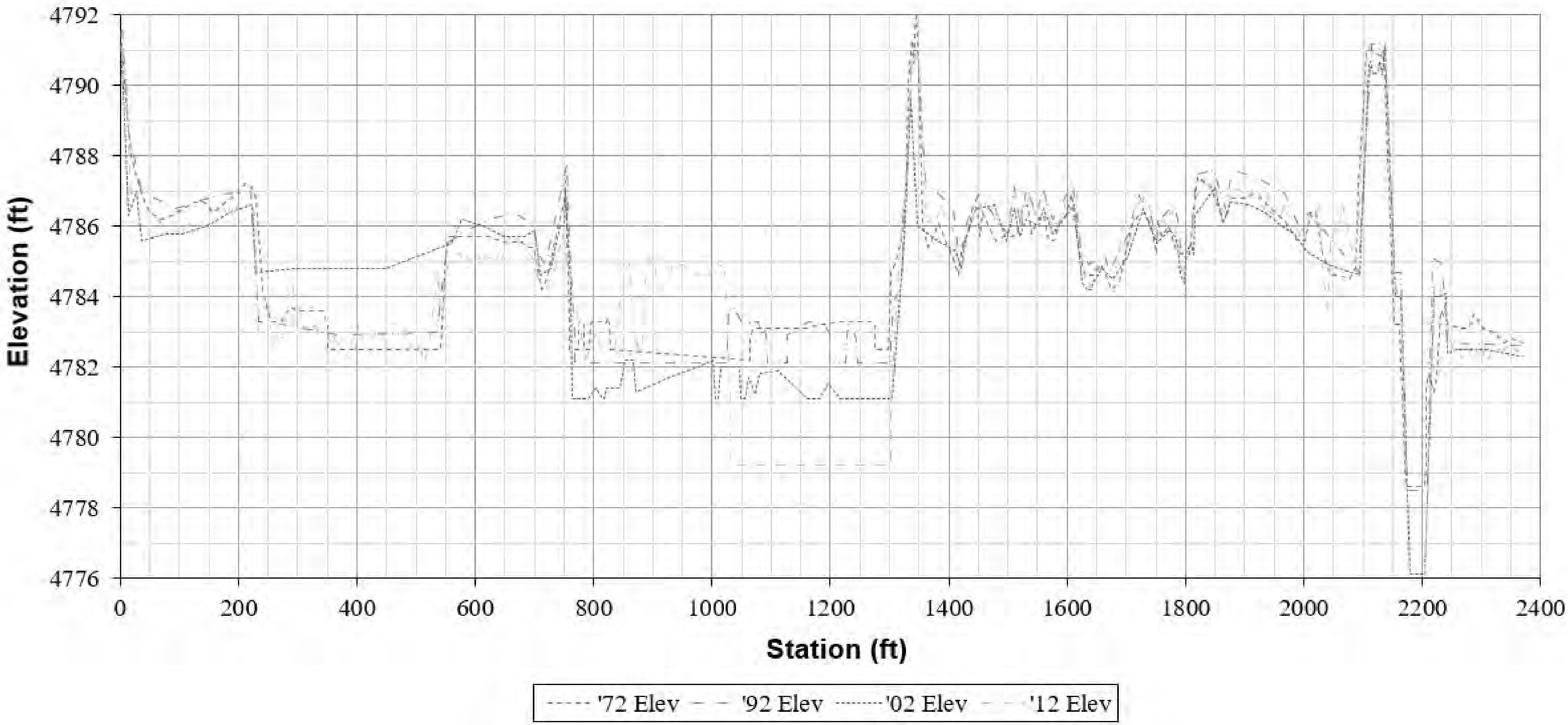

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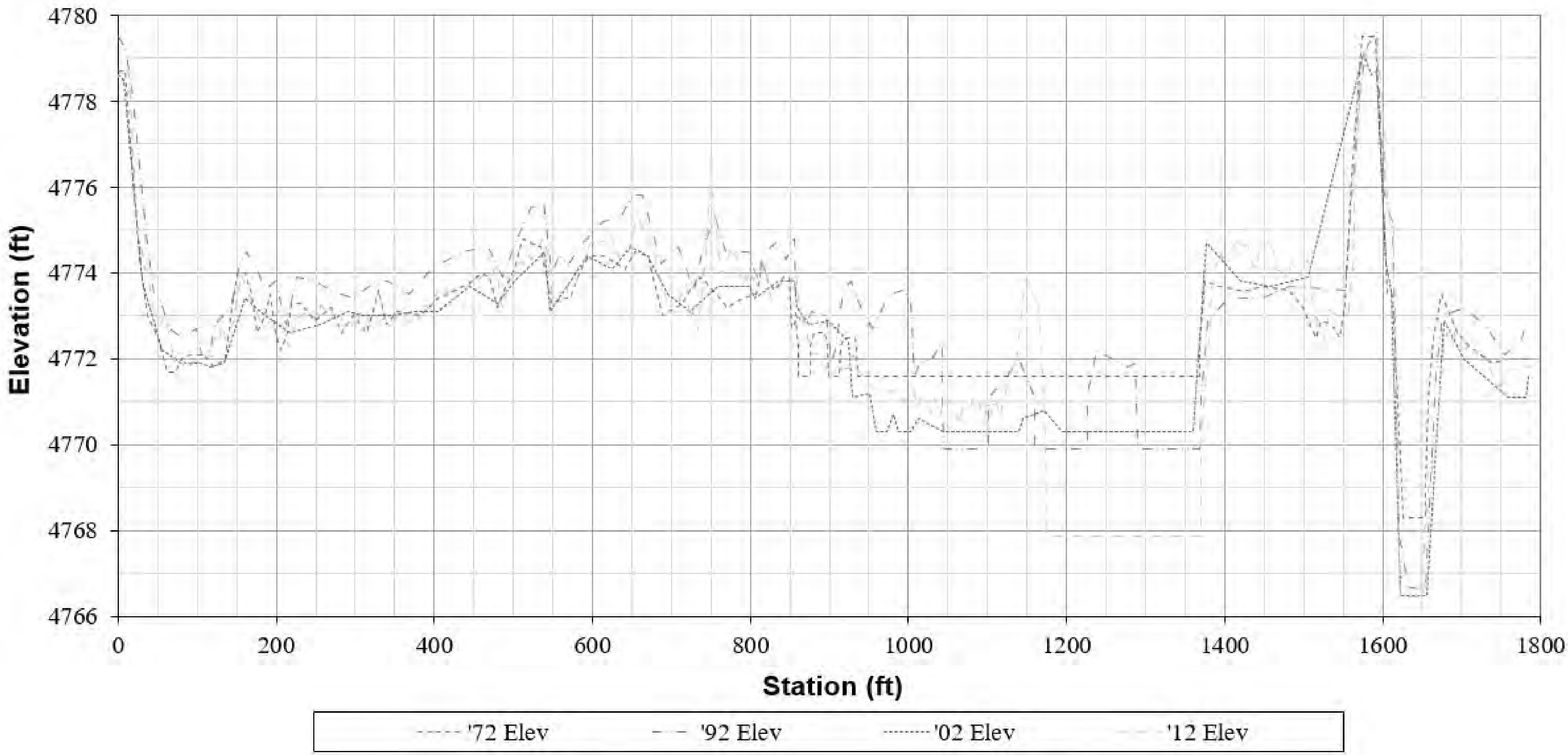

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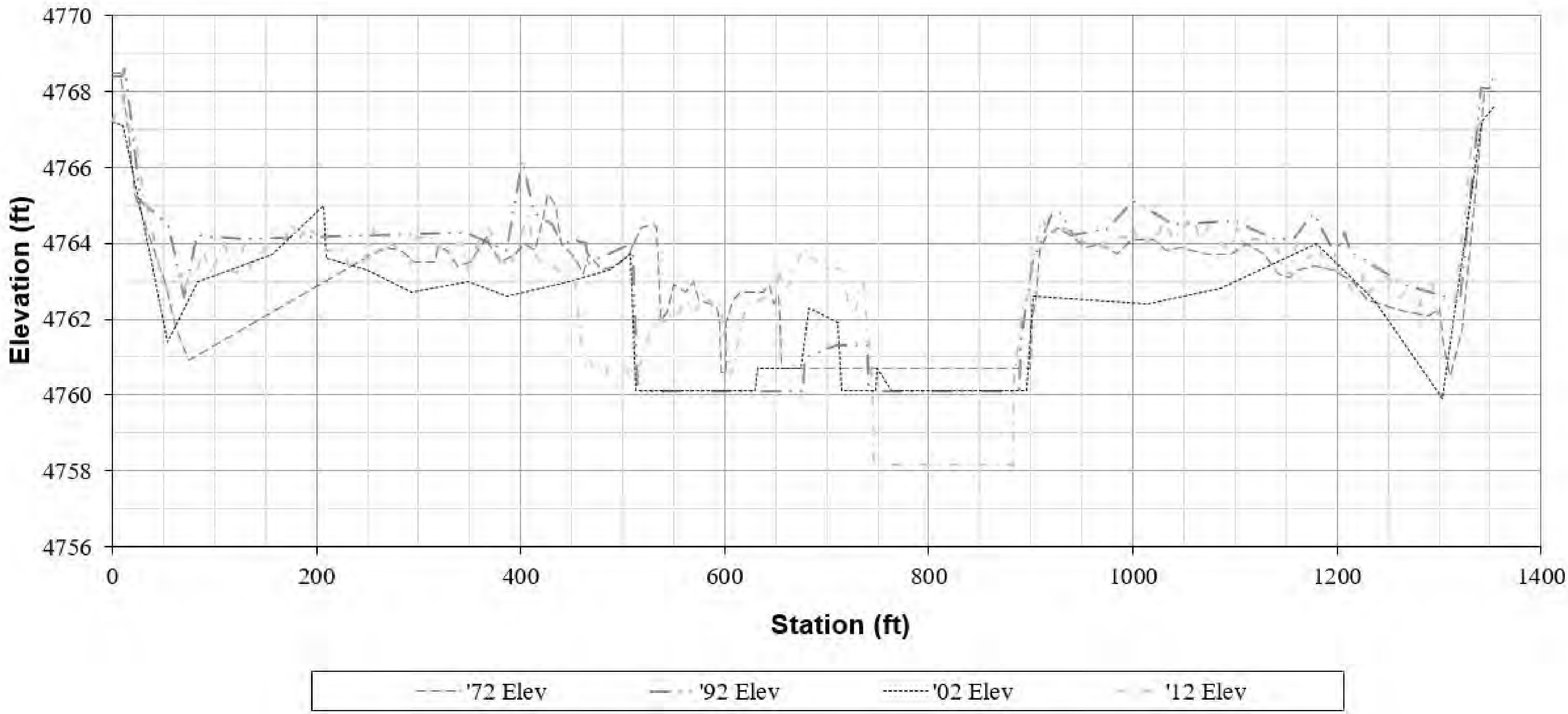

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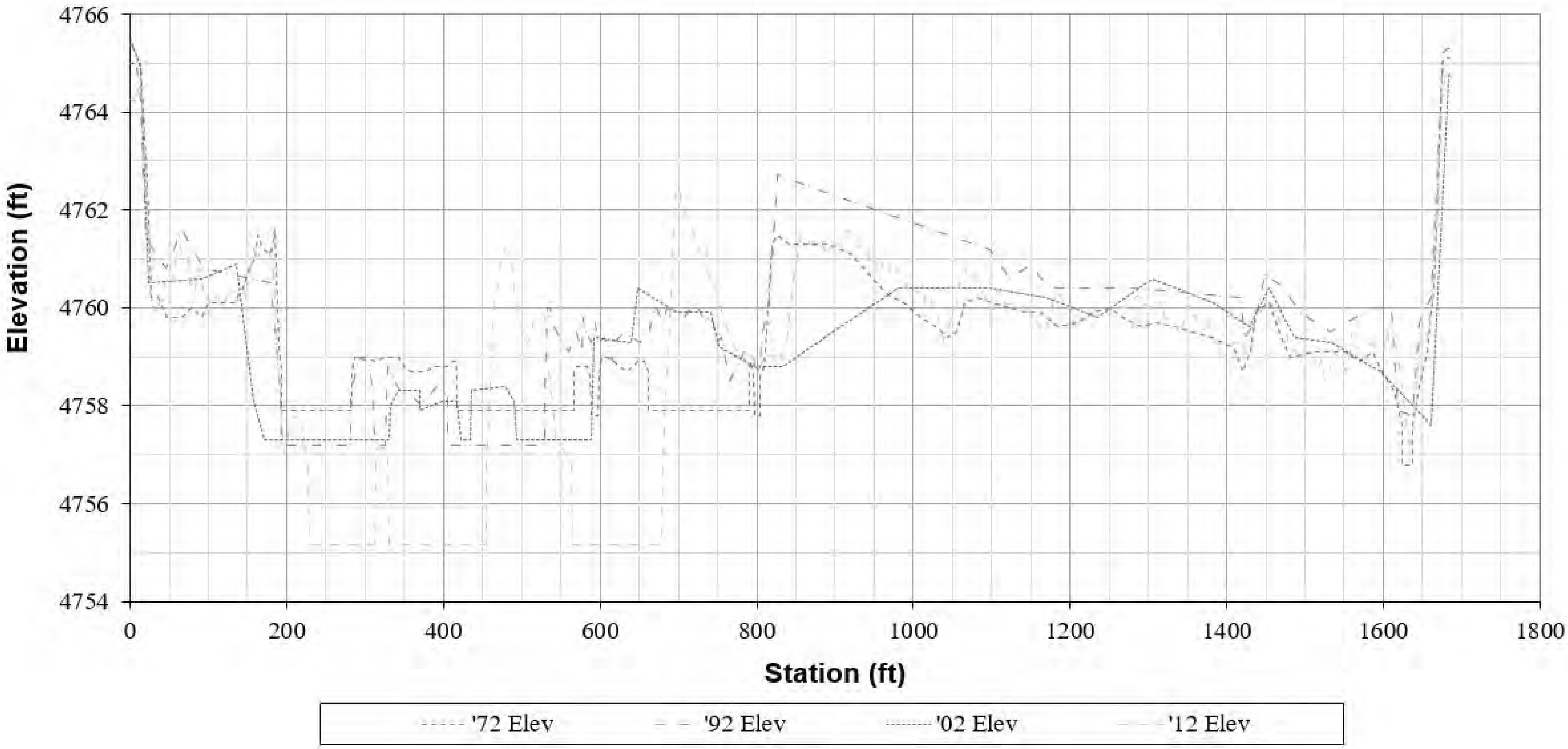

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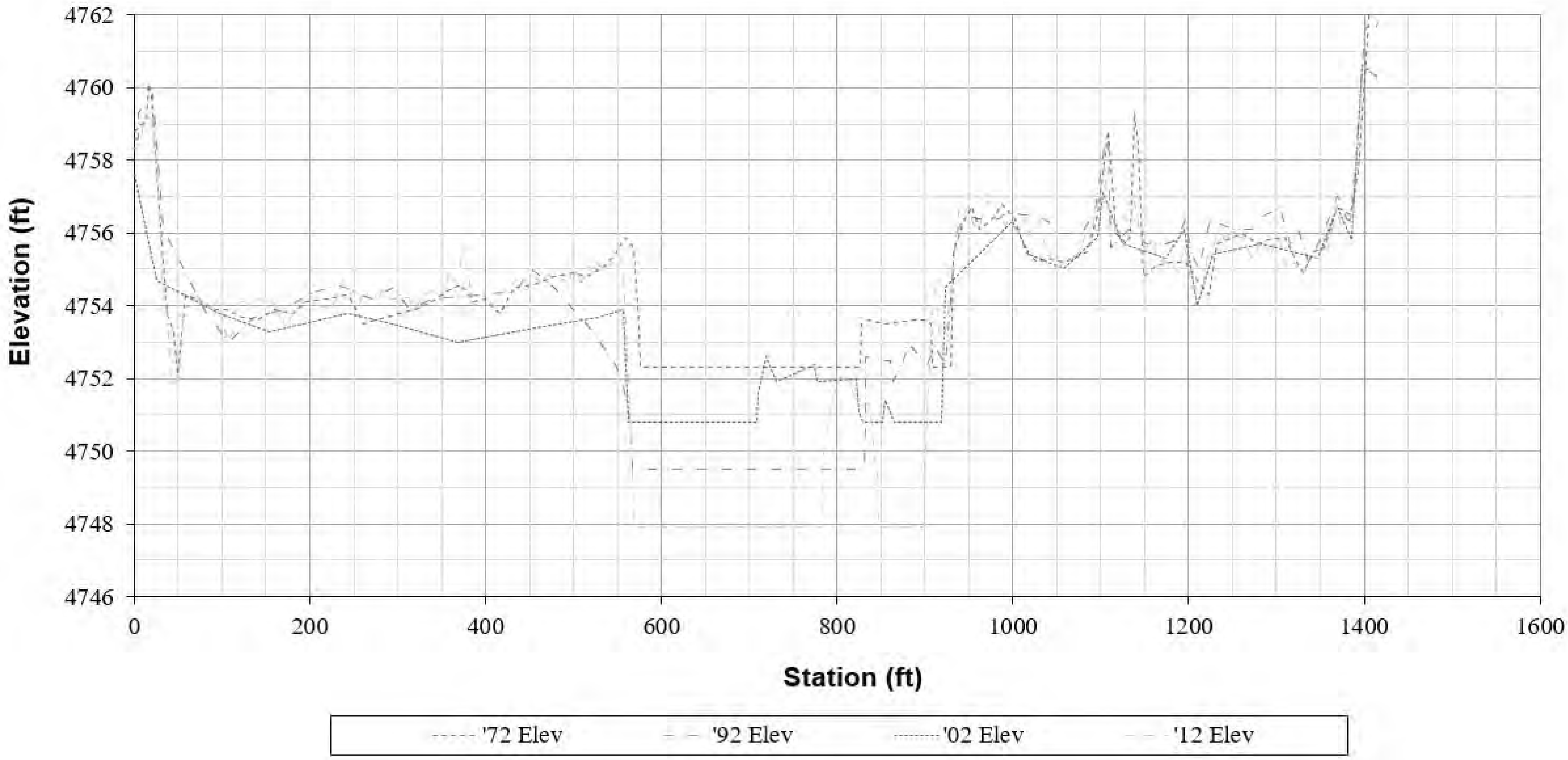

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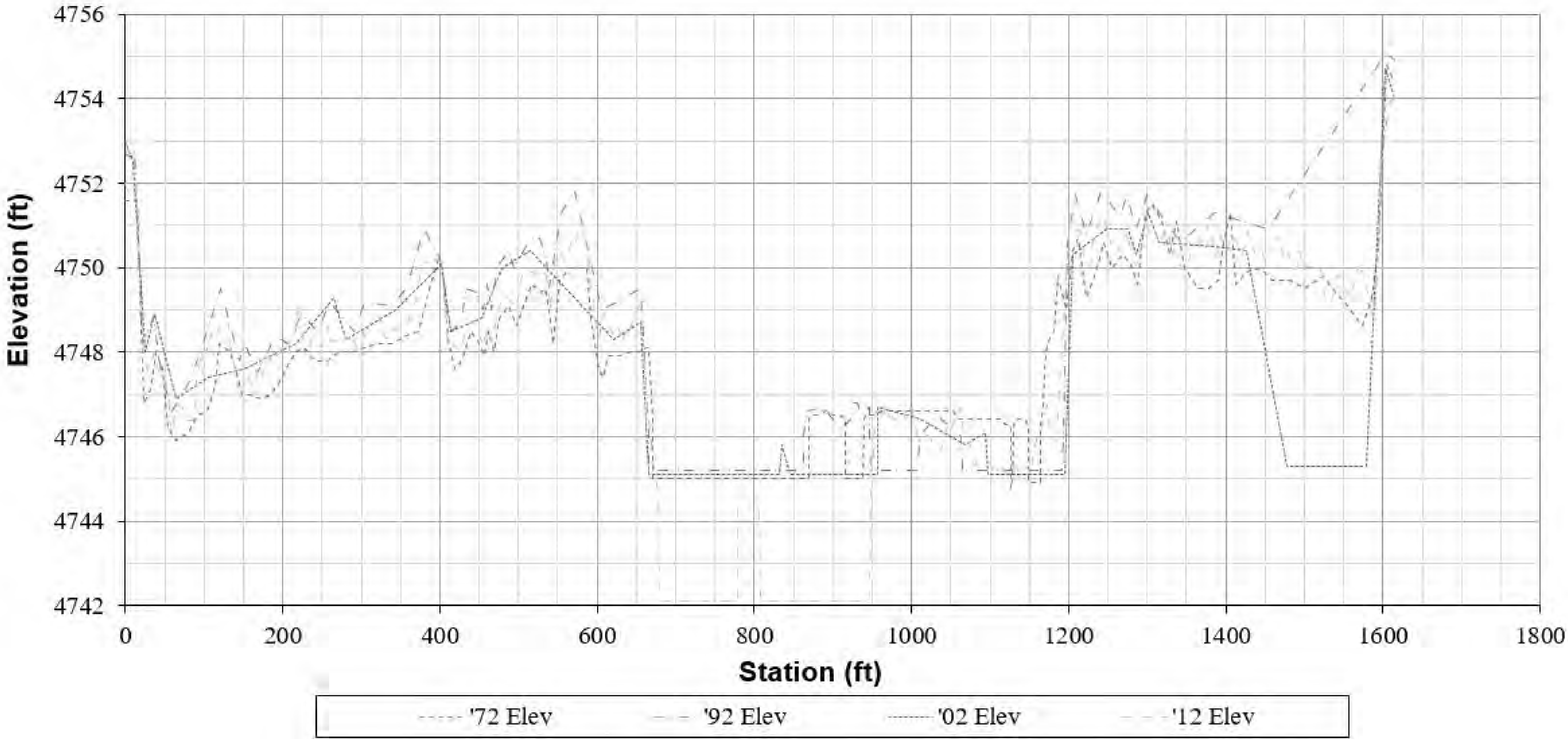


Figure 33. Cross Section of Aggradation-Degradation Line 1000. Elevations are given in the NGVD NAD 29 datum.

