ATTACHMENT 7
Technical Justification of Projects

The Dixon Main Drain/V-Drain Enlargement Project will provide the following physical benefits:

- Create Wetlands
- Restore Native Vegetation
- Reduce Erosion in the Channel
- Improve Water Quality
- Enhance Water Reuse Opportunities
- Help resolve existing conflicts between the City and various agricultural agencies regarding flood control in the watershed.
- Reduce Flooding in the 10-Year Storm
- Enable Construction of Drainage Improvements in the larger Eastside Drainage Project Watershed

These benefits are outlined and quantified in Table 7 and are more fully described below.

CREATE WETLANDS

The Project will create 5 – 6 acres of wetlands.

Intensive farming and grazing in the watershed area has resulted in a decrease of wetlands. The current Main Drain and V-Drain channels have approximately 13 acres of wetland. Although this area will be disturbed during construction, new wetlands will be created at a ratio of over 1.5:1. The completed project will have approximately 18-19 acres of US Army Corps of Engineers regulated wetlands. Existing and post project wetland determination and calculations were prepared by Monk Associates Environmental Consultants and certified by the US Army Corps of Engineers (Mitigation Monitoring Plan Dixon Main Drain and V-Drain, May 27, 2009). The enlarged channels are designed to provide improved or superior functions and values over the existing channels. Floodplain benches and channel side slopes will remain saturated long enough during each wet season to promote sustainable growth of hydrophytic vegetation.

The project includes five years of monitoring the created wetlands in order to ensure the establishment of a self-sustaining hydrophytic plant community that includes representative wetland taxa (i.e., wetland plant genera and species). Following the completion of the grading and excavation of the proposed project, an As-Built Report will be prepared and submitted to the Corps, RWQCB and the California Department of Fish and Game. At the end of each monitoring year (years one through five), a detailed annual monitoring report will be prepared. The

monitoring report will contain hydrology data, plant community sampling data and summaries and photographic documentation. Photos, taken from the same location each year will allow a visual analysis of the year to year changes that occur in the channels and the created floodplains benches. During the monitoring efforts, plant establishment failure and/or damage to project site features, such as erosion, will be noted and repaired. The required mitigation monitoring will insure the certainty of the establishment of this project benefit.

RESTORE NATIVE VEGETATION

Existing upland areas at the project site are ruderal habitat which consists of plant species adapted to continuous disturbance (Holland and Keil 1995). Many of the plant species found within the project area are non-native species. Within the project area, this habitat occurs along the top-of-banks of the ditches, along the graded road to the east of the V-Drain, and in upland areas adjacent to fields. The fields on the west and south sides of the channels support vegetation communities that are classified as agrestal (croplands) and pastoral (grazing land) (Holland & Keil 1995). These are highly disturbed communities that are the result of long-term ground manipulation and/or cultivation. These communities are dominated by plant species well-adapted to grazing of livestock or disturbance associated with cultivation. The main crop grown in the agricultural fields adjacent to the project is alfalfa (Medicago sativa), thus these fields require regular ground disturbance for both cultivation (disking activities) and harvesting practices. The remaining fields adjacent to the project site are used for cattle grazing. The Main Drain and V-Drain channels adjacent to these fields have cattle that have trampled channel bank and consumed vegetation.

Project will seed native grasses in 50 acres of uplands.

The Project will seed approximately 50 acres of uplands with a variety of native perennial grasses. The upland area includes a portion of the channel slope above the floodplain bench, the upland edge and the piled spoils area. In areas adjacent to pasture, a cattle exclusion fence will be installed to protect the plantings. The seeding will be monitored and maintained for two years. Within two years, there will be at least 50% visual coverage by native grasses of the area seeded. Upland area monitoring will include photo point establishment and photo monitoring annually to document plant survival and growth, quarterly surveying of planted vegetation to determine survival and semi-annual (spring and fall) surveys to determine need for weed control. The required monitoring in addition to the construction of cattle exclusion fencing will insure this project benefit will be established.

REDUCE EROSION IN THE CHANNEL

The larger channel section with 4:1 slope banks and high water flood bench will decrease water velocity from the existing condition and thus decrease in-stream erosion. Native vegetation planted on the bench and banks above the bench will also decrease channel erosion in high flow events.

The project will construct 8,600 feet of permanent fence along the western project boundary that will prevent livestock (cattle) from accessing the channel as is the case currently. Eliminating livestock's access to the water course will eliminate erosion and sedimentation caused by the livestock trampling channel banks and in-stream areas and consuming vegetation. Approximately 24 acres of land previously accessible to grazing cattle will be protected by the exclusionary fencing. These improvements will reduce erosion in the channel.

IMPROVE WATER QUALITY

Currently cattle grazing in adjacent fields have free access to the project channels increasing the fecal coliform levels in the water. Bare stream slopes cause by trampling by cattle and lack of vegetation on channel slopes cause erosion and increased sediment loading in the water. Restoring native vegetation in the channel, decreasing water velocity in the channel during high flow events and excluding cattle from the channel are all components of the project that will improve water quality in the channels. The project will create 13 additional acres of wetlands which will be vegetated, approximately 50 acres of upland areas will be planted and 24 acres of channel area will be fenced off from cattle. These combined improvements will increase water quality in the channel downstream in Haas Slough.

Project will protect 24 acres
with cattle exclusional fencing.

ENHANCE WATER REUSE OPPORTUNITIES

The property owner to the south of the Dixon Main Drain has rights to use agricultural runoff from the Dixon Main Drain for irrigation. The Dixon Main Drain / V-Drain Project will construct a new weir and pump intake in the Dixon Main Drain. These new facilities will raise the water level in the channel during the summer months which will enable agricultural runoff to be pumped more efficiently. The new intake includes a trash screen and permanent wet well which will improve ease of use of the facility. These improvements will enhance the water reuse in this area.

HELP RESOLVE EXISTING CONFLICTS BETWEEN THE CITY AND VARIOUS AGRICULTURAL AGENCIES REGARDING FLOOD CONTROL IN THE WATERSHED

Drainage in the Dixon Watershed Management Plan area which includes the Main Drain and V-Drain project area has been fraught with conflict and court cases. Urbanized areas in the City of Dixon drain to the flat agricultural areas to the south where drainage channels are undersized for even agricultural use due to changing agricultural practices. Development in the urbanized area increased runoff and increased conflict between the City and agricultural agencies. The Dixon Resource Conservation District, Reclamation District 2068, the Maine Prairie Water District, and the City of Dixon came together to form the Dixon Regional Watershed Joint Powers Authority. Their goal is to construct projects with the goal of reducing flooding by reestablishing, at a minimum, the level of service originally constructed in the regional drainage facilities and

increasing capacities where economically feasible and mutually beneficial to the parties. The Dixon Main Drain/V-Drain Project was cooperatively developed to meet the needs of both the City and the different agricultural agencies. The Project is the first phase of the Eastside Drainage Project, a project that will eventually provide an outfall for drainage from the City's Northeast Quadrant. The watershed management plan helps to resolve the conflict between the urban and rural areas and between competing interests within the rural areas.

REDUCE FLOODING IN THE 10-YEAR STORM

The Project will reduce localized flooding in the 10-year storm. The Dixon Main Drain will be enlarged to have a capacity increase of 375 cfs over the existing average capacity of 240 cfs. The V-Drain will be enlarged to a capacity of 1,518 cfs, 386 cfs above the average existing capacity of 1,132 cfs.

Flooding at the V-Drain and Main Drain intersection, January, 1997.