Attachment 7—Summary of evaluated FDA project scenarios

HEC-FDA

Middle Rio Grande Flood Control Project, New Mexico
Mountain View, Isleta and Belen Units

May 2009

These folders contain the entire models for the HEC-FDA runs used in the computations for the:

1) Discharge-Exceedence Functions with Uncertainty

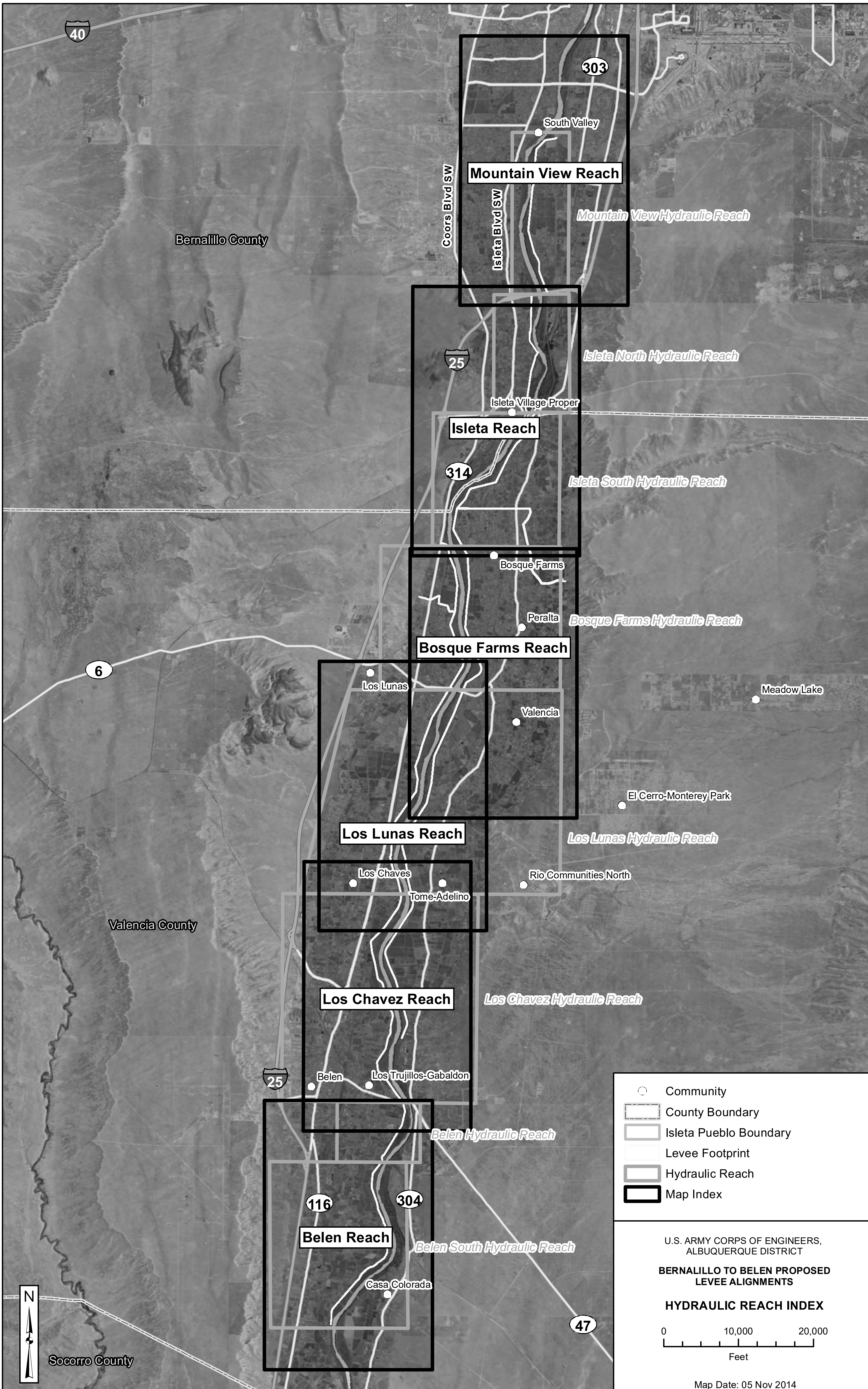
2) Stage-Discharge Functions with Uncertainty

3) Computation of Levee Elevations at Index Locations

This analysis was conducted for both the current With-Project and Without-Project Condition (2008) and the future With-Project and Without-Project Condition (2058). This folder contains .STY files and appropriate control FDA files.

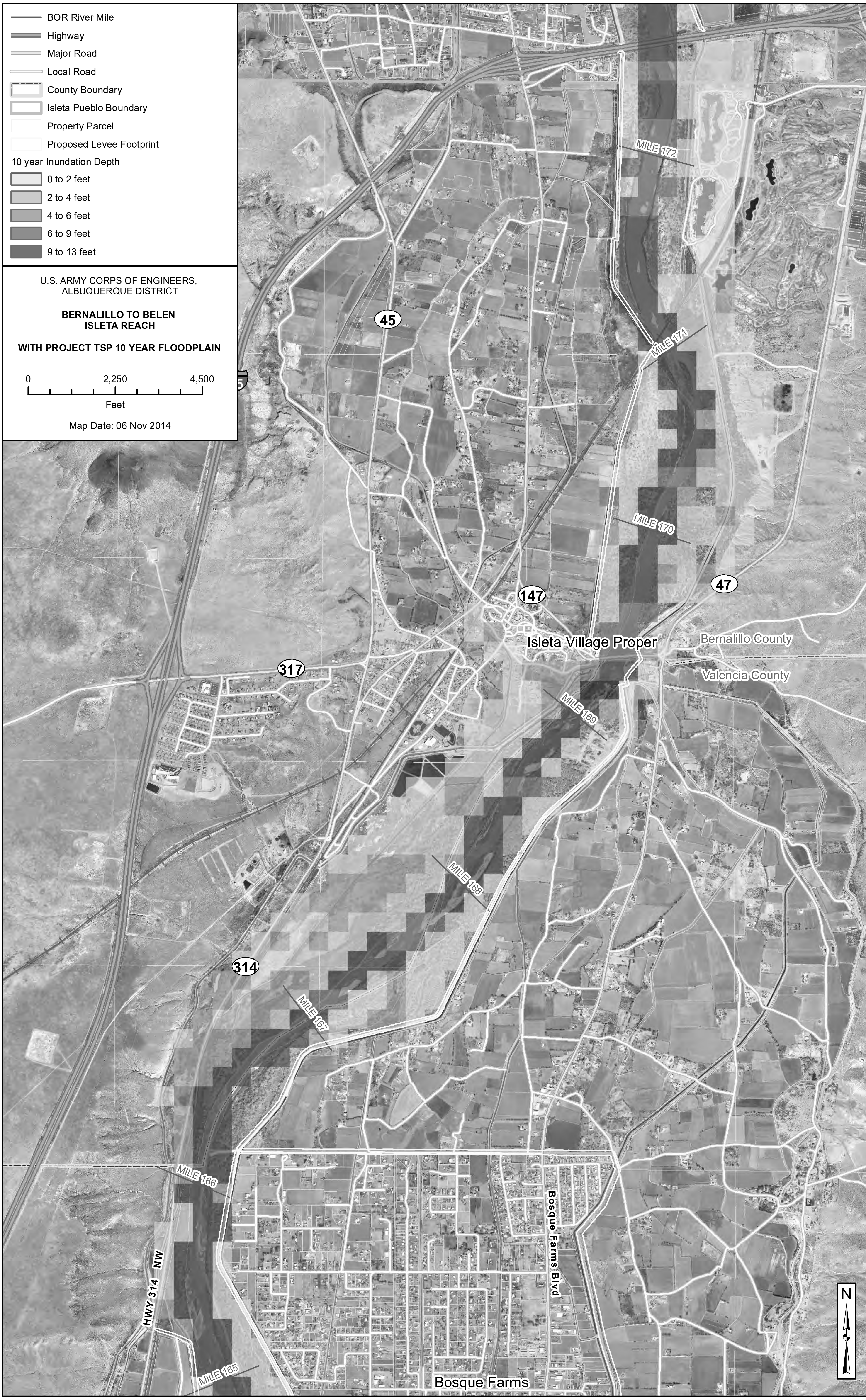
The models can be run in HEC-FDA version 1.2.4 (November 2008)

Attachment 8—FLO-2D Inundation maps with project



40
303
South Valley
Mountain View Reach
Coors Blvd SW
Isleta Blvd SW
Mountain View Hydraulic Reach
Bernalillo County
25
Isleta North Hydraulic Reach
Isleta Village Proper
Isleta Reach
314
Isleta South Hydraulic Reach
Bosque Farms
Peralta
Bosque Farms Hydraulic Reach
Bosque Farms Reach
6
Los Lunas
Meadow Lake
Valencia
El Cerro-Monterey Park
Los Lunas Reach
Los Lunas Hydraulic Reach
Los Chaves
Tome-Adelino
Rio Communities North
Valencia County
Los Chavez Reach
Los Chavez Hydraulic Reach
25
Belen
Los Trujillos-Gabaldon
Belen Hydraulic Reach
116
304
Belen Reach
Belen South Hydraulic Reach
Casa Colorada
47
N
Socorro County
Community
County Boundary
Isleta Pueblo Boundary
Levee Footprint
Hydraulic Reach
Map Index
U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN PROPOSED
LEVEE ALIGNMENTS
HYDRAULIC REACH INDEX
0
10,000
20,000
Feet
Map Date: 05 Nov 2014


BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
10 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
MOUNTAIN VIEW REACH
WITH PROJECT TSP 10 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014
Blake Rd SW
Isleta Blvd SW
MILE 179
2Nd St SW
303
47
Rio Bravo Blvd SW
Broadway Blvd SE
MILE 178
Gun Club Rd SW
South Valley
MILE 177
MILE 176
MILE 175
MILE 174
314
MILE 173
Coors Blvd SW
25
N

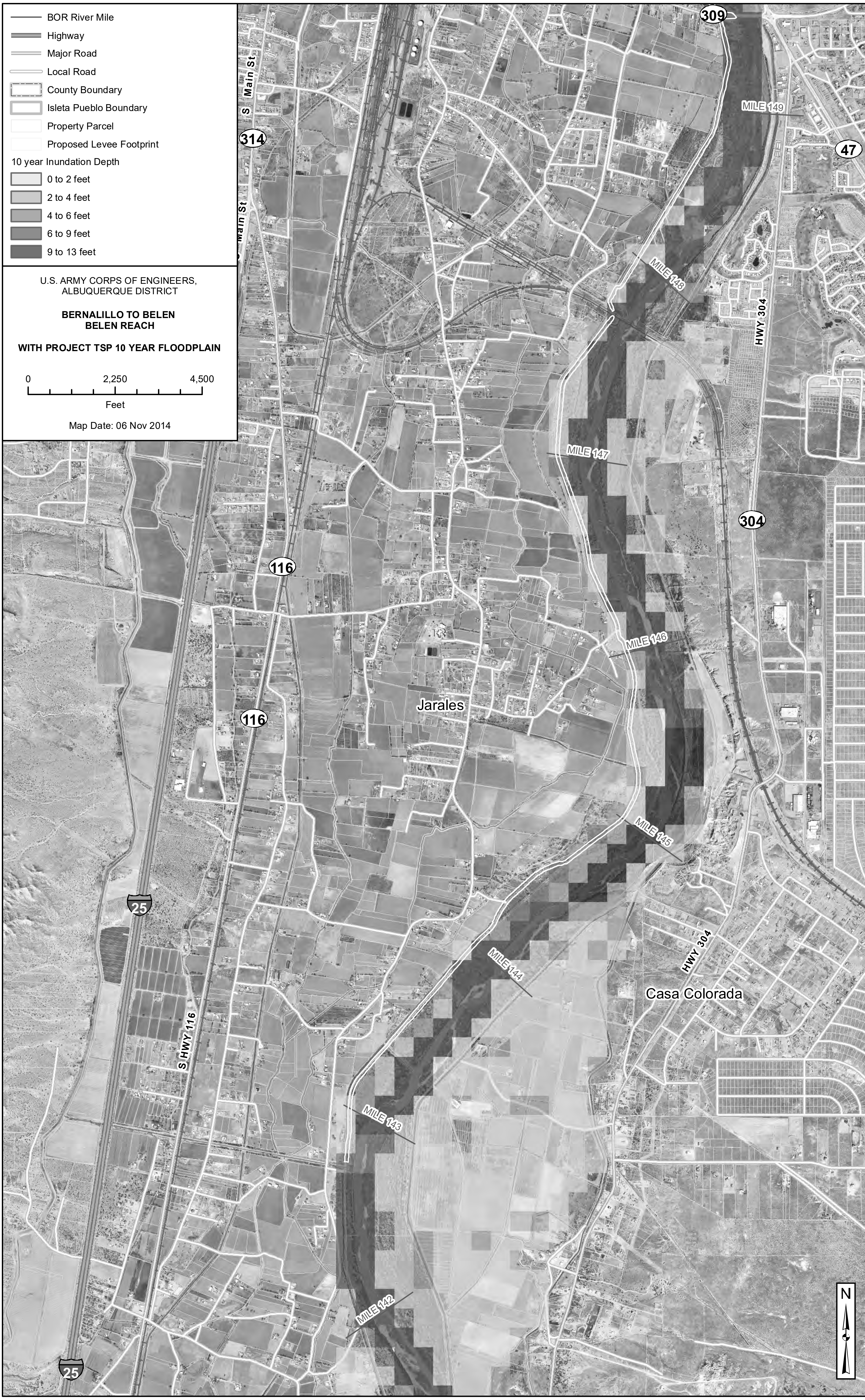


BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
10 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN ISLETA REACH
WITH PROJECT TSP 10 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014
MILE 172
MILE 171
MILE 170
MILE 169
MILE 168
MILE 167
MILE 166
MILE 165
45
147
47
317
314
Isleta Village Proper
Bernalillo County
Valencia County
Bosque Farms Blvd
HWY 314 NW
Bosque Farms
N

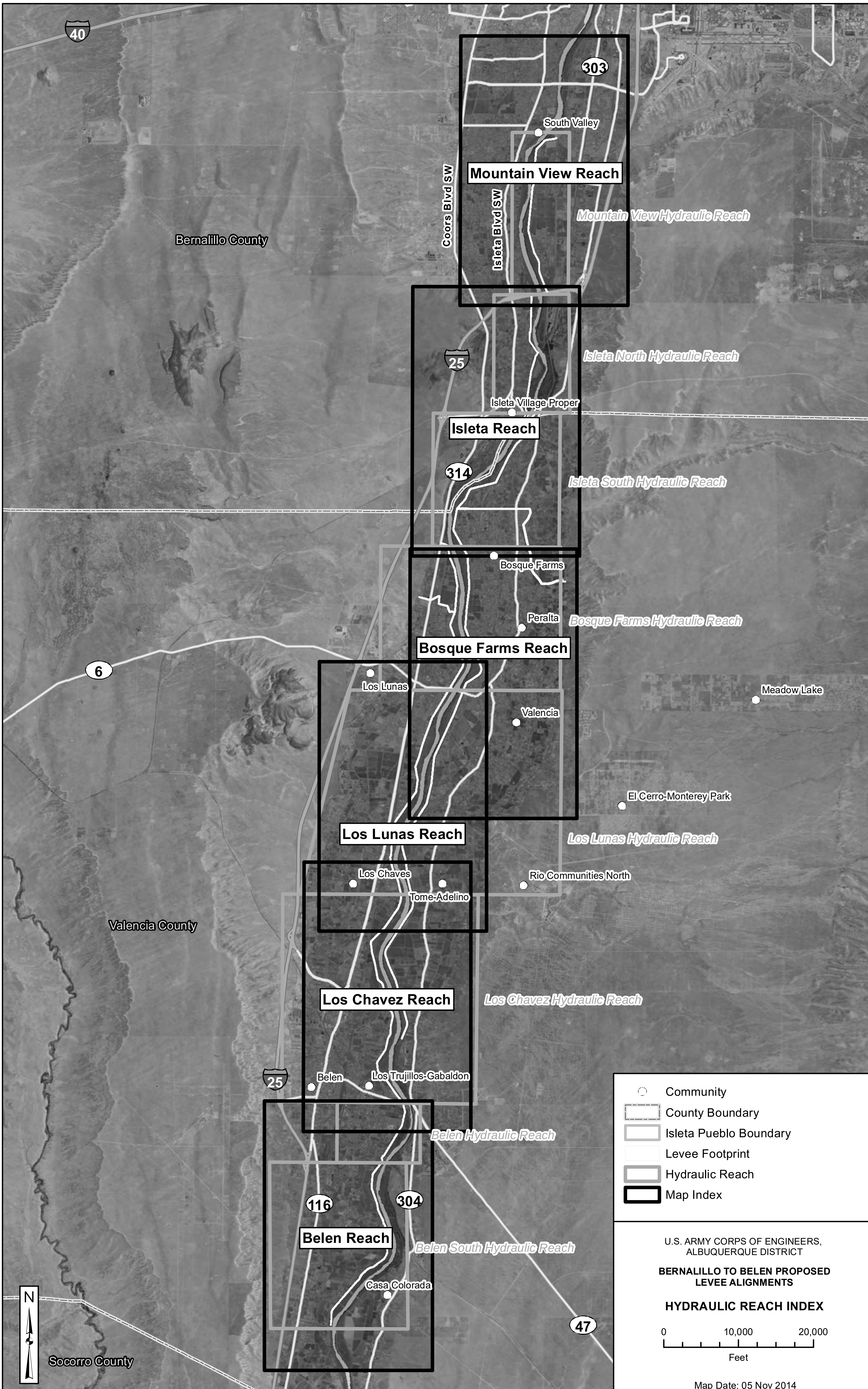
Bosque Farms
Bosque Farms Blvd
Peralta
Valencia
MILE 165
MILE 164
MILE 163
MILE 162
MILE 161
MILE 160
MILE 159
314
HWY 314 NW
HWY 314 NW
HWY 314 SW
Main St NE
Main St NE
Main St NE
6
47
N
BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
10 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
BOSQUE FARMS REACH
WITH PROJECT TSP 10 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014

Los Lunas
6
Main St NE
Main St NE
Main St NE
HWY 314 NW
HWY 314 SW
HWY 314 SW
HWY 314 SW
HWY 314 SW
HWY 314
HWY 314
25
25
314
47
MILE 162
MILE 161
MILE 160
MILE 159
MILE 158
MILE 157
MILE 156
MILE 155
Los Chaves
N
BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
10 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
LOS LUNAS REACH
WITH PROJECT TSP 10 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014

BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
10 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
LOS CHAVEZ REACH
WITH PROJECT TSP 10 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014
Los Chaves
314
Tome-Adelino
HWY 314
MILE 156
MILE 155
MILE 154
MILE 153
MILE 152
MILE 151
MILE 150
MILE 149
47
Frontage Rd
N Main St
W Reinken Ave
E Reinken Ave
E River Rd
Belen
Los Trujillos-Gabaldon
548
309
304
S Main St
N



BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
10 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
BELEN REACH
WITH PROJECT TSP 10 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014
309
S Main St
314
Main St
MILE 149
47
MILE 148
HWY 304
MILE 147
304
116
MILE 146
Jarales
116
MILE 145
25
MILE 144
HWY 304
Casa Colorada
S HWY 116
MILE 143
MILE 142
25
N