During the 1997 storm which was approximately the 10-year storm the areas of flooding in the project area were mapped (*Dixon Watershed Management Plan August 24, 2001 West Yost Associates*). This mapped area adjacent to the Dixon Main Drain and V-Drain is approximately 836 acres. The project is designed to contain the 10-year storm when the Eastside Drainage Project is constructed and this 836 acres will be removed from flooding. In the interim condition, prior to construction of Phase II of the Eastside Drainage Project, the Main Drain and V-Drain will have capacity to contain localized flooding from higher recurrence interval storms. This is because upstream conveyance facilities are undersized causing runoff to pond upstream and not flow to the V-Drain and Main Drain. Flooding will continue during flooding events caused by high water in the Yolo Bypass. Areas of existing flooding are shown in Figure 7-1 and the reduced flooding benefit is analyzed in Attachment 8. Figures 7-2 through 7-5 show the water levels in the Main Drain and V-Drain with and without the project constructed. Figures 7-2 through 7-5 are results from XP-SWMM modeling of the Dixon Watershed with and without the Project.

ENABLE CONSTRUCTION OF DRAINAGE IMPROVEMENTS IN THE LARGER EASTSIDE DRAINAGE PROJECT WATERSHED

The Dixon Main Drain/V-drain enlargement project provides capacity now, to reduce the frequency, depth and duration of existing flooding for local events. It is the first phase of the Eastside Drainage Project. The second phase is the Eastside Drain, a system of new and enlarged channels constructed from the Northeast Quadrant of the City of Dixon to the Dixon Main Drain. The Dixon Main Drain/V-Drain Enlargement Project (DMDVD) provides capacity in the most downstream reaches of the watershed. Without the construction of this downstream capacity any planned upstream improvements would be either ineffective or increase flooding in downstream areas. Furthermore, the Dixon Main Drain / V-Drain Enlargement Project is the most environmentally complicated and costly component of the Eastside Drainage Project. Easements purchased with the DMDVD will allow for

possible future enlargement if further design of the Phase 2 project determines that would be beneficial. In general, construction of the DMDVD will "uncork" the bottom of the system which will allow the Eastside Drain improvements to be constructed.

The Eastside Drainage Project will provide flood protection to 600 acres of existing and future urban development and reduced flooding for 11,600 acres of agricultural lands. The JPA continues to investigate future projects that will incorporate the benefits of the Eastside Drain Project to an additional 500 acres of existing and future urban development in the Solano County Northeast Dixon Agricultural Supporting Limited Industrial Area and 4,800 acres of agricultural lands. The benefit area for the Eastside Drainage Project is shown in Figure 7-6.

The Eastside Drain will be completely funded with money from the Northeast Quadrant development through Storm Drainage Facilities Impact Fees collected by the City of Dixon. These additional benefits may not occur if the Eastside Drain Project is never constructed, however, the benefits in the Eastside Drain Project area will be impossible to achieve without construction of the Dixon Main Drain / V-Drain Enlargement Project.

List of Figures:

Figure 7-1. Flooded Areas from January 1997 Storms

Figure 7-2. Stage in the Dixon Main Drain 10-year Storm

Figure 7-3. Stage in the Dixon Main Drain 100-year Storm

Figure 7-4. Stage in the V-Drain 10-year Storm

Figure 7-5. Stage in the V-Drain 100-year Storm

Figure 7-6. Benefit Map

Table 7. Annual Project Physical Benefits

Project Name: Dixon Main Drain / V-Drain Enlargement Project

Type of Benefit Claimed: CREATE WETLANDS BY ENLARGING CHANNEL SECTION AND CREATING FLOODPLAIN BENCH

Measure of Benefit Claimed (Name of Units): Acres

Additional Information About this Measure:

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
50 Year Project Life	12.95	18 - 19	5 - 6

Comments: Source: Mitigation and Monitoring Plan, Dixon Main Drain and V-Drain Enlargement Project, Solano County, Ca prepared by Monk & Associates, May 27, 2009, page 7 (copy in Attachment 3 Appendix A)

Type of Benefit Claimed: RESTORE NATIVE VEGETATION, REDUCE EROSION AND IMPROVE WATER QUALITY BY FENCING CHANNEL FROM LIVESTOCK

Measure of Benefit Claimed (Name of Units): Acres

Additional Information About this Measure:

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
50 Year Project Life	0	24.35	24.35

Comments: Source 95% Comlete: Plans for Dixon Main Drain and V-Drain Enlargement, prepared by West Yost Associates, pages 6, 12 -17 (copy in Attachment 3 Appendix A)

Type of Benefit Claimed: RESTORE NATIVE VEGETATION, BY PLANTING UPLAND AREAS

Measure of Benefit Claimed (Name of Units): Acres

Additional Information About this Measure: Upland areas include slope above floodplain bench, upland edge and piled spoils areas. Areas adjacent to pasture are fenced, areas not adjacent to pasture do not require fencing. Existing upland areas are agricultural roads, disturbed ground and agricultural buffer.

Table 7. Annual Project Physical Benefits

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
50 Year Project Life	0	50	50

Comments: Source: Plans for Dixon Main Drain and V-Drain Enlargement, prepared by West Yost Associates, pages 6 – 17 (copy in Attachment 3 Appendix A)

Type of Benefit Claimed: REDUCED LOCALIZED FLOODING IN 10-YEAR AND 100-YEAR STORM

Measure of Benefit Claimed (Name of Units): Acres

Additional Information About this Measure:

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
50 Year Project Life	0	836	836

Comments: Source: Dixon Watershed Joint Powers Authority, Main Drain and V-Drain Hydraulic Study, May 10, 2012 prepared by West Yost Associates, Figure 1 (copy in Attachment 3 Appendix A), Figures 7-1 through 7-5 in Attachment 7

Type of Benefit Claimed: ENABLE CONSTRUCTION OF EASTSIDE DRAINAGE PROJECT

Measure of Benefit Claimed (Name of Units): Acres

Additional Information About this Measure: This is the total acreage that would experience reduced flooding once the entire Eastside Drainage Project is constructed. Construction of the Eastside Drainage project is not possible without construction of the Main Drain / V-Drain Project

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
50 Year Project Life	0	11,600	11,600

Comments: Source: Eastside Drain Project Conceptual Design Report Prepared for Dixon Water Joint Powers Authority January 2008 by West Yost Associates (copy in Attachment 3 Appendix A) Figure 7-6 Benefit Map in Attachment 7