40
303
South Valley
Mountain View Reach
Coors Blvd SW
Isleta Blvd SW
Mountain View Hydraulic Reach
Bernalillo County
25
Isleta North Hydraulic Reach
Isleta Village Proper
Isleta Reach
314
Isleta South Hydraulic Reach
Bosque Farms
Peralta
Bosque Farms Hydraulic Reach
Bosque Farms Reach
6
Los Lunas
Meadow Lake
Valencia
El Cerro-Monterey Park
Los Lunas Reach
Los Lunas Hydraulic Reach
Los Chaves
Tome-Adelino
Rio Communities North
Valencia County
Los Chavez Reach
Los Chavez Hydraulic Reach
25
Belen
Los Trujillos-Gabaldon
Belen Hydraulic Reach
116
304
Belen Reach
Belen South Hydraulic Reach
Casa Colorada
N
47
Socorro County
Community
County Boundary
Isleta Pueblo Boundary
Levee Footprint
Hydraulic Reach
Map Index
U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN PROPOSED
LEVEE ALIGNMENTS
HYDRAULIC REACH INDEX
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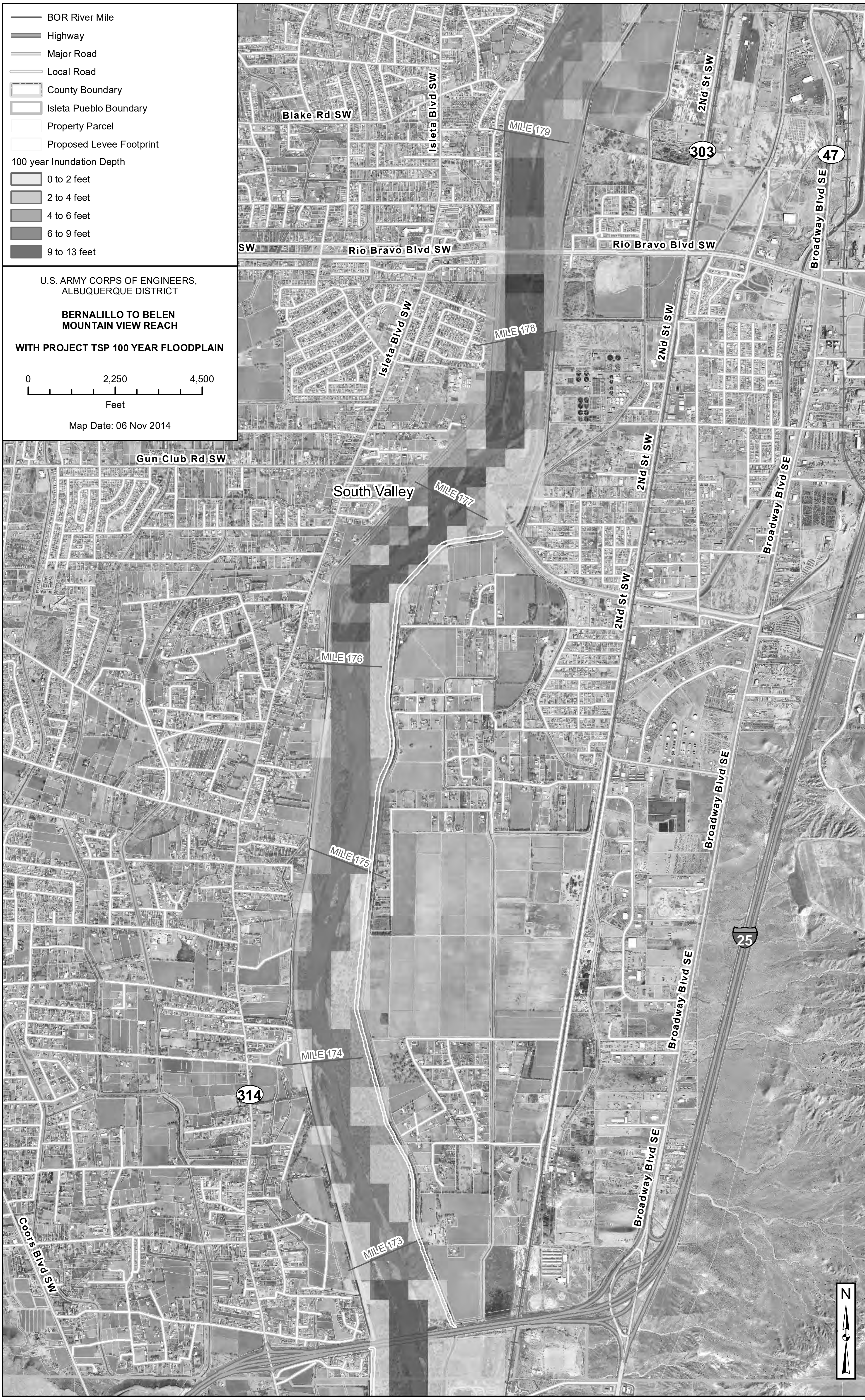
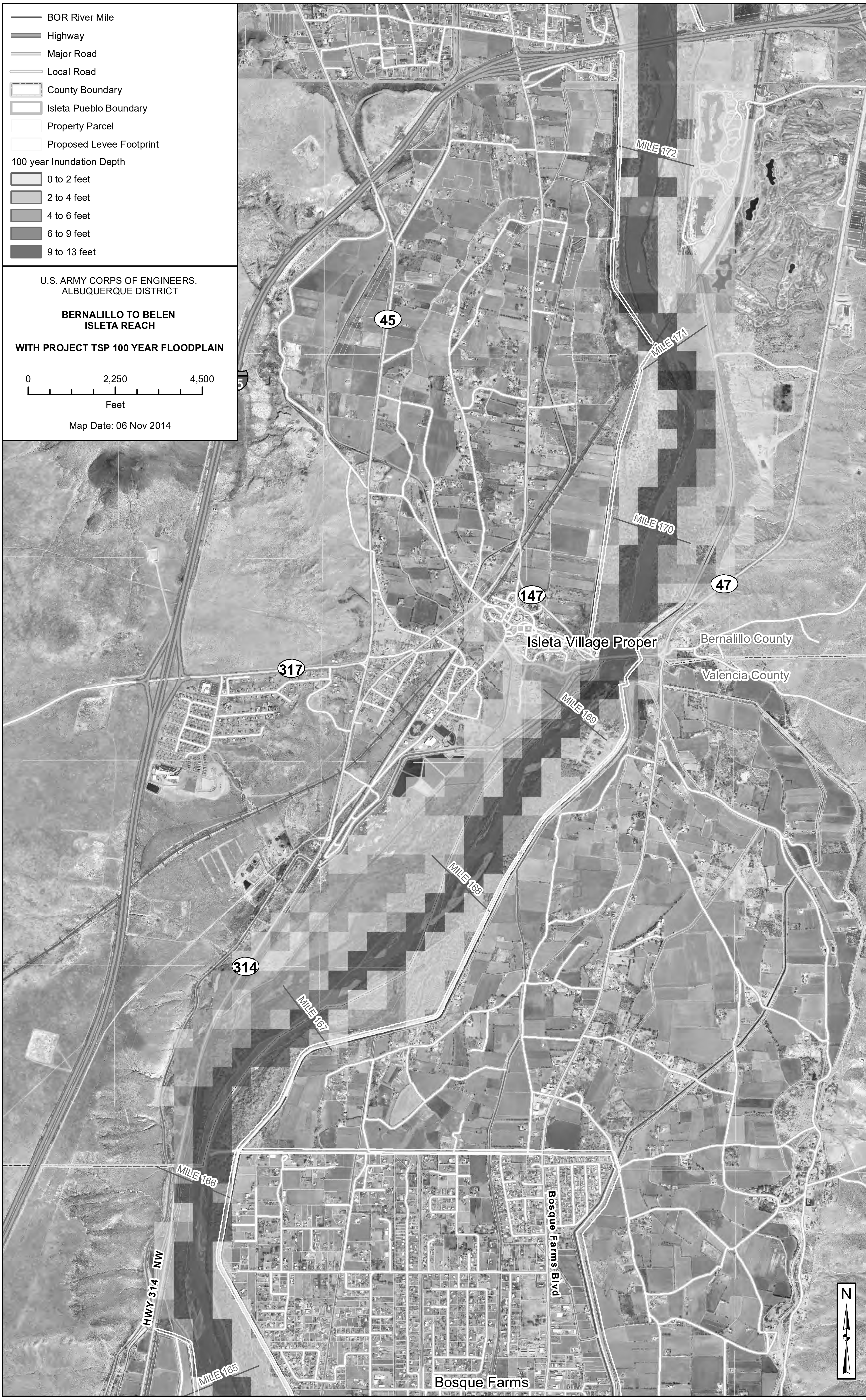
20,000
Feet
Map Date: 05 Nov 2014

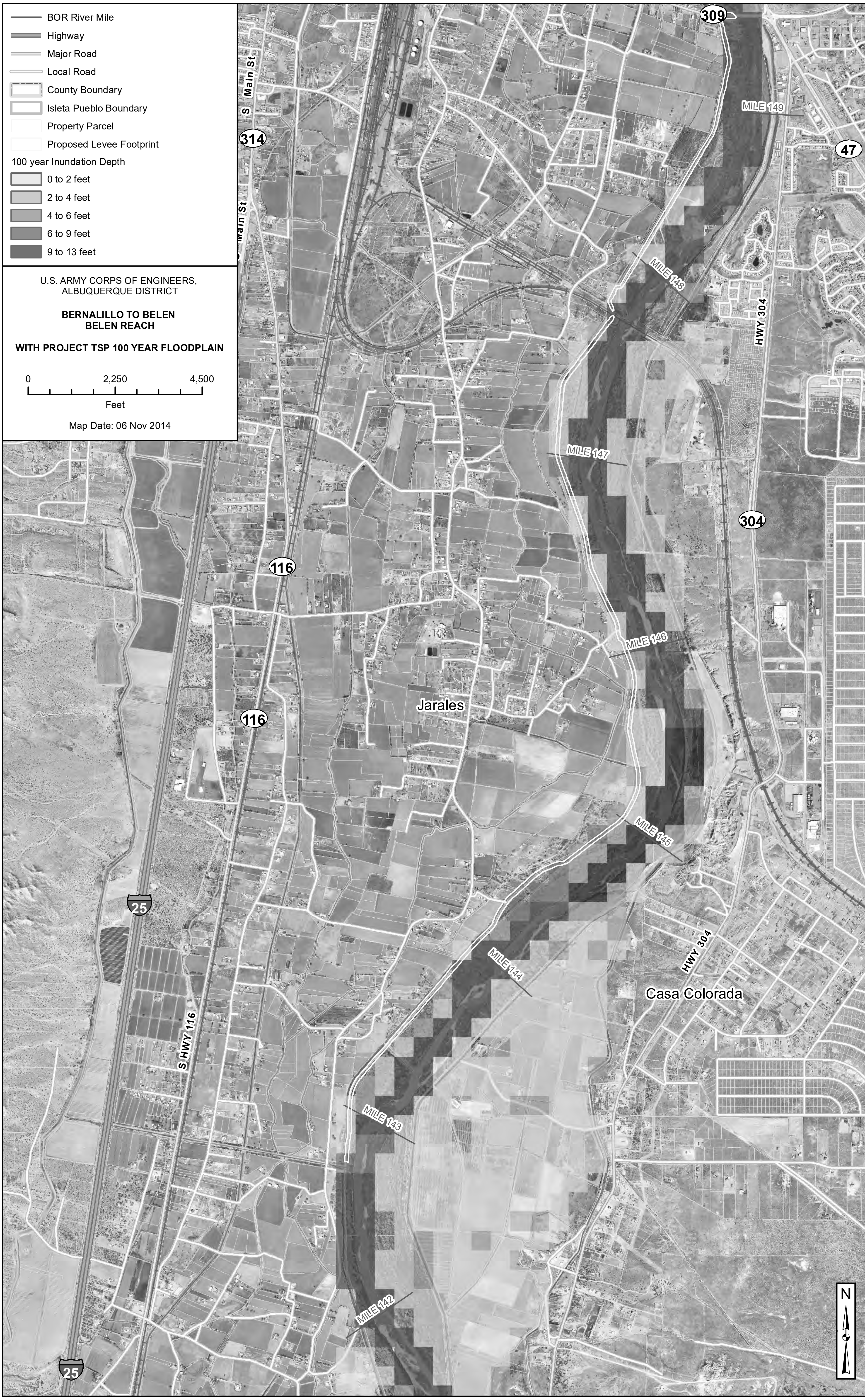

BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
100 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
MOUNTAIN VIEW REACH
WITH PROJECT TSP 100 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014
Blake Rd SW
Isleta Blvd SW
2nd St SW
303
47
Broadway Blvd SE
Rio Bravo Blvd SW
MILE 179
MILE 178
MILE 177
MILE 176
MILE 175
MILE 174
MILE 173
Gun Club Rd SW
South Valley
2Nd St SW
25
314
Coors Blvd SW
N


BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
100 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
ISLETA REACH
WITH PROJECT TSP 100 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014
MILE 172
MILE 171
MILE 170
MILE 169
MILE 168
MILE 167
MILE 166
MILE 165
45
47
147
317
314
Isleta Village Proper
Bernalillo County
Valencia County
Bosque Farms Blvd
HWY 314 NW
Bosque Farms
N

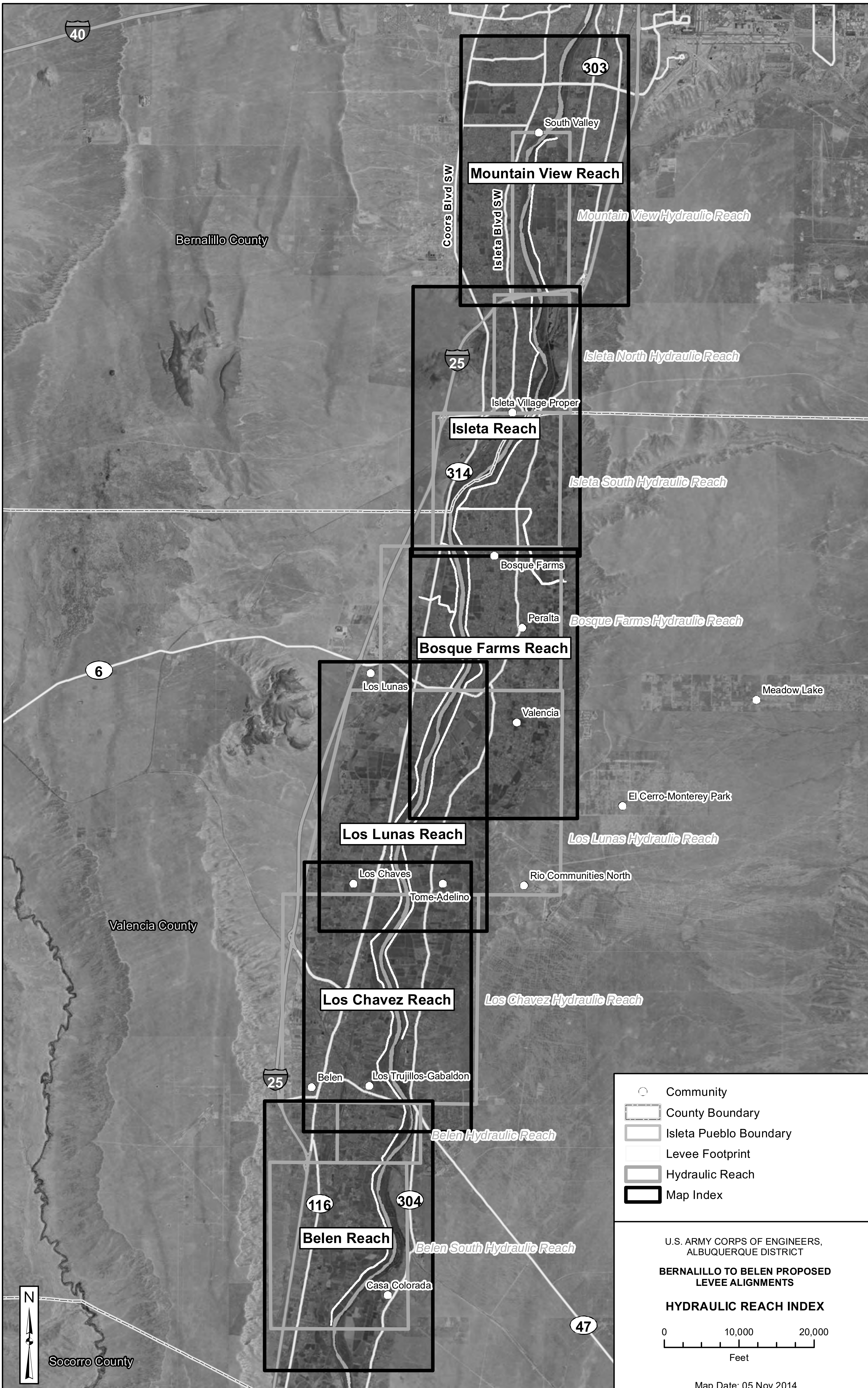

Bosque Farms
Peralta
Valencia
314
HWY 314 NW
HWY 314 NW
HWY 314 SW
Bosque Farms Blvd
Main St NE
Main St NE
Main St NE
6
47
MILE 165
MILE 164
MILE 163
MILE 162
MILE 161
MILE 160
MILE 159
158
N
BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
100 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
BOSQUE FARMS REACH
WITH PROJECT TSP 100 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014


BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
100 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
LOS LUNAS REACH
WITH PROJECT TSP 100 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014
6
Los Lunas
HWY 314 NW
SW HWY 314
SW HWY 314
HWY 314 SW
Main St NE
Main St NE
Main St NE
MILE 162
MILE 161
MILE 160
MILE 159
MILE 158
MILE 157
MILE 156
MILE 155
314
HWY 314 SW
HWY 314 SW
HWY 314 SW
47
Los Chaves
Tome-Adelino
HWY 314
HWY 314
N

BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
100 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
LOS CHAVEZ REACH
WITH PROJECT TSP 100 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014
Los Chaves
314
Tome-Adelino
MILE 156
MILE 155
MILE 154
MILE 153
MILE 152
MILE 151
MILE 150
MILE 149
HWY 314
Frontage Rd
47
N Main St
W Reinken Ave
E Reinken Ave
E River Rd
Belen
Los Trujillos-Gabaldon
548
309
304
S Main St
N



BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
100 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
BELEN REACH
WITH PROJECT TSP 100 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014
309
S Main St
314
47
MILE 149
MILE 148
HWY 304
MILE 147
304
116
MILE 146
Jarales
116
MILE 145
25
MILE 144
HWY 304
Casa Colorada
S HWY 116
MILE 143
MILE 142
25
N

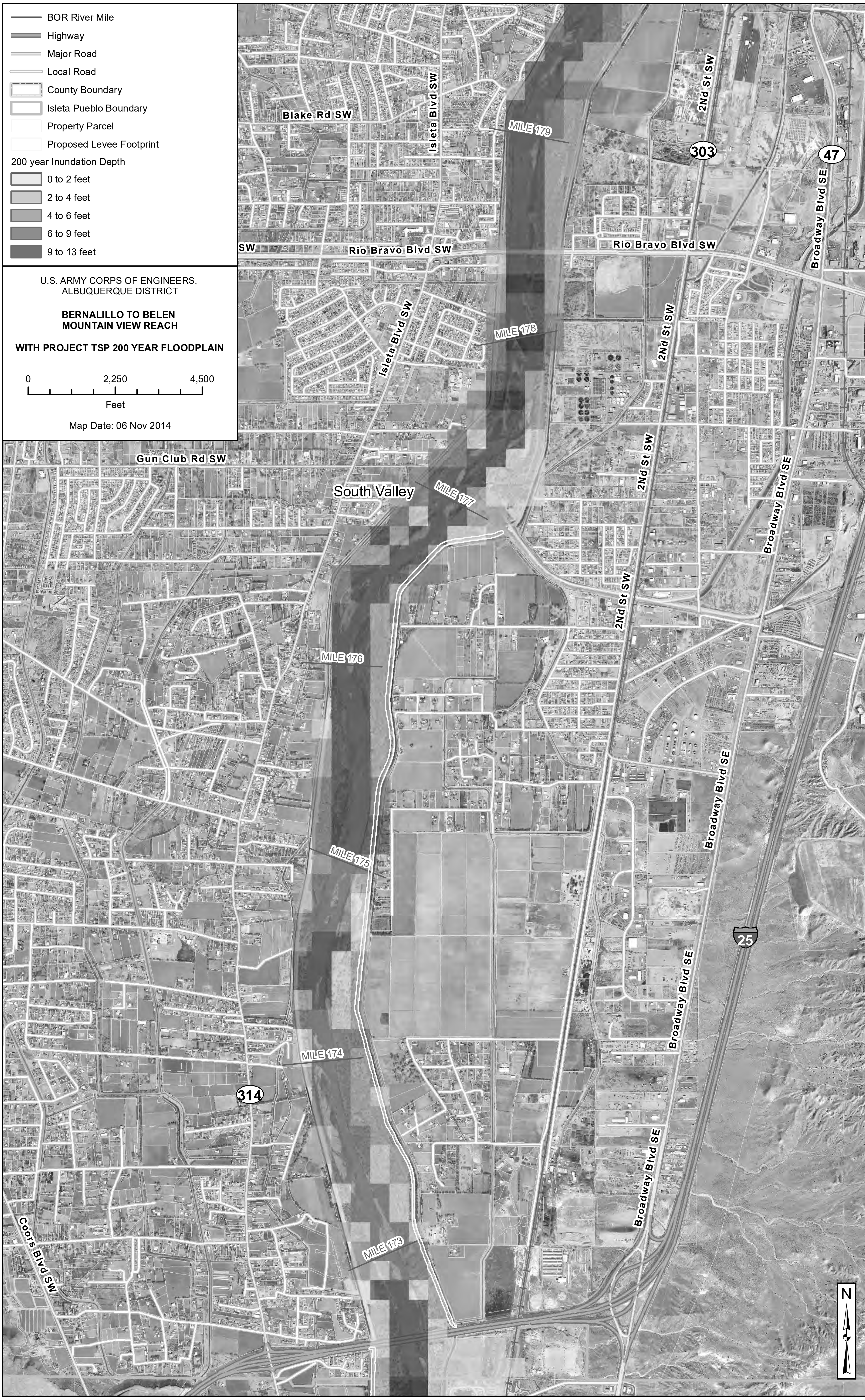


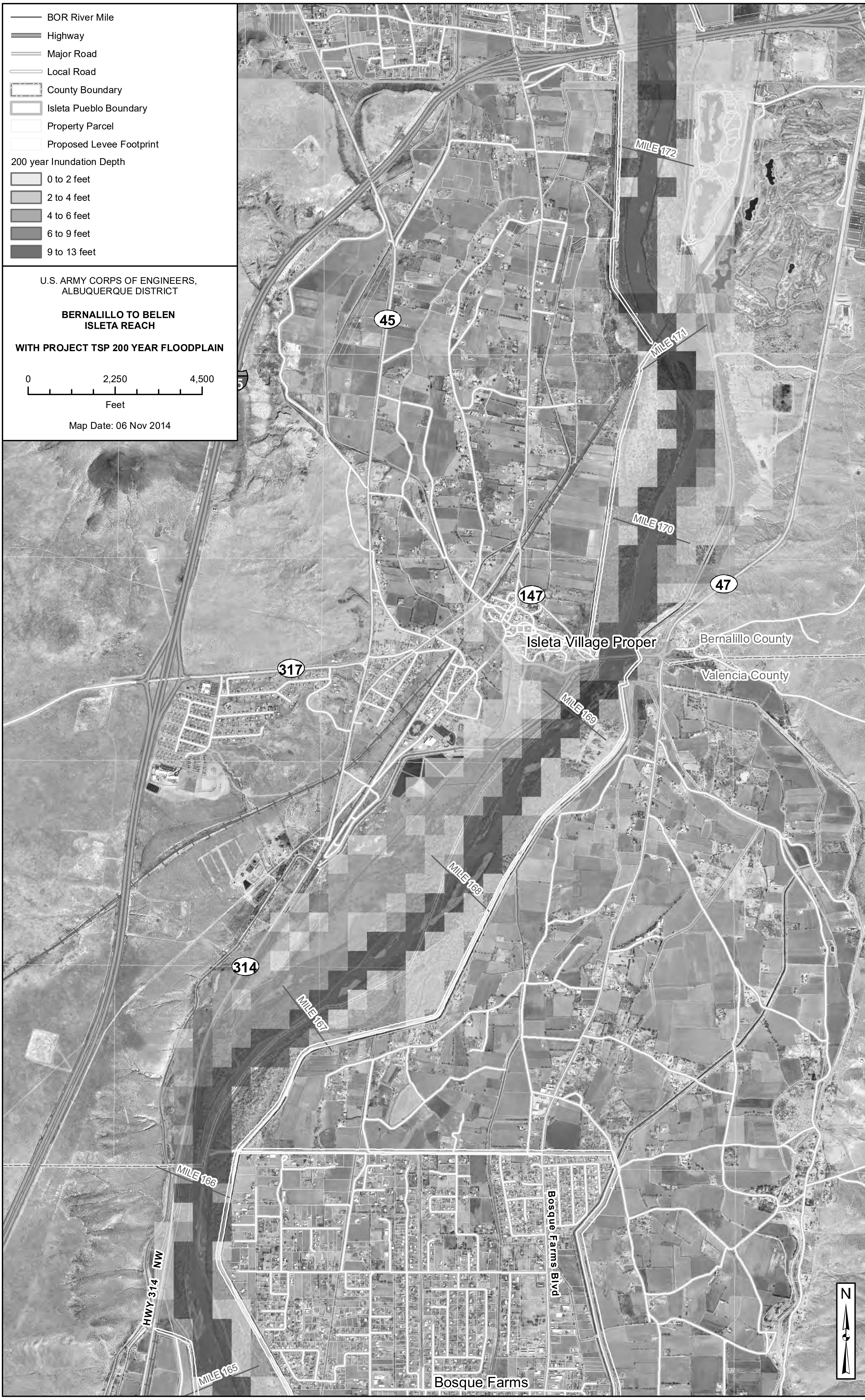
U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT

BERNALILLO TO BELEN PROPOSED LEVEE ALIGNMENTS

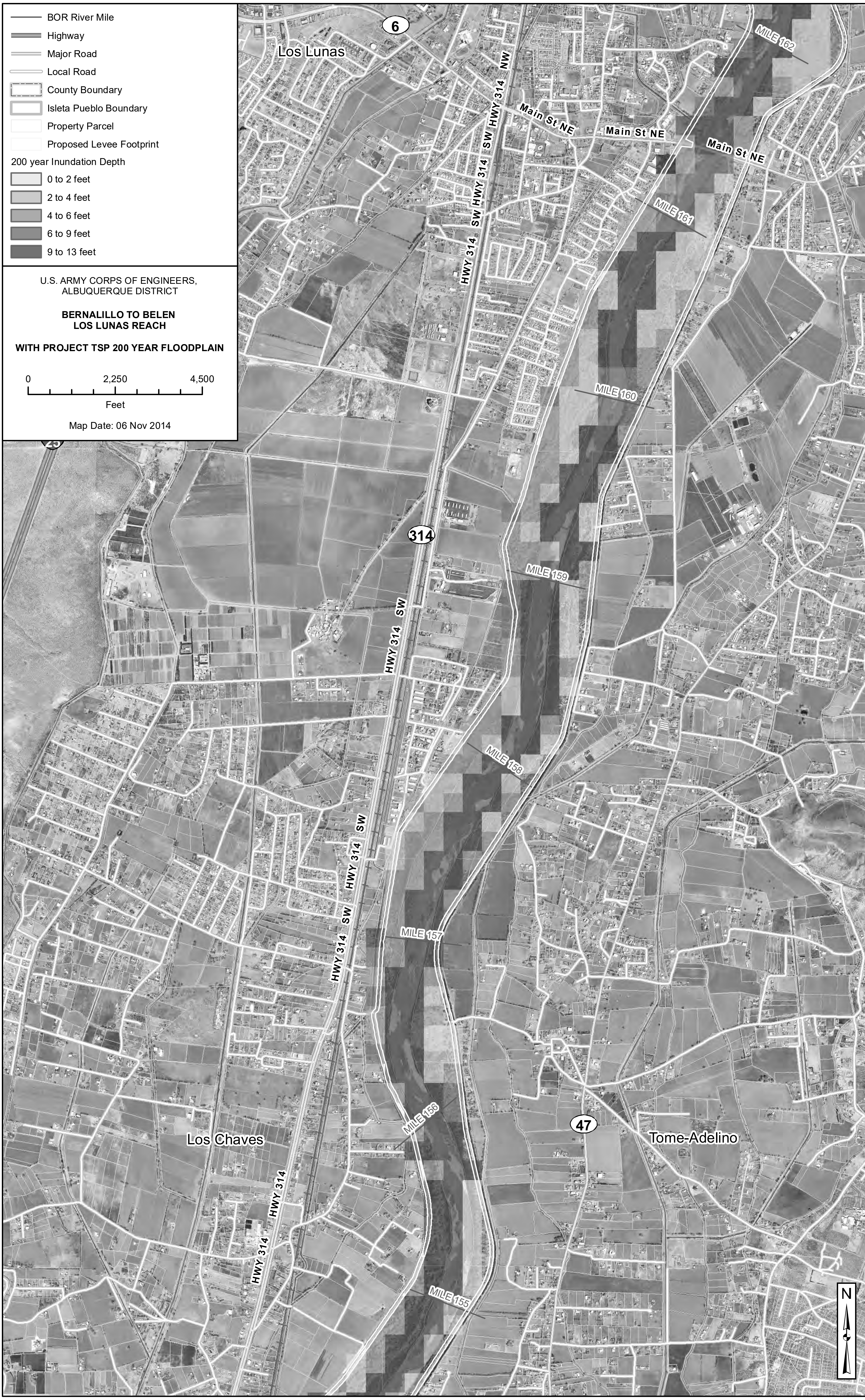
HYDRAULIC REACH INDEX

Map Date: 05 Nov 2014

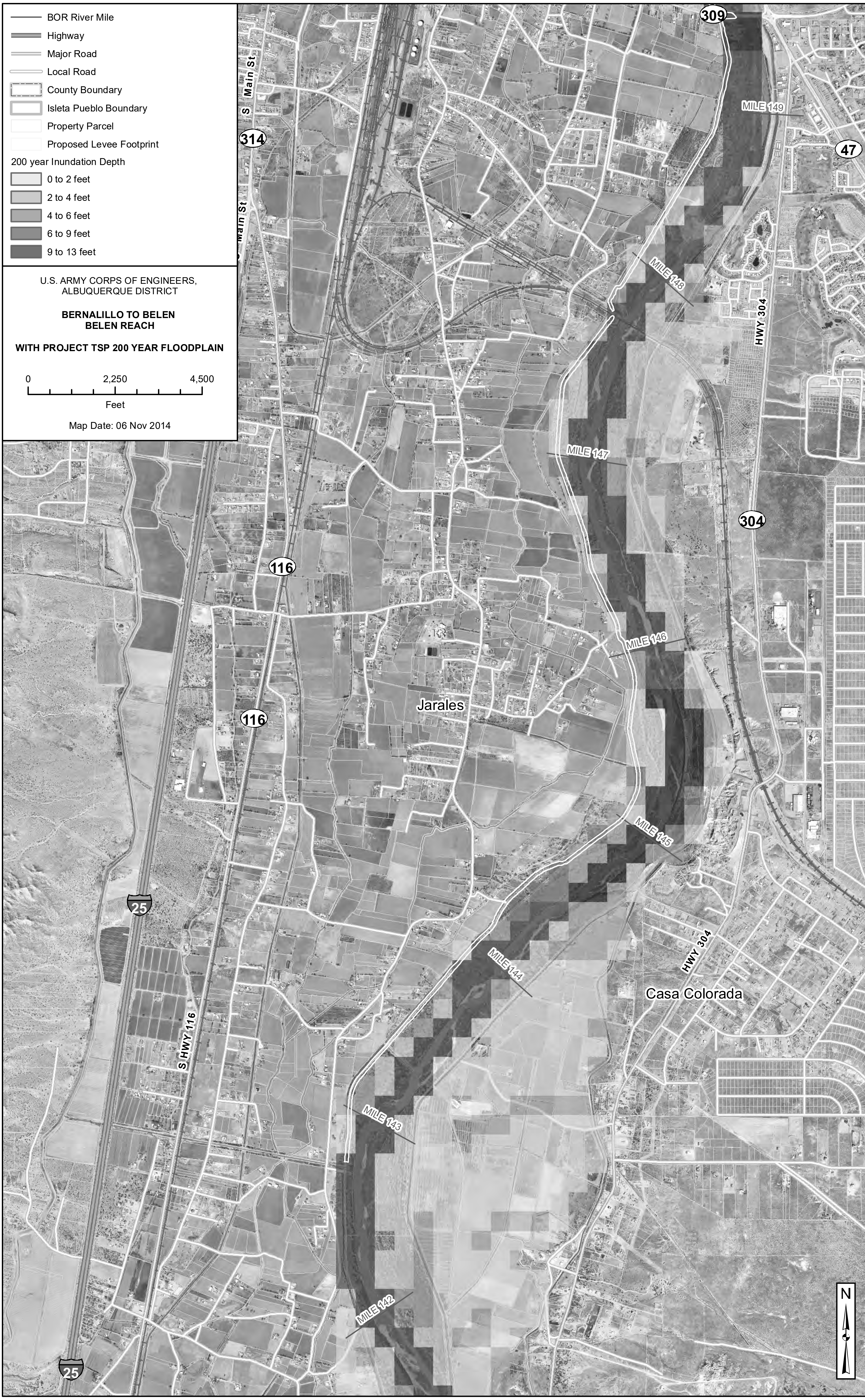

BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
200 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
MOUNTAIN VIEW REACH
WITH PROJECT TSP 200 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014
Blake Rd SW
Isleta Blvd SW
MILE 179
2Nd St SW
303
47
Rio Bravo Blvd SW
Broadway Blvd SE
MILE 178
Gun Club Rd SW
South Valley
MILE 177
MILE 176
MILE 175
25
MILE 174
314
MILE 173
Coors Blvd SW
N


BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
200 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
ISLETA REACH
WITH PROJECT TSP 200 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014
MILE 172
MILE 171
MILE 170
MILE 169
MILE 168
MILE 167
MILE 166
MILE 165
45
47
147
317
314
Isleta Village Proper
Bernalillo County
Valencia County
Bosque Farms Blvd
HWY 314 NW
Bosque Farms
N


Bosque Farms
Peralta
Valencia
Bosque Farms Blvd
HWY 314 NW
HWY 314 NW
HWY 314 SW
Main St NE
Main St NE
Main St NE
314
6
47
MILE 165
MILE 164
MILE 163
MILE 162
MILE 161
MILE 160
MILE 159
158
N
BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
200 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
BOSQUE FARMS REACH
WITH PROJECT TSP 200 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014


BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
200 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
LOS LUNAS REACH
WITH PROJECT TSP 200 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014
Los Lunas
6
HWY 314 NW
Main St NE
Main St NE
Main St NE
MILE 162
MILE 161
MILE 160
MILE 159
MILE 158
MILE 157
MILE 156
MILE 155
HWY 314 SW
314
47
Los Chaves
Tome-Adelino
HWY 314
N


BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
200 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
LOS CHAVEZ REACH
WITH PROJECT TSP 200 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014
Los Chaves
314
Tome-Adelino
MILE 156
MILE 155
MILE 154
MILE 153
MILE 152
MILE 151
MILE 150
MILE 149
HWY 314
Frontage Rd
47
N Main St
W Reinken Ave
E Reinken Ave
E River Rd
Belen
Los Trujillos-Gabaldon
548
309
304
S Main St
N


BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
200 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
BELEN REACH
WITH PROJECT TSP 200 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014
309
S Main St
314
47
MILE 149
MILE 148
MILE 147
MILE 146
MILE 145
MILE 144
MILE 143
MILE 142
HWY 304
304
116
Jarales
25
S HWY 116
Casa Colorada
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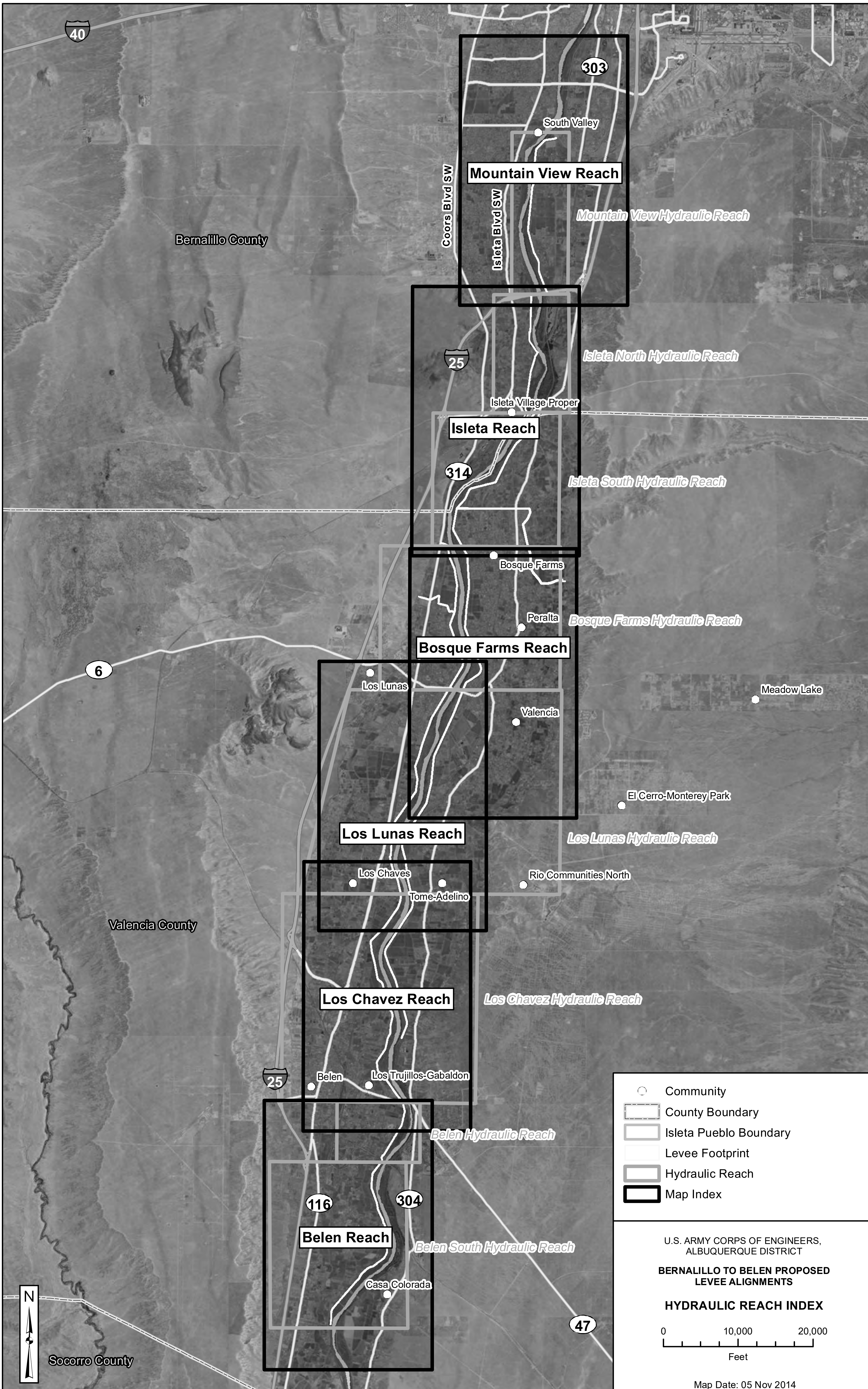
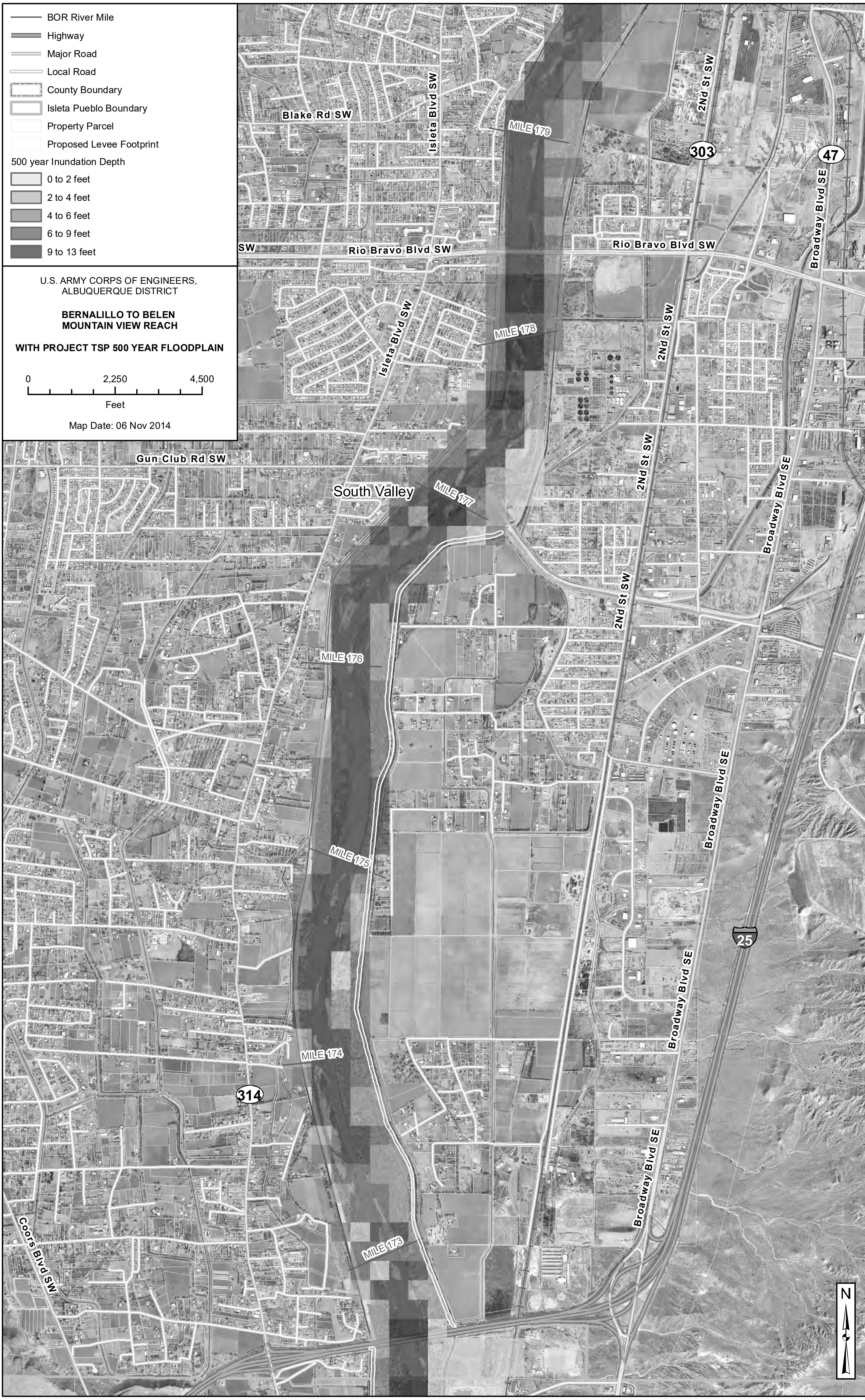


40
303
South Valley
Mountain View Reach
Coors Blvd SW
Isleta Blvd SW
Mountain View Hydraulic Reach
Bernalillo County
25
Isleta North Hydraulic Reach
Isleta Village Proper
Isleta Reach
314
Isleta South Hydraulic Reach
Bosque Farms
Peralta
Bosque Farms Hydraulic Reach
Bosque Farms Reach
6
Los Lunas
Meadow Lake
Valencia
El Cerro-Monterey Park
Los Lunas Reach
Los Lunas Hydraulic Reach
Los Chaves
Tome-Adelino
Rio Communities North
Valencia County
Los Chavez Reach
Los Chavez Hydraulic Reach
25
Belen
Los Trujillos-Gabaldon
Belen Hydraulic Reach
116
304
Belen Reach
Belen South Hydraulic Reach
Casa Colorada
47
N
Socorro County
Community
County Boundary
Isleta Pueblo Boundary
Levee Footprint
Hydraulic Reach
Map Index
U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN PROPOSED LEVEE ALIGNMENTS
HYDRAULIC REACH INDEX
0
10,000
20,000
Feet
Map Date: 05 Nov 2014


BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
500 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
MOUNTAIN VIEW REACH
WITH PROJECT TSP 500 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014
Blake Rd SW
Isleta Blvd SW
MILE 179
2Nd St SW
303
47
Broadway Blvd SE
Rio Bravo Blvd SW
MILE 178
Gun Club Rd SW
South Valley
MILE 177
MILE 176
MILE 175
25
MILE 174
314
Coors Blvd SW
MILE 173
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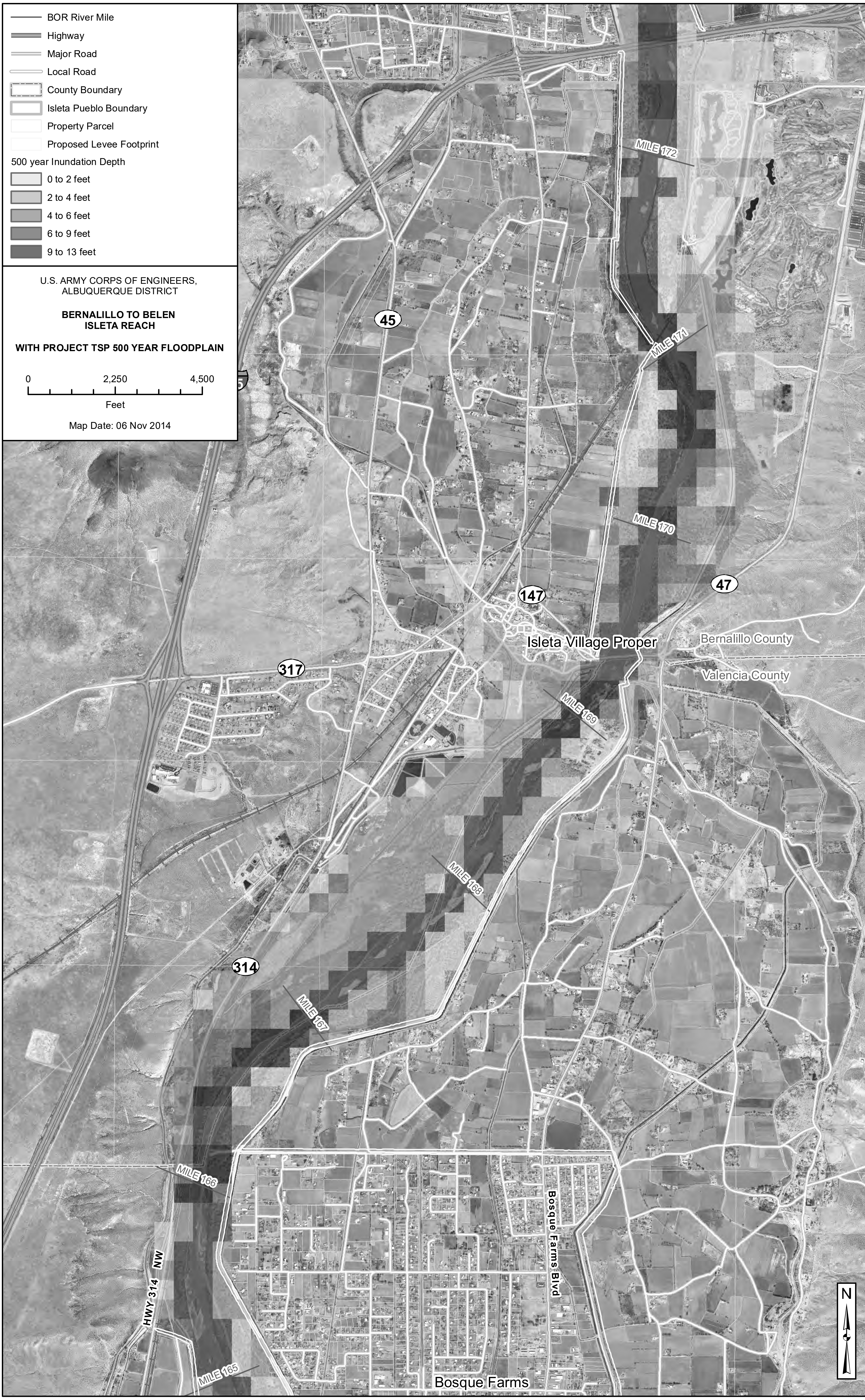
BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
500 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
ISLETA REACH
WITH PROJECT TSP 500 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014
MILE 172
MILE 171
MILE 170
MILE 169
MILE 168
MILE 167
MILE 166
MILE 165
45
147
47
317
314
Isleta Village Proper
Bernalillo County
Valencia County
Bosque Farms Blvd
HWY 314 NW
Bosque Farms
N