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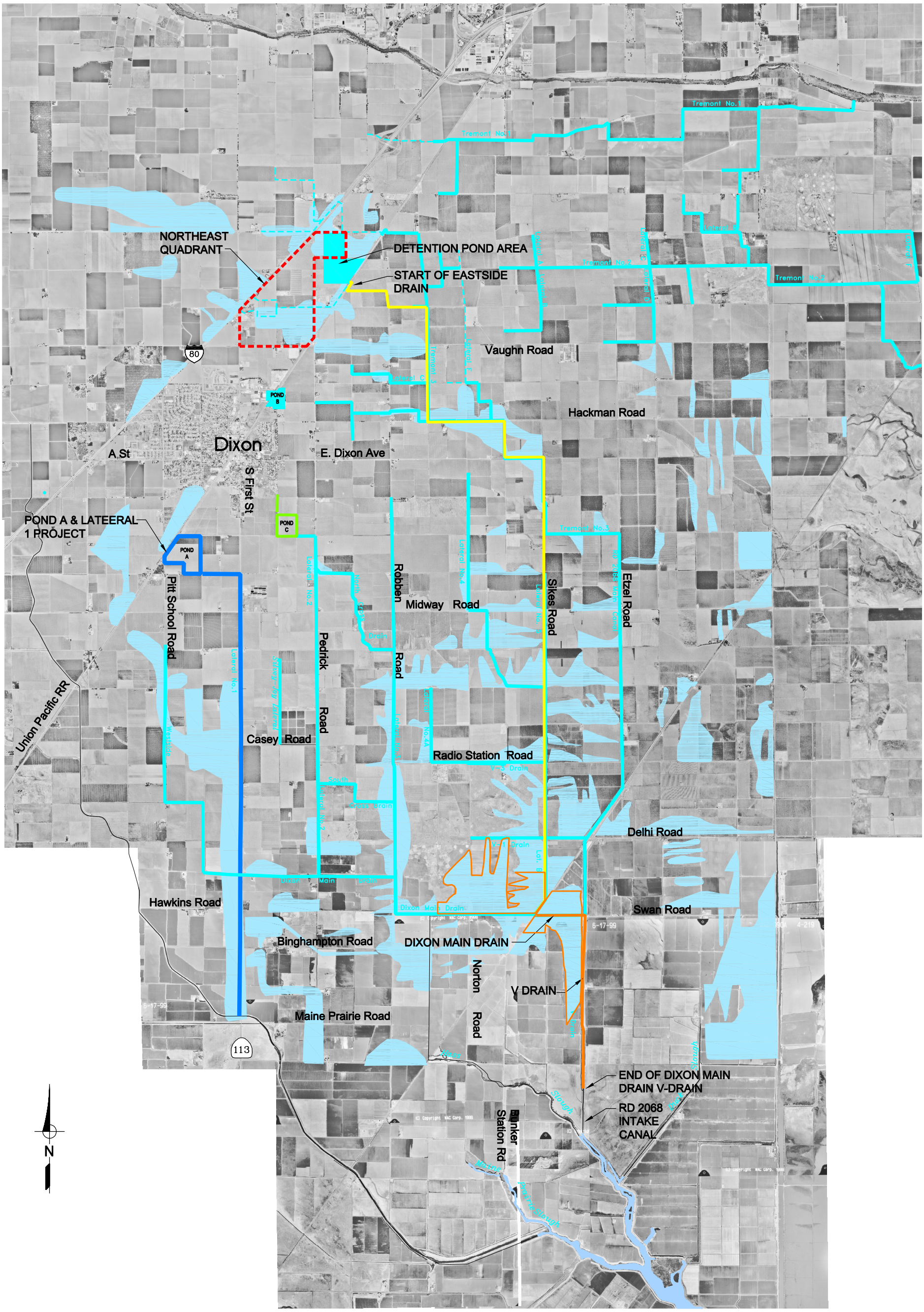


LEGEND:

- DRAINAGE CHANNEL MAINTAINED BY DISTRICT
- DRAINAGE CHANNEL NOT MAINTAINED BY DISTRICT
- EASTSIDE DRAIN
- DIXON MAIN DRAIN / V-DRAIN
- FLOODED AREA
- FLOODED AREA BENEFITING FROM MAIN DRAIN / V-DRAIN

Figure 7-1
Dixon Regional Watershed JPA
Proposition 1E Grant Proposal
Flooded Areas from January 1997 Storms