Bosque Farms
Peralta
Valencia
Bosque Farms Blvd
HWY 314 NW
HWY 314 SW
Main St NE
314
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MILE 165
MILE 164
MILE 163
MILE 162
MILE 161
MILE 160
MILE 159
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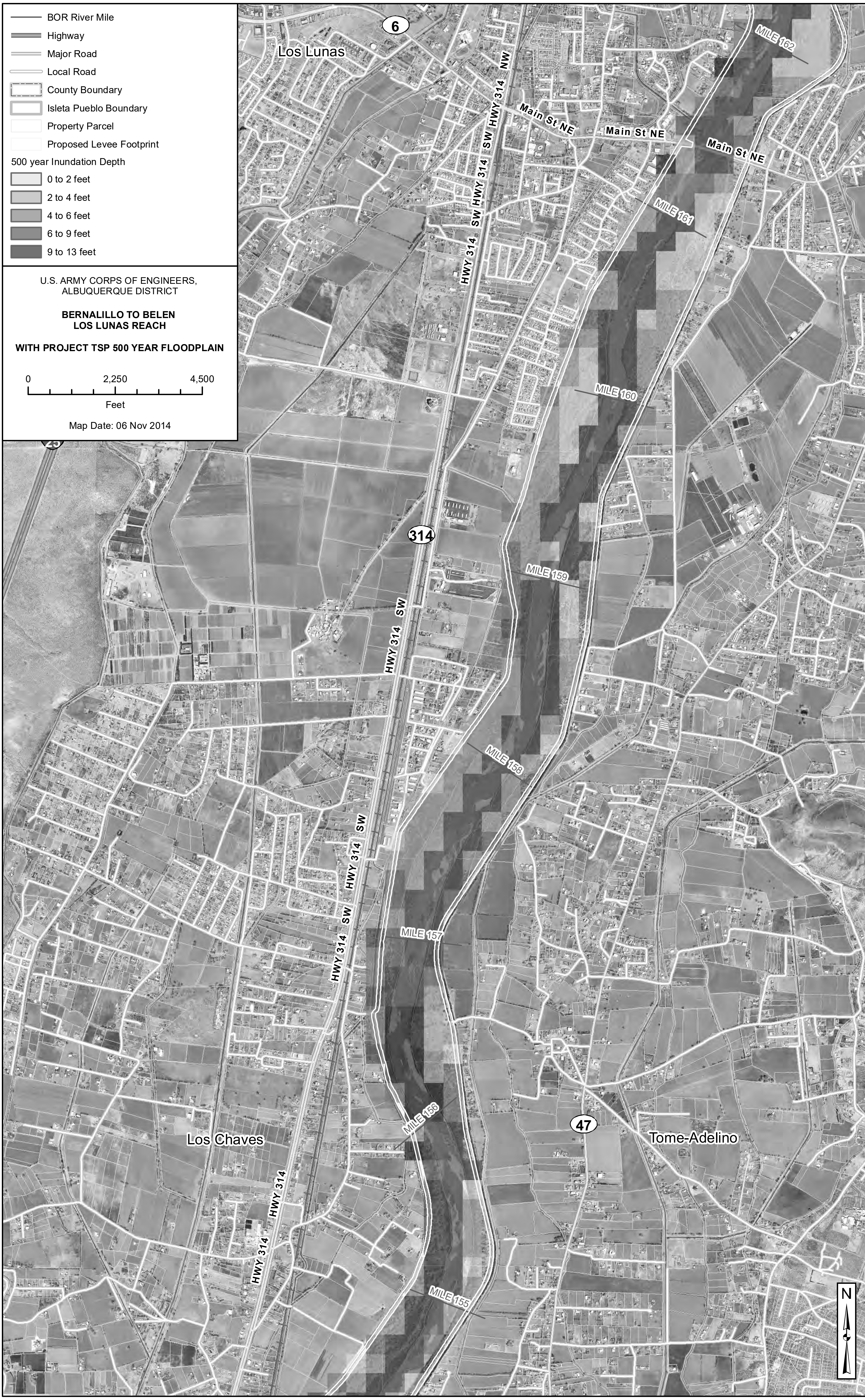
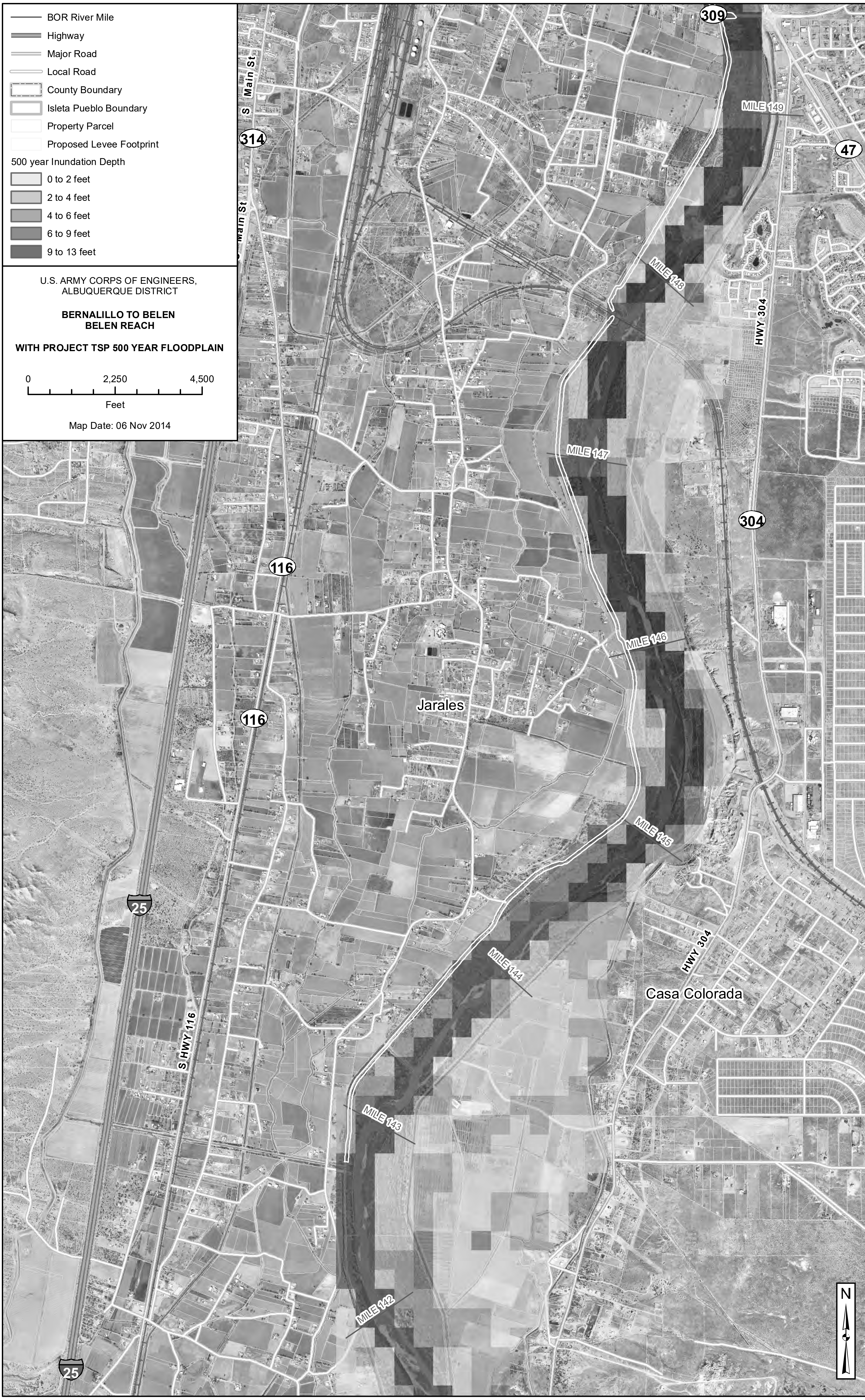
BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
500 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
BOSQUE FARMS REACH
WITH PROJECT TSP 500 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014


BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
500 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
LOS LUNAS REACH
WITH PROJECT TSP 500 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014
Los Lunas
6
Main St NE
HWY 314 SW
HWY 314 NW
MILE 162
MILE 161
MILE 160
MILE 159
MILE 158
MILE 157
MILE 156
MILE 155
314
47
Los Chaves
Tome-Adelino
N

BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
500 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
LOS CHAVEZ REACH
WITH PROJECT TSP 500 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014
Los Chaves
314
Tome-Adelino
MILE 156
HWY 314
MILE 155
HWY 314
HWY 314
MILE 154
MILE 153
47
Frontage Rd
HWY 314
MILE 152
MILE 151
N Main St
W Reinken Ave
E Reinken Ave
Belen
Los Trujillos-Gabaldon
MILE 150
E River Rd
548
309
304
MILE 149
S Main St
N



BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
500 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
BELEN REACH
WITH PROJECT TSP 500 YEAR FLOODPLAIN
0
2,250
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Feet
Map Date: 06 Nov 2014
309
314
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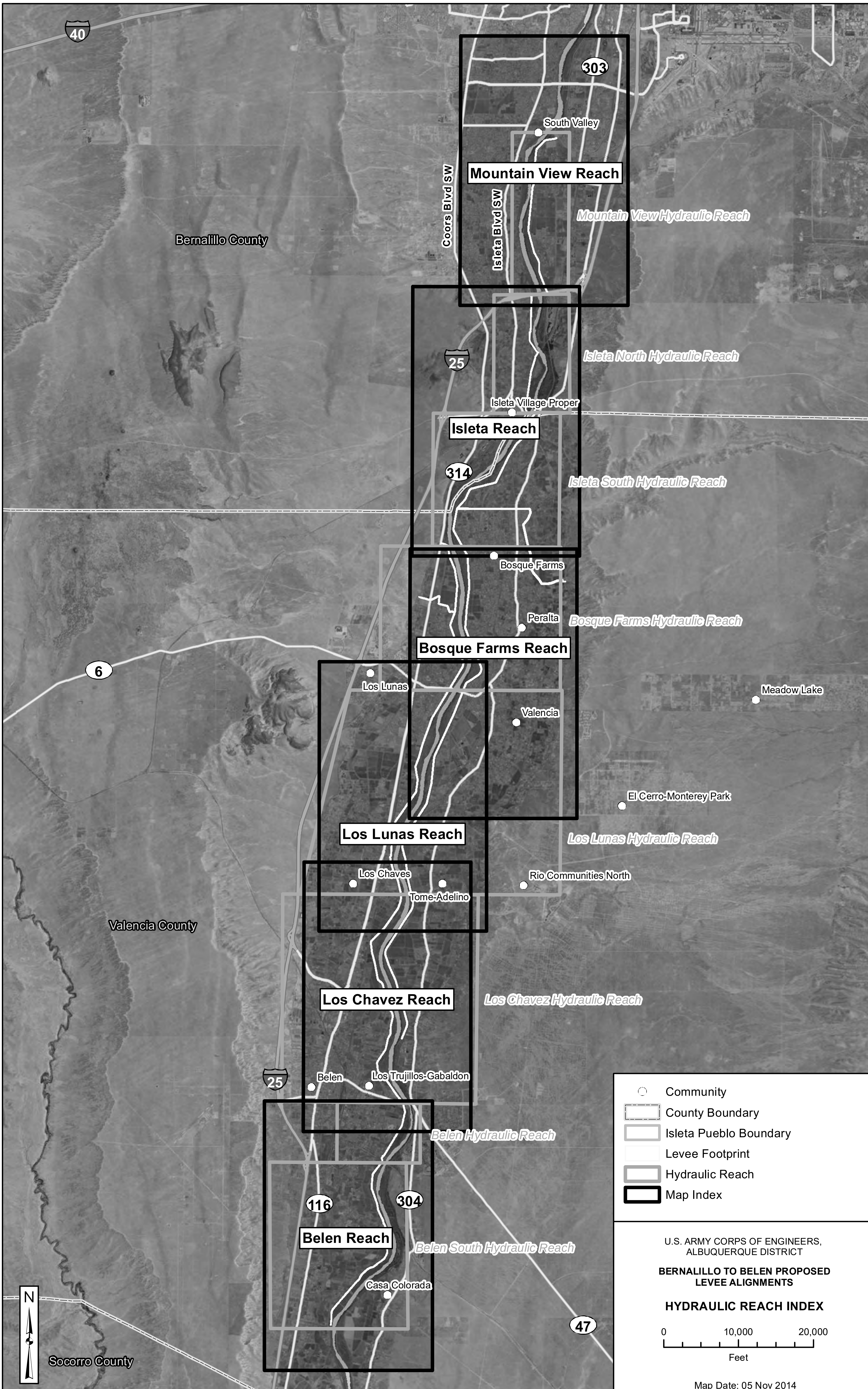
S Main St
MILE 149
47
MILE 148
HWY 304
MILE 147
304
116
MILE 146
Jarales
116
MILE 145
25
HWY 304
MILE 144
Casa Colorada
S HWY 116
MILE 143
MILE 142
25
N

Attachment 9—FLO-2D Residual Inundation maps with project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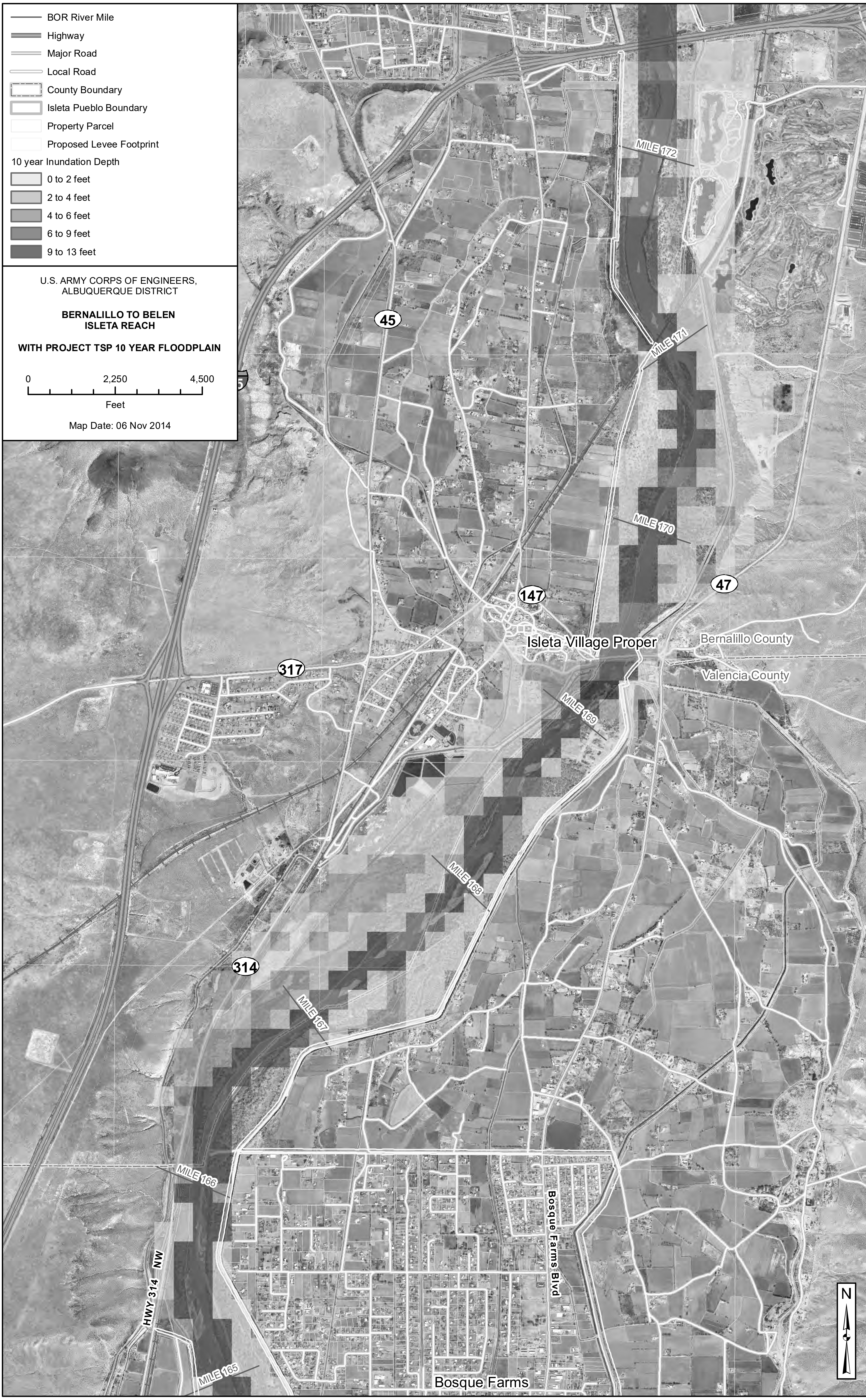
303
South Valley
Mountain View Reach
Coors Blvd SW
Isleta Blvd SW
Mountain View Hydraulic Reach
Bernalillo County
25
Isleta North Hydraulic Reach
Isleta Village Proper
Isleta Reach
314
Isleta South Hydraulic Reach
Bosque Farms
Peralta
Bosque Farms Hydraulic Reach
Bosque Farms Reach
6
Los Lunas
Meadow Lake
Valencia
El Cerro-Monterey Park
Los Lunas Reach
Los Lunas Hydraulic Reach
Los Chaves
Tome-Adelino
Rio Communities North
Valencia County
Los Chavez Reach
Los Chavez Hydraulic Reach
25
Belen
Los Trujillos-Gabaldon
Belen Hydraulic Reach
116
304
Belen Reach
Belen South Hydraulic Reach
Casa Colorada
47
N
Socorro County
Community
County Boundary
Isleta Pueblo Boundary
Levee Footprint
Hydraulic Reach
Map Index
U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN PROPOSED
LEVEE ALIGNMENTS
HYDRAULIC REACH INDEX
0
10,000
20,000
Feet
Map Date: 05 Nov 2014

BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
10 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
MOUNTAIN VIEW REACH
WITH PROJECT TSP 10 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014
Blake Rd SW
Isleta Blvd SW
MILE 179
303
47
2Nd St SW
Rio Bravo Blvd SW
Broadway Blvd SE
MILE 178
Gun Club Rd SW
South Valley
MILE 177
MILE 176
MILE 175
25
MILE 174
314
MILE 173
Coors Blvd SW
N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County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
10 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
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U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
ISLETA REACH
WITH PROJECT TSP 10 YEAR FLOODPLAIN
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2,250
4,500
Feet
Map Date: 06 Nov 2014
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MILE 170
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MILE 168
MILE 167
MILE 166
MILE 165
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47
147
317
314
Isleta Village Proper
Bernalillo County
Valencia County
HWY 314 NW
Bosque Farms Blvd
Bosque Farms
N


Bosque Farms
Peralta
Valencia
Bosque Farms Blvd
HWY 314 NW
HWY 314 NW
HWY 314 SW
Main St NE
Main St NE
Main St NE
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MILE 165
MILE 164
MILE 163
MILE 162
MILE 161
MILE 160
MILE 159
158
N
BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
10 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
BOSQUE FARMS REACH
WITH PROJECT TSP 10 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014

Los Lunas
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Main St NE
Main St NE
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HWY 314 SW
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314
HWY 314 SW
HWY 314 SW
HWY 314 SW
47
Los Chaves
HWY 314
HWY 314
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BOR River Mile
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County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
10 year Inundation Depth
0 to 2 feet
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4 to 6 feet
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U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
LOS LUNAS REACH
WITH PROJECT TSP 10 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014