WEST YOST & ASSOCIATES

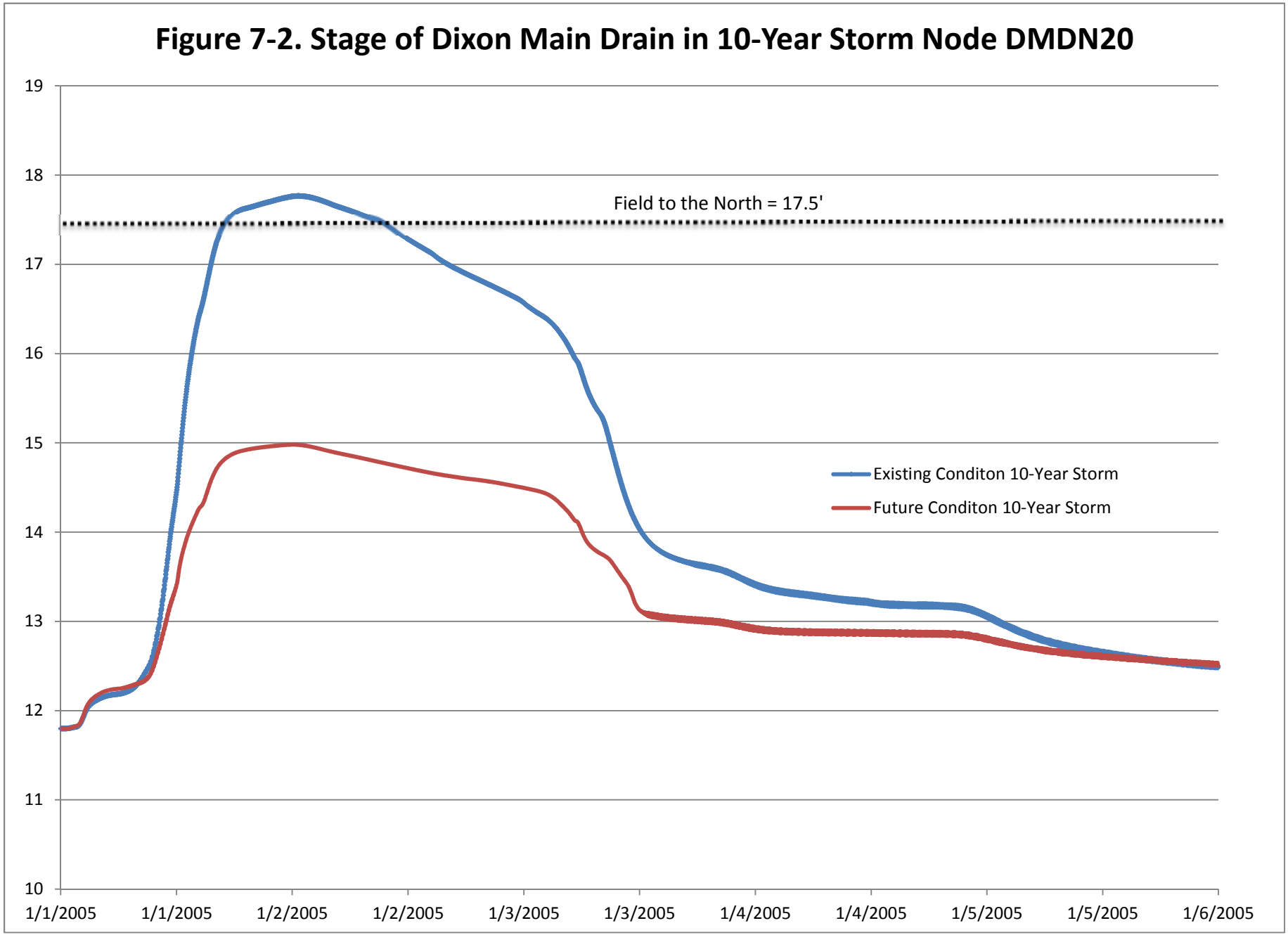


Figure 7-2. Stage of Dixon Main Drain in 10-Year Storm Node DMDN20
19
18
17
16
15
14
13
12
11
10
Field to the North = 17.5'
Existing Conditon 10-Year Storm
Future Conditon 10-Year Storm
1/1/2005
1/1/2005
1/2/2005
1/2/2005
1/3/2005
1/3/2005
1/4/2005
1/4/2005
1/5/2005
1/5/2005
1/6/2005