BOR River Mile
Highway
Major Road
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County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
10 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
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U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
LOS CHAVEZ REACH
WITH PROJECT TSP 10 YEAR FLOODPLAIN
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4,500
Feet
Map Date: 06 Nov 2014
Los Chaves
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Tome-Adelino
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MILE 155
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MILE 150
MILE 149
HWY 314
Frontage Rd
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W Reinken Ave
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Los Trujillos-Gabaldon
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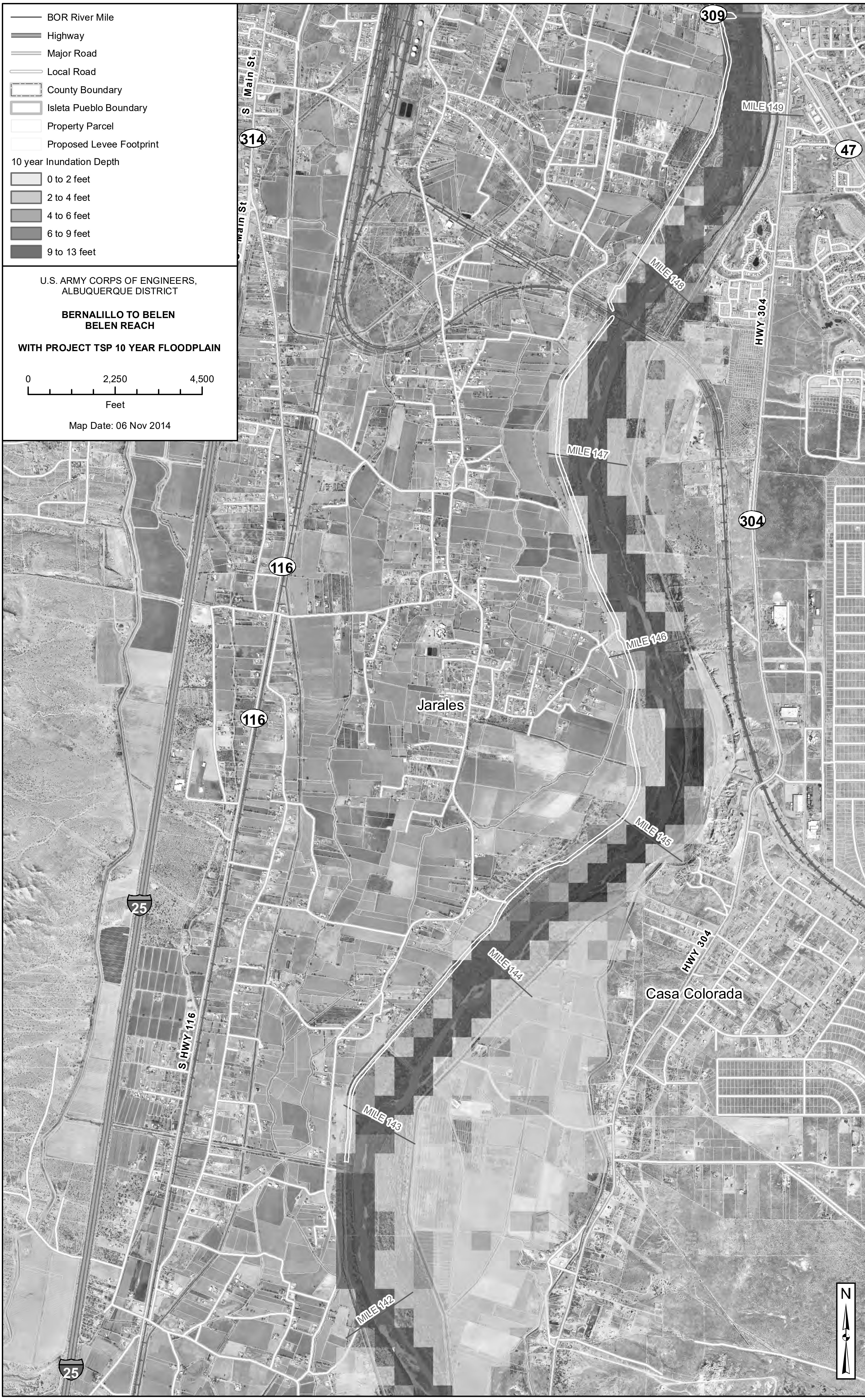
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County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
10 year Inundation Depth
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4 to 6 feet
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U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
BELEN REACH
WITH PROJECT TSP 10 YEAR FLOODPLAIN
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Map Date: 06 Nov 2014
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MILE 148
HWY 304
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Jarales
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Casa Colorada
S HWY 116
MILE 143
MILE 142
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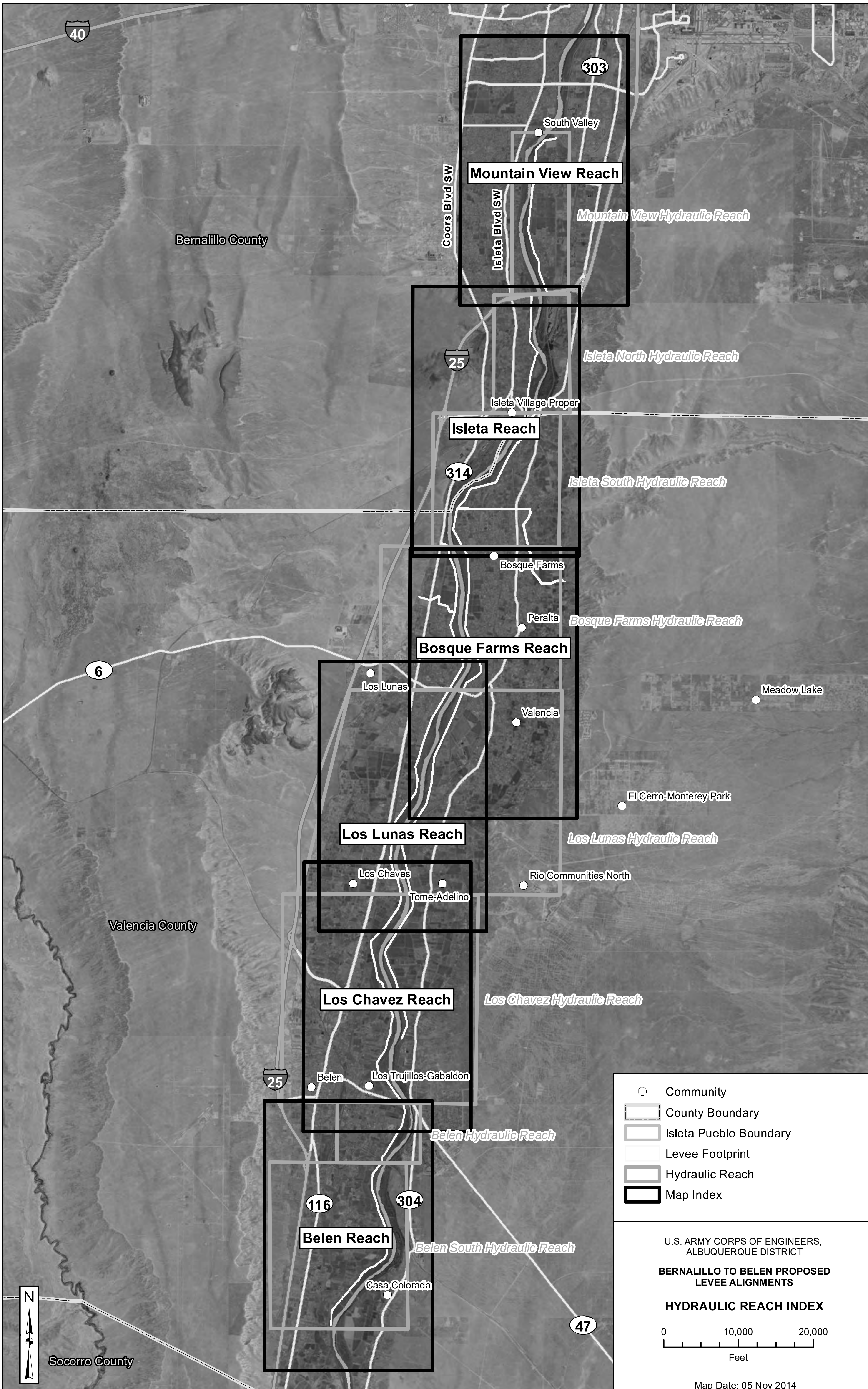
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South Valley
Mountain View Reach
Coors Blvd SW
Isleta Blvd SW
Mountain View Hydraulic Reach
Bernalillo County
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Isleta North Hydraulic Reach
Isleta Village Proper
Isleta Reach
314
Isleta South Hydraulic Reach
Bosque Farms
Peralta
Bosque Farms Hydraulic Reach
Bosque Farms Reach
6
Los Lunas
Meadow Lake
Valencia
El Cerro-Monterey Park
Los Lunas Reach
Los Lunas Hydraulic Reach
Los Chaves
Tome-Adelino
Rio Communities North
Valencia County
Los Chavez Reach
Los Chavez Hydraulic Reach
Belen
Los Trujillos-Gabaldon
Belen Hydraulic Reach
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Belen Reach
Belen South Hydraulic Reach
Casa Colorada
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Socorro County
Community
County Boundary
Isleta Pueblo Boundary
Levee Footprint
Hydraulic Reach
Map Index
U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN PROPOSED LEVEE ALIGNMENTS
HYDRAULIC REACH INDEX
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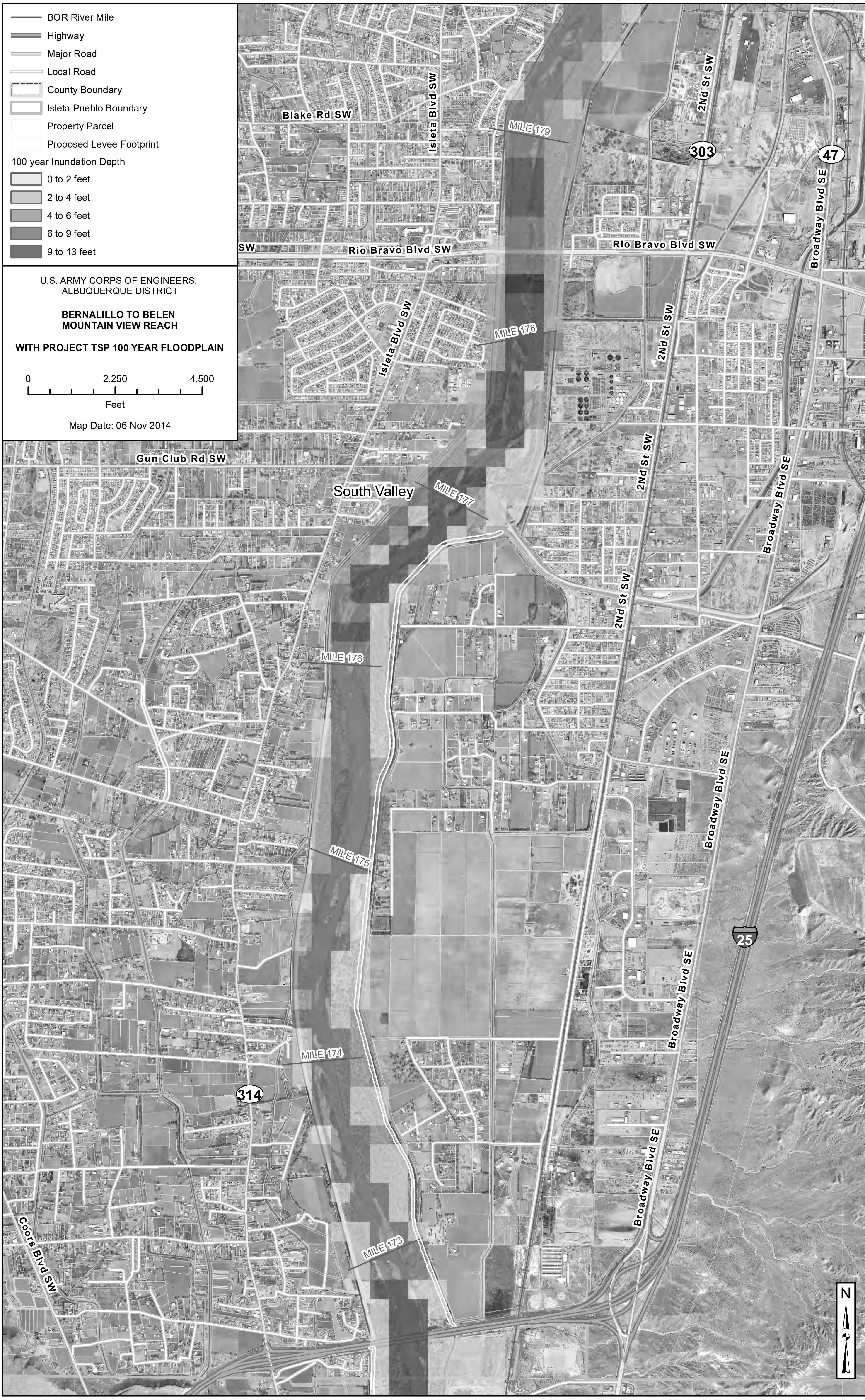
20,000
Feet
Map Date: 05 Nov 2014



BOR River Mile
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County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
100 year Inundation Depth
0 to 2 feet
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4 to 6 feet
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U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
MOUNTAIN VIEW REACH
WITH PROJECT TSP 100 YEAR FLOODPLAIN
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Feet
Map Date: 06 Nov 2014
Blake Rd SW
Isleta Blvd SW
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Broadway Blvd SE
Rio Bravo Blvd SW
Rio Bravo Blvd SW
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2Nd St SW
Gun Club Rd SW
South Valley
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MILE 173
Coors Blvd SW
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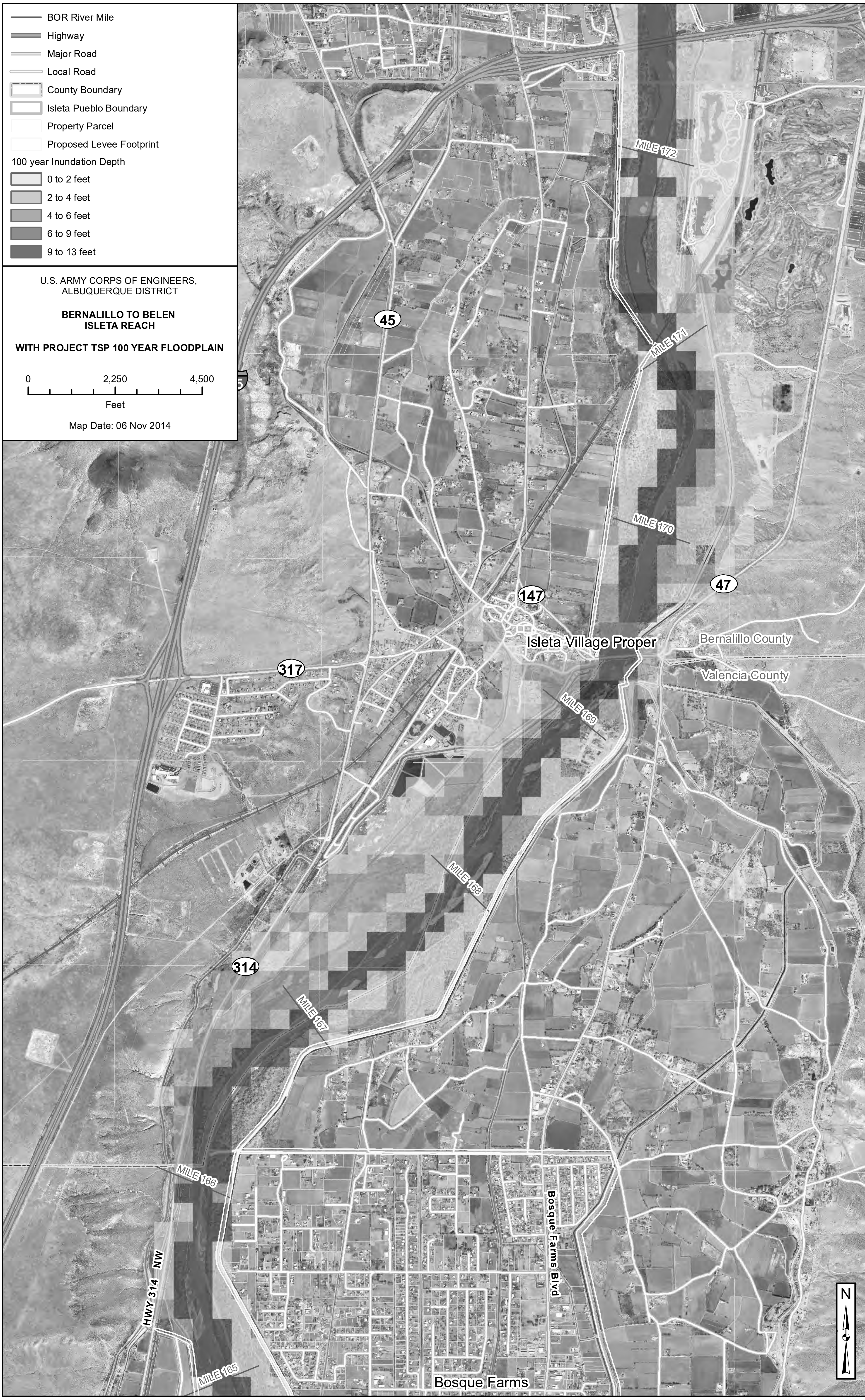

BOR River Mile
Highway
Major Road
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County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
100 year Inundation Depth
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6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
ISLETA REACH
WITH PROJECT TSP 100 YEAR FLOODPLAIN
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2,250
4,500
Feet
Map Date: 06 Nov 2014
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Isleta Village Proper
Bernalillo County
Valencia County
Bosque Farms Blvd
HWY 314 NW
Bosque Farms
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Bosque Farms
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Valencia
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HWY 314 SW
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BOR River Mile
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County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
100 year Inundation Depth
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U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
BOSQUE FARMS REACH
WITH PROJECT TSP 100 YEAR FLOODPLAIN
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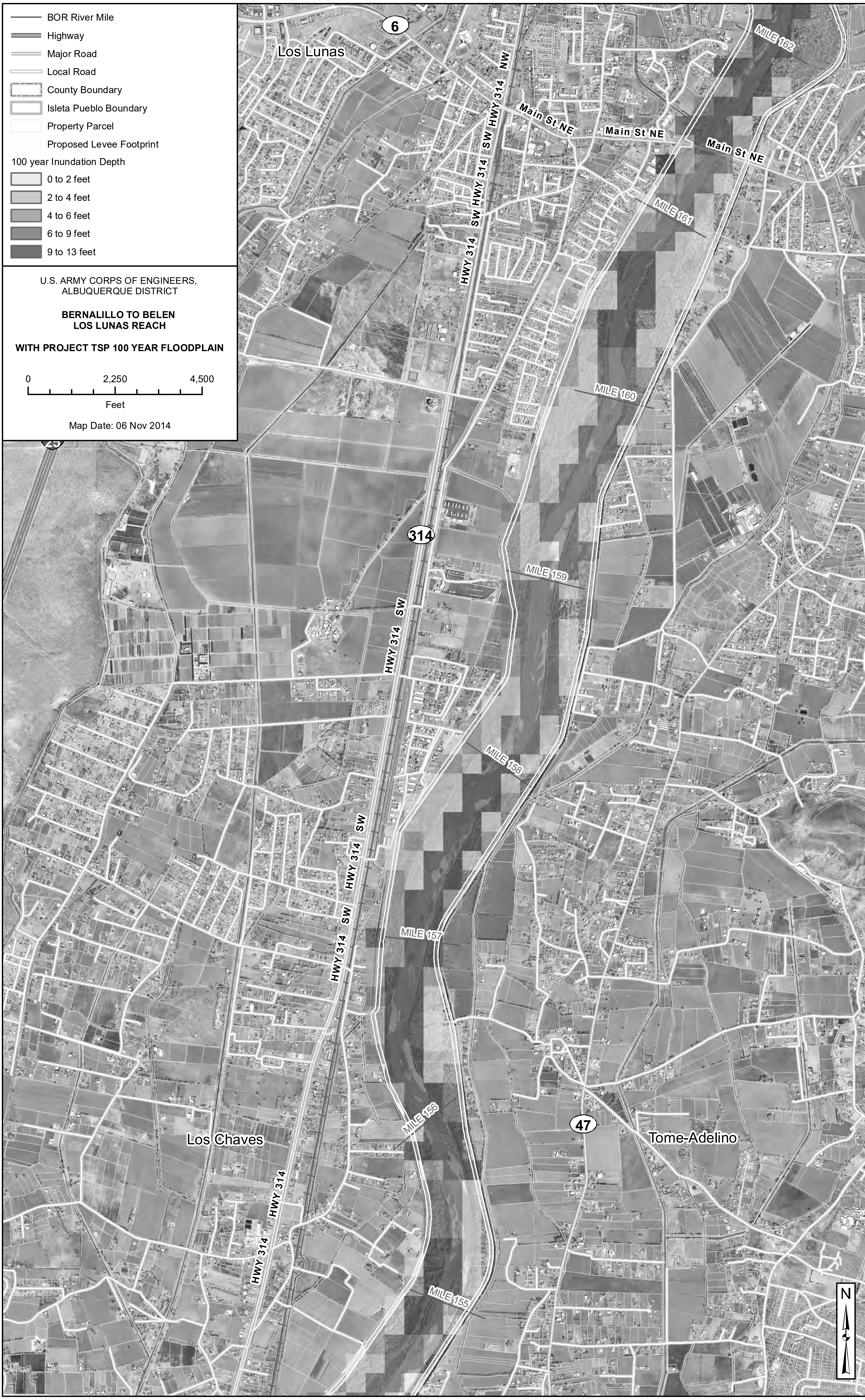
Feet
Map Date: 06 Nov 2014


BOR River Mile
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Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
100 year Inundation Depth
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U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
LOS LUNAS REACH
WITH PROJECT TSP 100 YEAR FLOODPLAIN
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Feet
Map Date: 06 Nov 2014
Los Lunas
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MILE 157
MILE 156
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Los Chaves
HWY 314
47
Tome-Adelino
N

BOR River Mile
Highway
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County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
100 year Inundation Depth
0 to 2 feet
2 to 4 feet
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U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
LOS CHAVEZ REACH
WITH PROJECT TSP 100 YEAR FLOODPLAIN
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Feet
Map Date: 06 Nov 2014
Los Chaves
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Tome-Adelino
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Belen
Los Trujillos-Gabaldon
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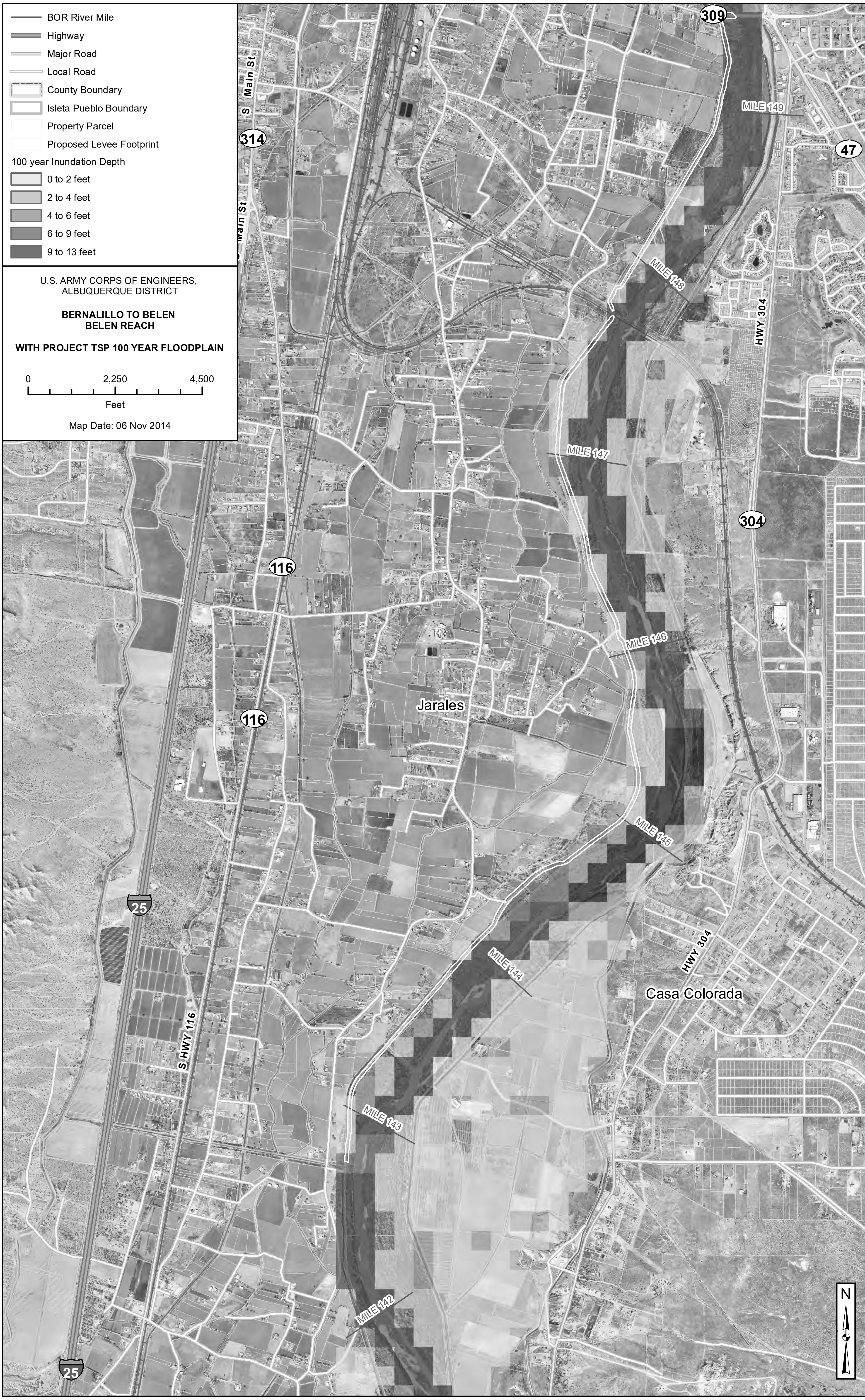

BOR River Mile
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County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
100 year Inundation Depth
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2 to 4 feet
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U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
BELEN REACH
WITH PROJECT TSP 100 YEAR FLOODPLAIN
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Map Date: 06 Nov 2014
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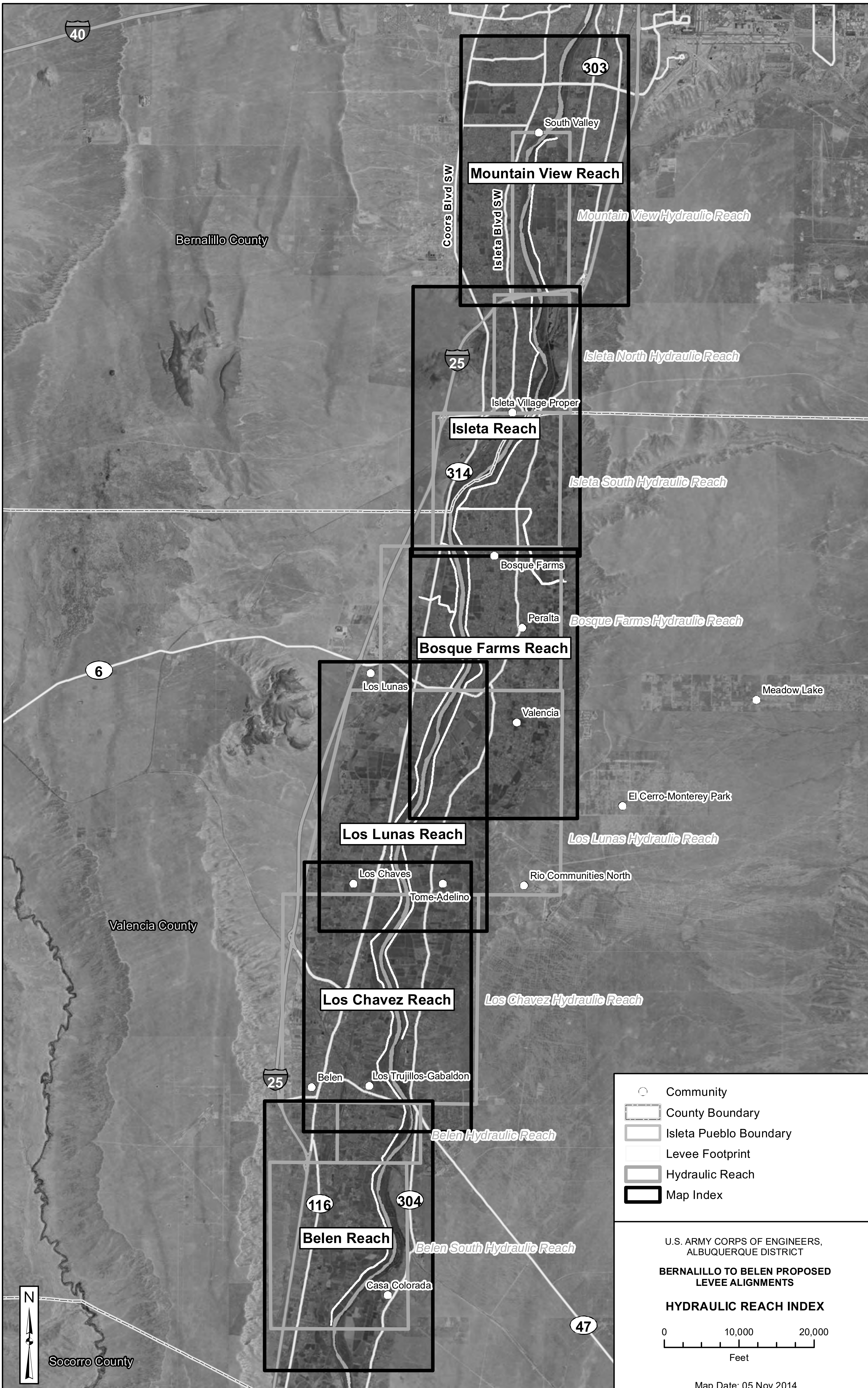


Community

County Boundary

Isleta Pueblo Boundary

Levee Footprint

Hydraulic Reach

Map Index

U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT

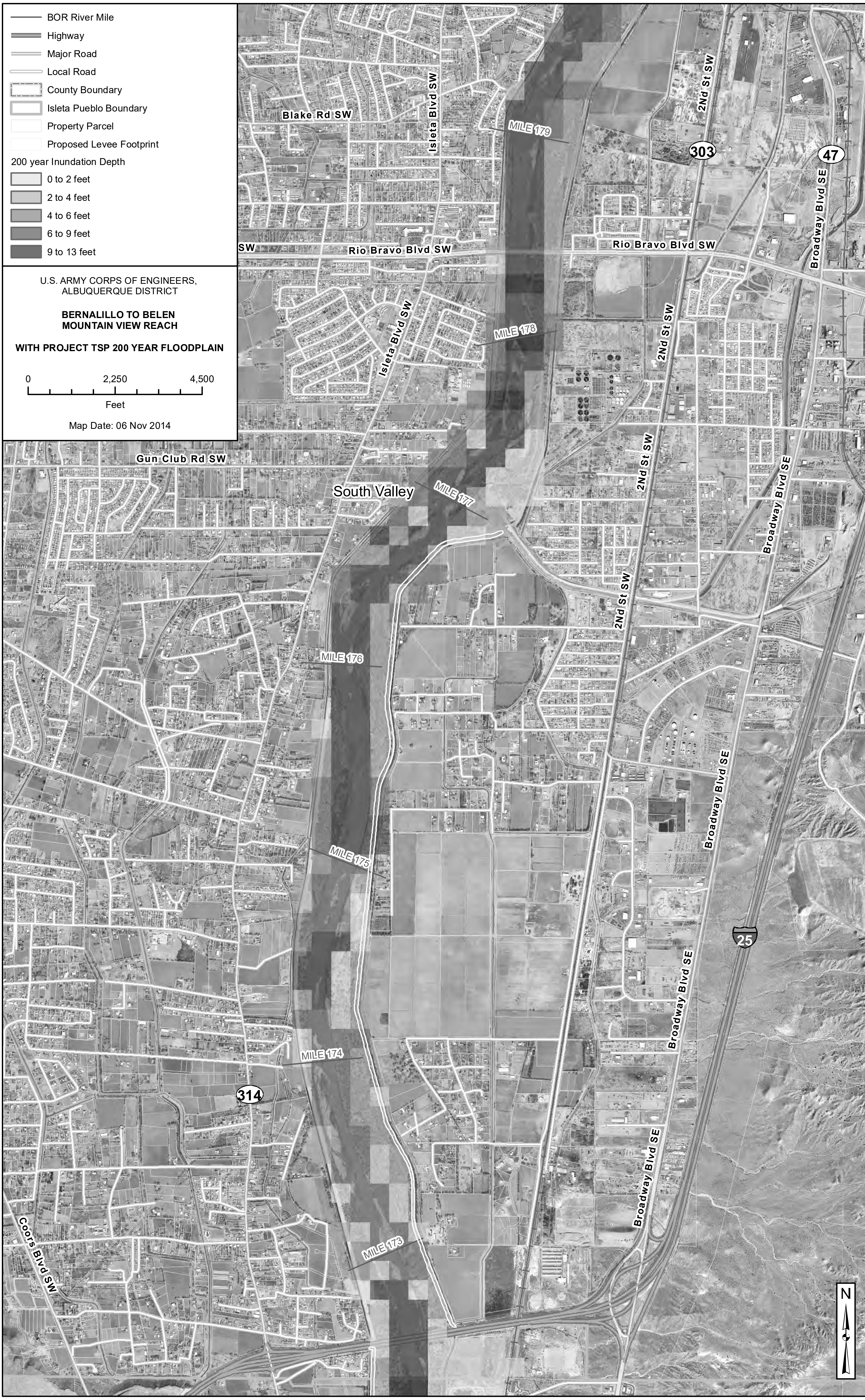
BERNALILLO TO BELEN PROPOSED LEVEE ALIGNMENTS

HYDRAULIC REACH INDEX

0 10,000 20,000

Feet

Map Date: 05 Nov 2014



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Highway
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County Boundary
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Property Parcel
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200 year Inundation Depth
0 to 2 feet
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U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
MOUNTAIN VIEW REACH
WITH PROJECT TSP 200 YEAR FLOODPLAIN
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Feet
Map Date: 06 Nov 2014
Blake Rd SW
Isleta Blvd SW
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2Nd St SW
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Rio Bravo Blvd SW
Broadway Blvd SE
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Gun Club Rd SW
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MILE 173
Coors Blvd SW
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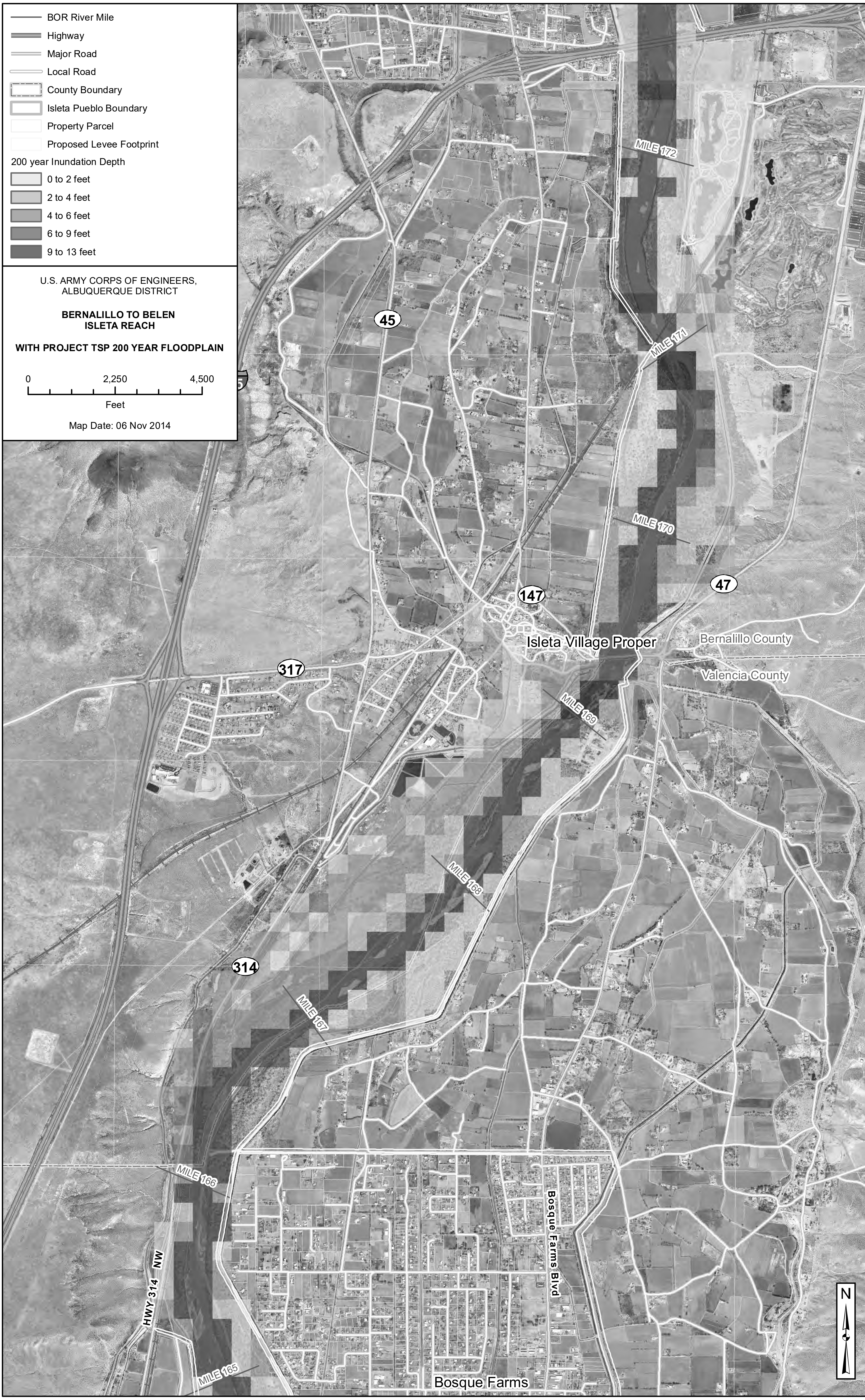

BOR River Mile
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County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
200 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
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9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN ISLETA REACH
WITH PROJECT TSP 200 YEAR FLOODPLAIN
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4,500
Feet
Map Date: 06 Nov 2014
MILE 172
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MILE 168
MILE 167
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314
Isleta Village Proper
Bernalillo County
Valencia County
Bosque Farms Blvd
HWY 314 NW
Bosque Farms
N

U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT

BERNALILLO TO BELEN
BOSQUE FARMS REACH

WITH PROJECT TSP 200 YEAR FLOODPLAIN

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Feet

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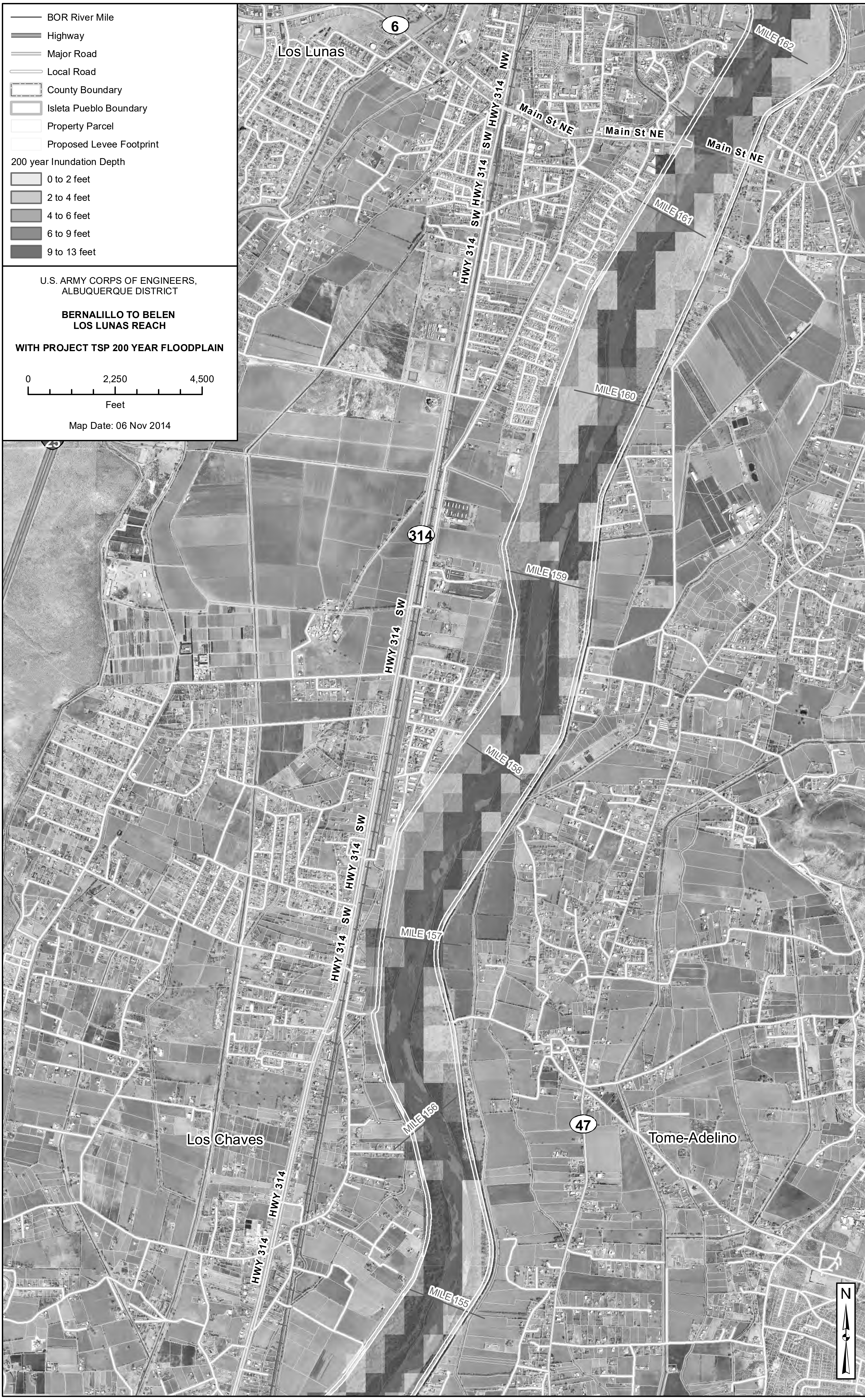
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U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
LOS LUNAS REACH
WITH PROJECT TSP 200 YEAR FLOODPLAIN
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Feet
Map Date: 06 Nov 2014
Los Lunas
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HWY 314 SW
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MILE 160
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MILE 157
MILE 156
MILE 155
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HWY 314 SW
HWY 314 SW
HWY 314 SW
47
Los Chaves
Tome-Adelino
HWY 314
HWY 314
N