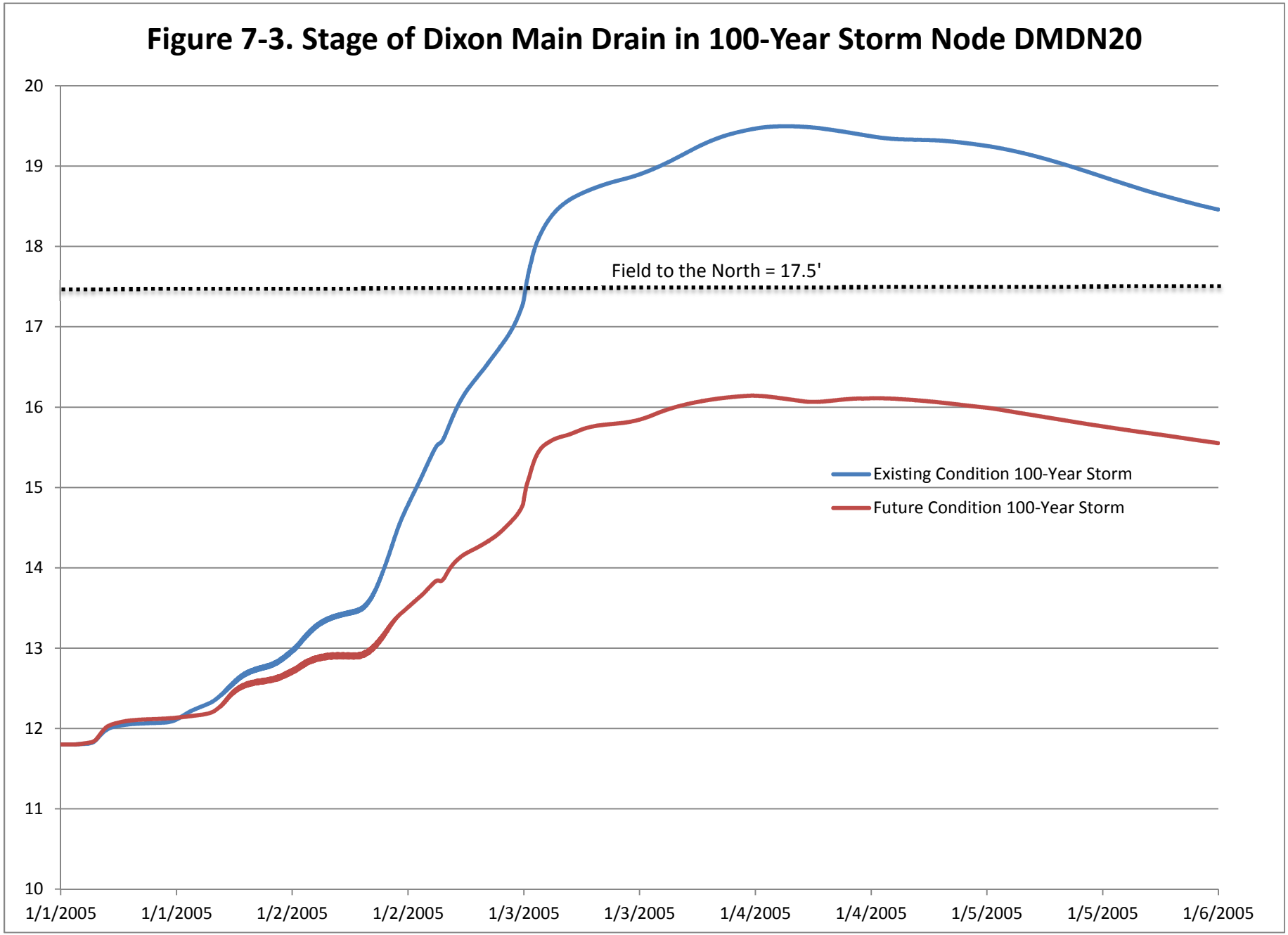


Figure 7-3. Stage of Dixon Main Drain in 100-Year Storm Node DMDN20
20
19
18
17
16
15
14
13
12
11
10
Field to the North = 17.5'
Existing Condition 100-Year Storm
Future Condition 100-Year Storm
1/1/2005
1/1/2005
1/2/2005
1/2/2005
1/3/2005
1/3/2005
1/4/2005
1/4/2005
1/5/2005
1/5/2005
1/6/2005