BOR River Mile
Highway
Major Road
Local Road
County Boundary
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Property Parcel
Proposed Levee Footprint
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U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
LOS CHAVEZ REACH
WITH PROJECT TSP 200 YEAR FLOODPLAIN
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Map Date: 06 Nov 2014
Los Chaves
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Los Trujillos-Gabaldon
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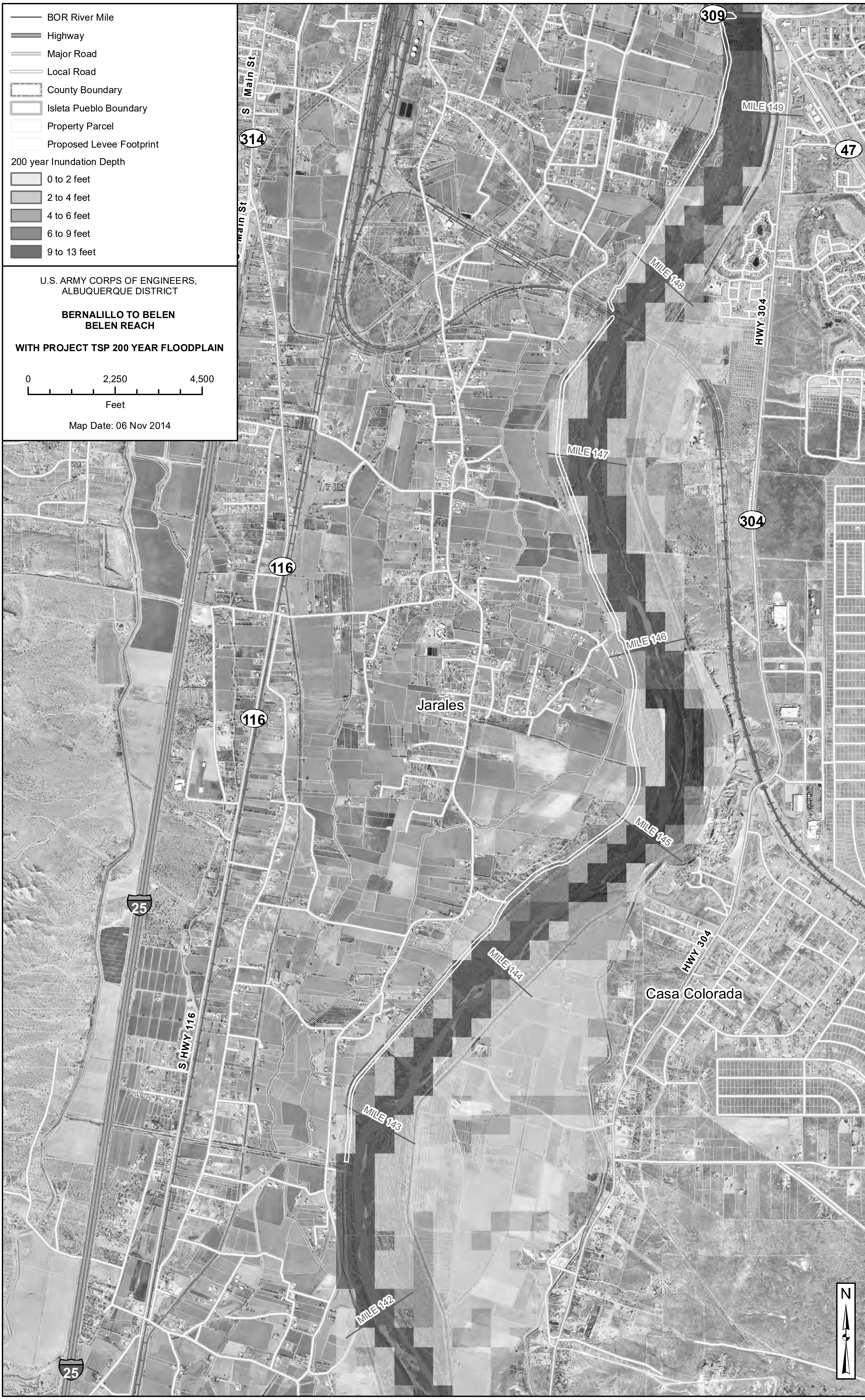
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County Boundary
Isleta Pueblo Boundary
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2 to 4 feet
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BERNALILLO TO BELEN
BELEN REACH
WITH PROJECT TSP 200 YEAR FLOODPLAIN
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Feet
Map Date: 06 Nov 2014
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MILE 148
MILE 147
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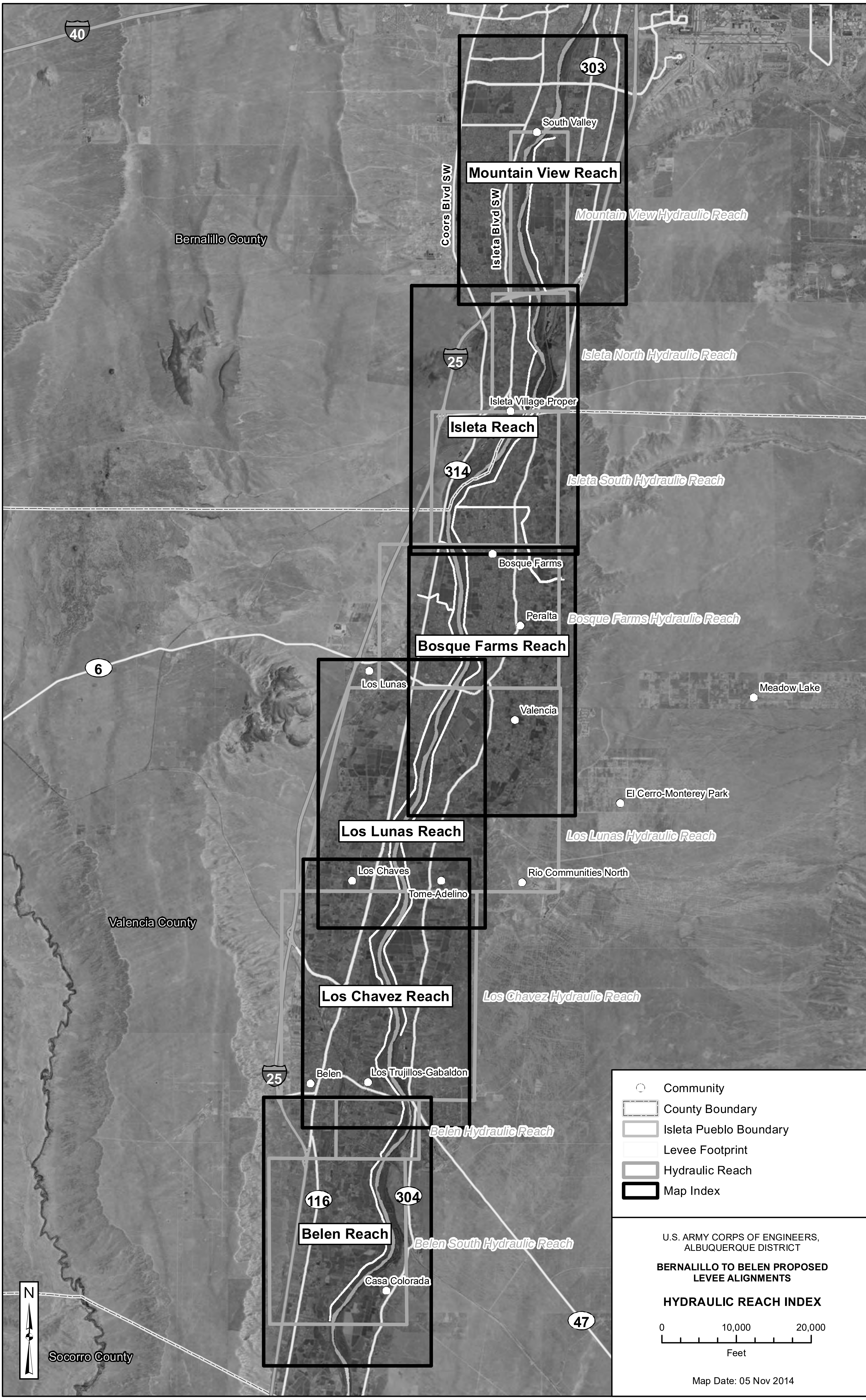
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314
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Bosque Farms
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6
Los Lunas
Meadow Lake
Valencia
El Cerro-Monterey Park
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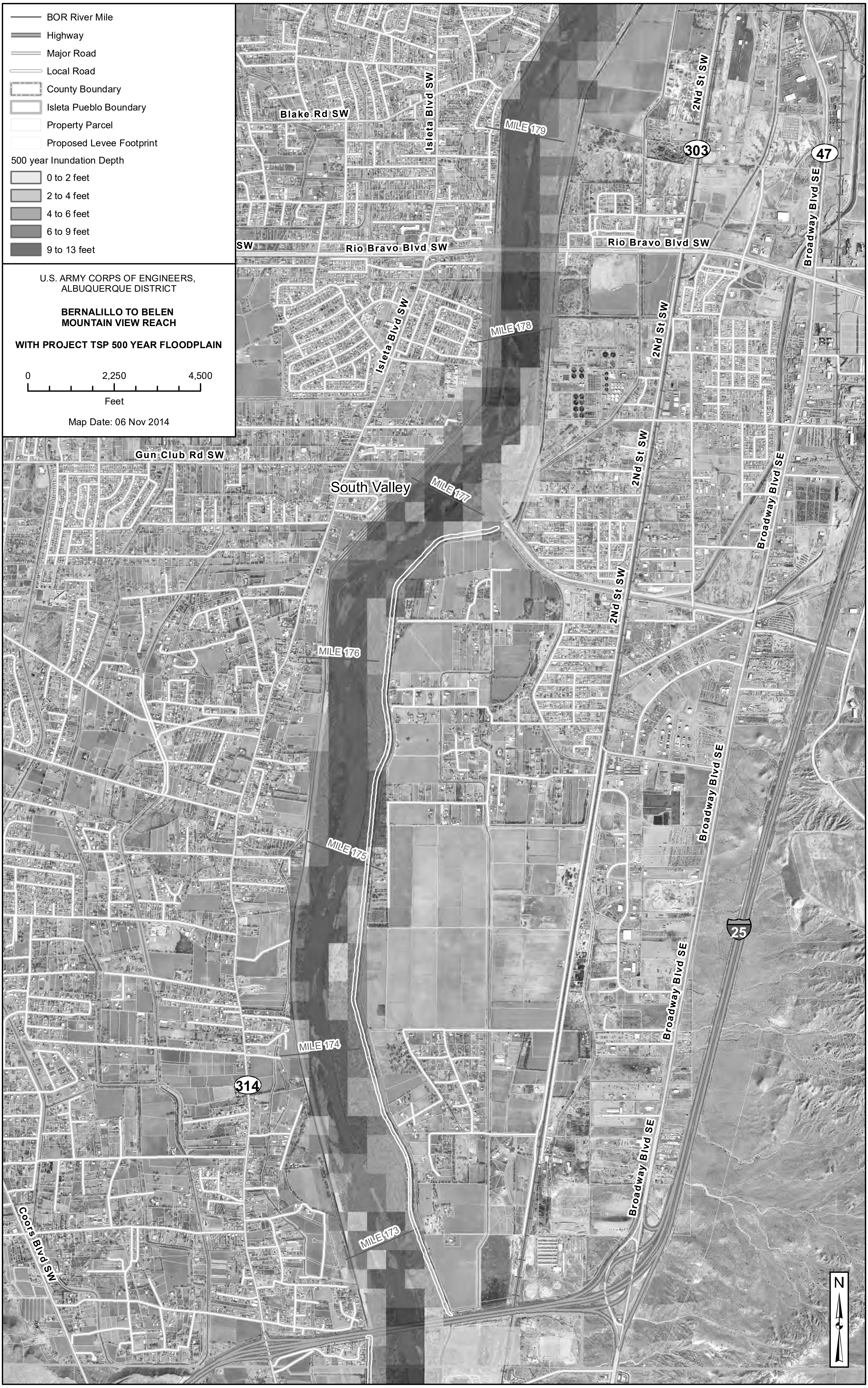
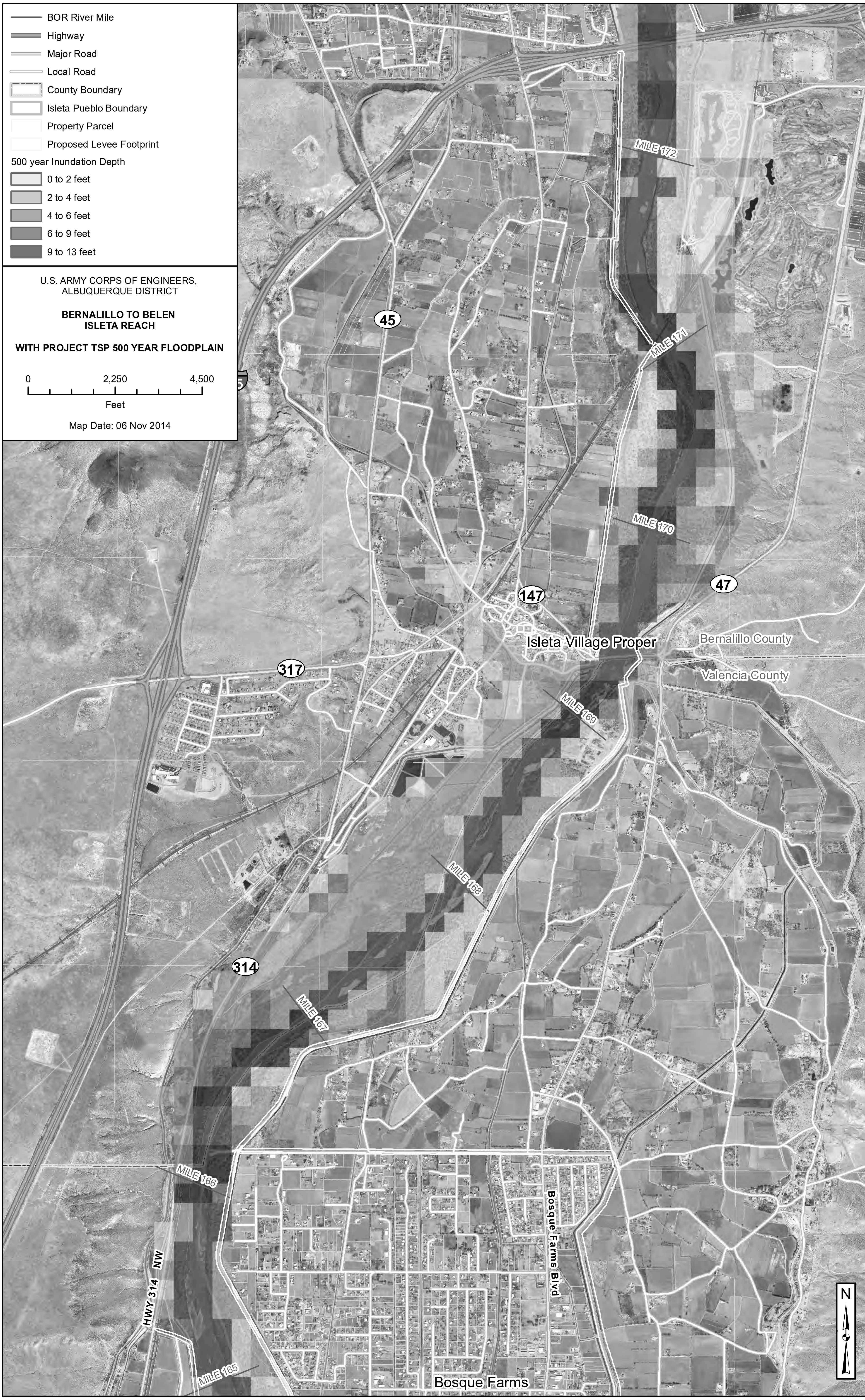
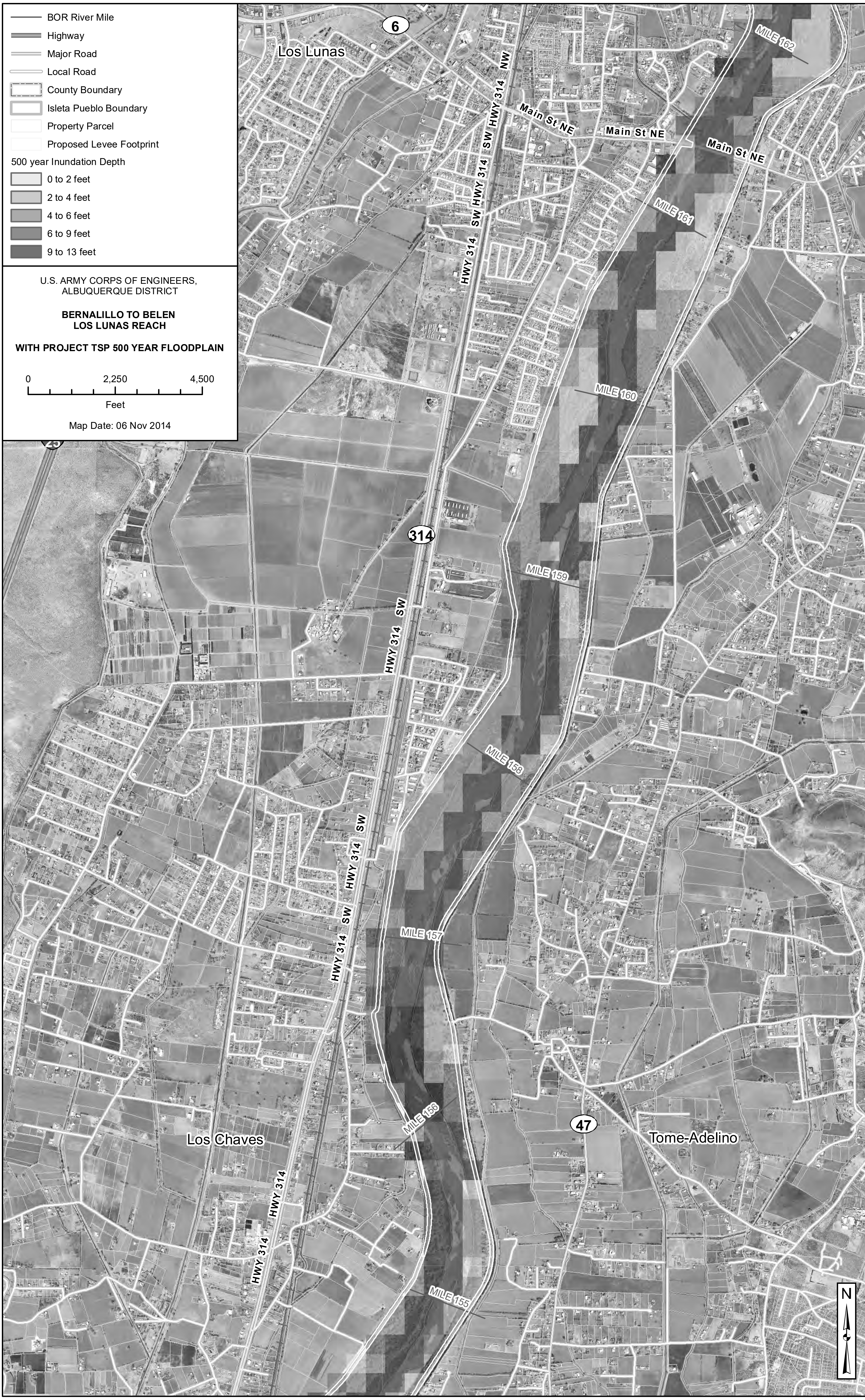
Los Chaves
Tome-Adelino
Rio Communities North
Valencia County
Los Chavez Reach
Los Chavez Hydraulic Reach
25
Belen
Los Trujillos-Gabaldon
Belen Hydraulic Reach
116
304
Belen Reach
Belen South Hydraulic Reach
Casa Colorada
47
N
Socorro County
Community
County Boundary
Isleta Pueblo Boundary
Levee Footprint
Hydraulic Reach
Map Index
U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN PROPOSED
LEVEE ALIGNMENTS
HYDRAULIC REACH INDEX
0
10,000
20,000
Feet
Map Date: 05 Nov 2014



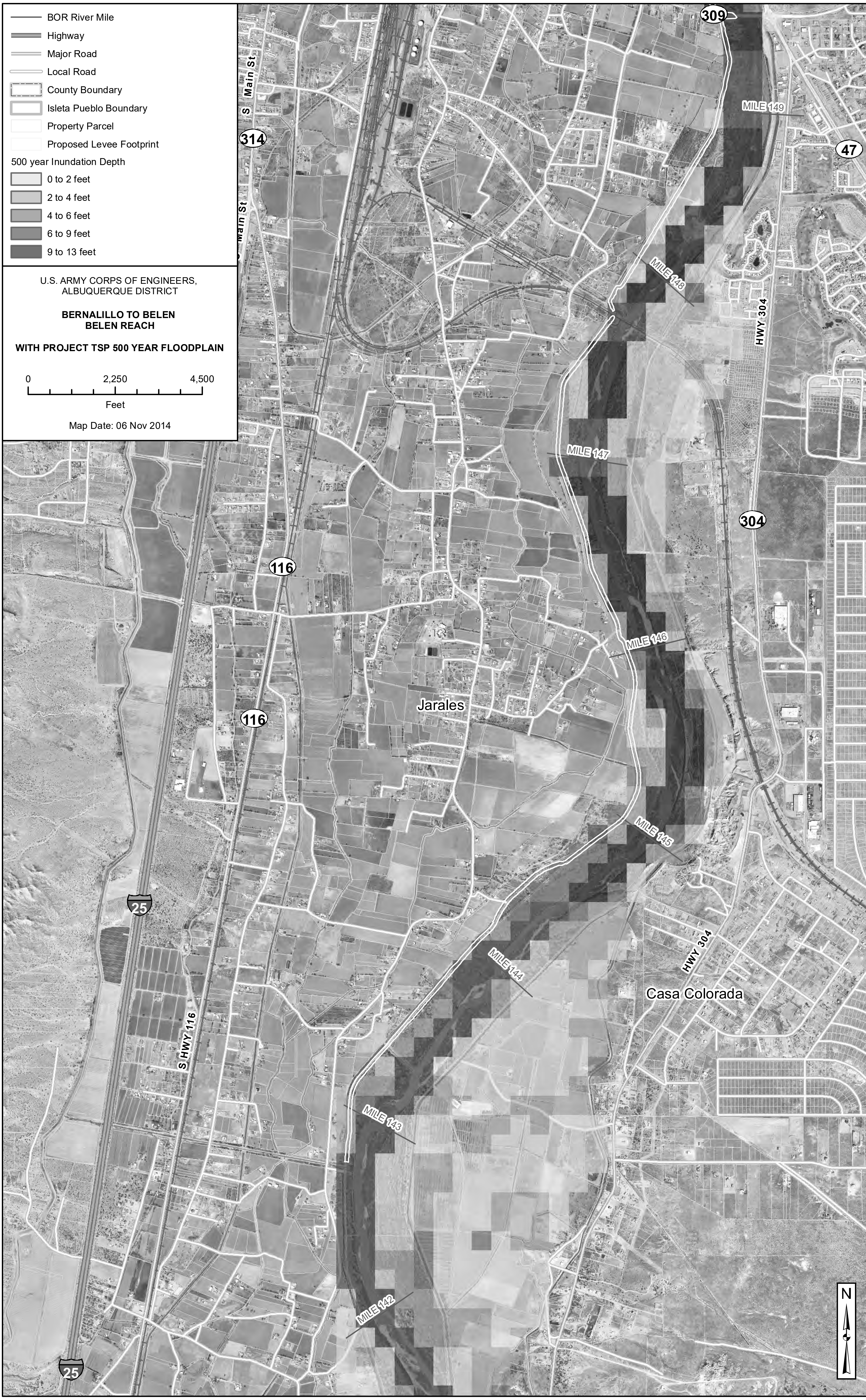
BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
500 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
MOUNTAIN VIEW REACH
WITH PROJECT TSP 500 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014
Blake Rd SW
Isleta Blvd SW
MILE 179
2nd St SW
303
47
Broadway Blvd SE
Rio Bravo Blvd SW
MILE 178
2Nd St SW
Gun Club Rd SW
South Valley
MILE 177
MILE 176
MILE 175
25
MILE 174
314
MILE 173
Coors Blvd SW
N


BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
500 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
ISLETA REACH
WITH PROJECT TSP 500 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014
MILE 172
MILE 171
MILE 170
MILE 169
MILE 168
MILE 167
MILE 166
MILE 165
45
47
147
317
314
Isleta Village Proper
Bernalillo County
Valencia County
Bosque Farms Blvd
HWY 314 NW
Bosque Farms
N


Bosque Farms
MILE 165
314
HWY 314 NW
MILE 164
Bosque Farms Blvd
Peralta
MILE 163
HWY 314 NW
MILE 162
Main St NE
Main St NE
Main St NE
HWY 314 SW
6
MILE 161
Valencia
47
MILE 160
MILE 159
158
N
BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
500 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS,
ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
BOSQUE FARMS REACH
WITH PROJECT TSP 500 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014


BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
500 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
LOS LUNAS REACH
WITH PROJECT TSP 500 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014
Los Lunas
6
Main St NE
HWY 314 SW
HWY 314 NW
MILE 162
MILE 161
MILE 160
MILE 159
MILE 158
MILE 157
MILE 156
MILE 155
314
47
Los Chaves
Tome-Adelino
HWY 314
N


BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
500 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
LOS CHAVEZ REACH
WITH PROJECT TSP 500 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014
Los Chaves
314
Tome-Adelino
HWY 314
MILE 156
MILE 155
MILE 154
MILE 153
MILE 152
MILE 151
MILE 150
MILE 149
Frontage Rd
47
N Main St
W Reinken Ave
E Reinken Ave
E River Rd
Belen
Los Trujillos-Gabaldon
548
309
304
S Main St
N



BOR River Mile
Highway
Major Road
Local Road
County Boundary
Isleta Pueblo Boundary
Property Parcel
Proposed Levee Footprint
500 year Inundation Depth
0 to 2 feet
2 to 4 feet
4 to 6 feet
6 to 9 feet
9 to 13 feet
U.S. ARMY CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT
BERNALILLO TO BELEN
BELEN REACH
WITH PROJECT TSP 500 YEAR FLOODPLAIN
0
2,250
4,500
Feet
Map Date: 06 Nov 2014
309
314
47
116
304
25
S Main St
HWY 304
S HWY 116
MILE 149
MILE 148
MILE 147
MILE 146
MILE 145
MILE 144
MILE 143
MILE 142
Jarales
Casa Colorada
N