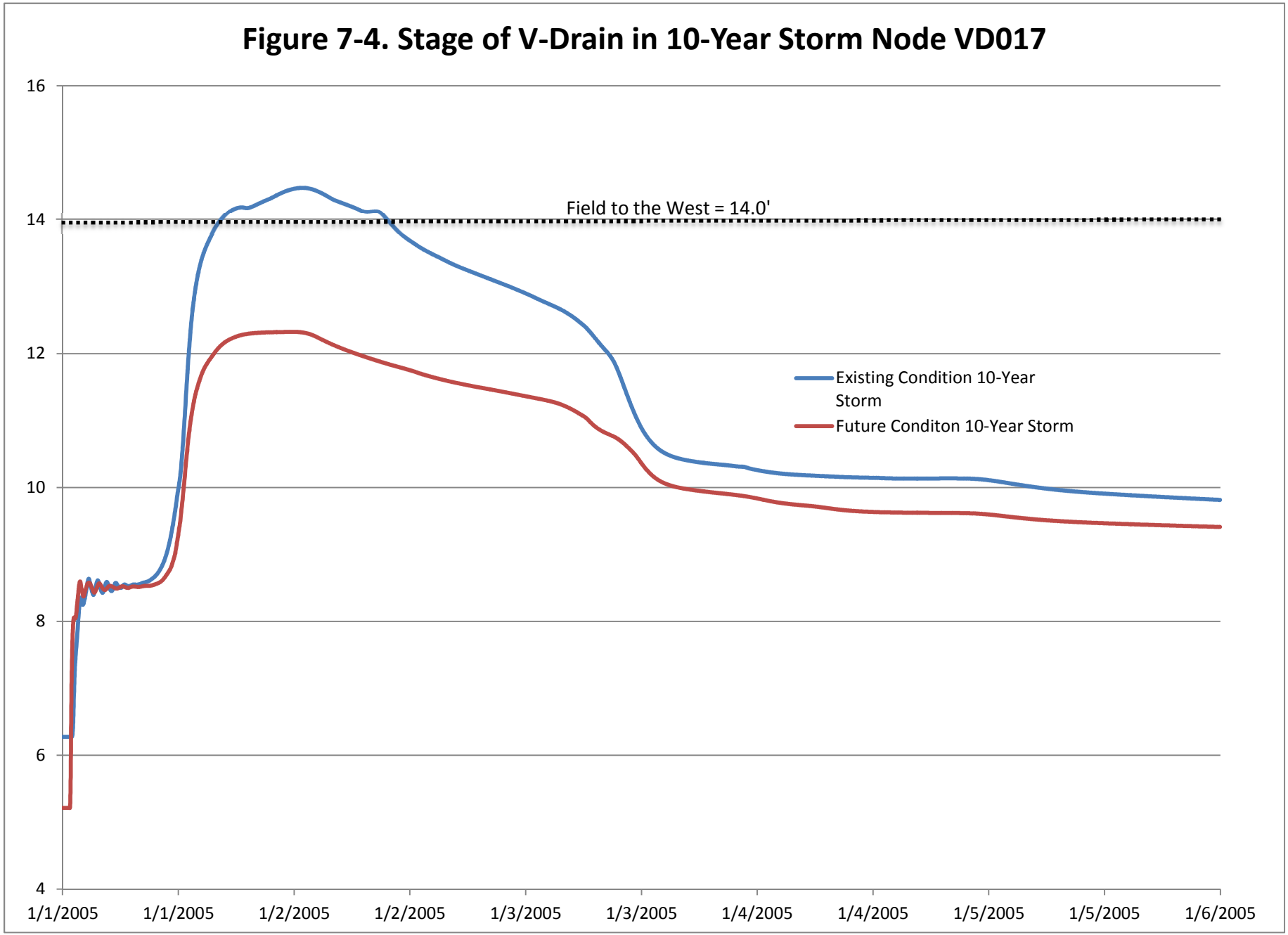


Figure 7-4. Stage of V-Drain in 10-Year Storm Node VD017
16
14
12
10
8
6
4
Field to the West = 14.0'
Existing Condition 10-Year Storm
Future Conditon 10-Year Storm
1/1/2005
1/1/2005
1/2/2005
1/2/2005
1/3/2005
1/3/2005
1/4/2005
1/4/2005
1/5/2005
1/5/2005
1/6/2005

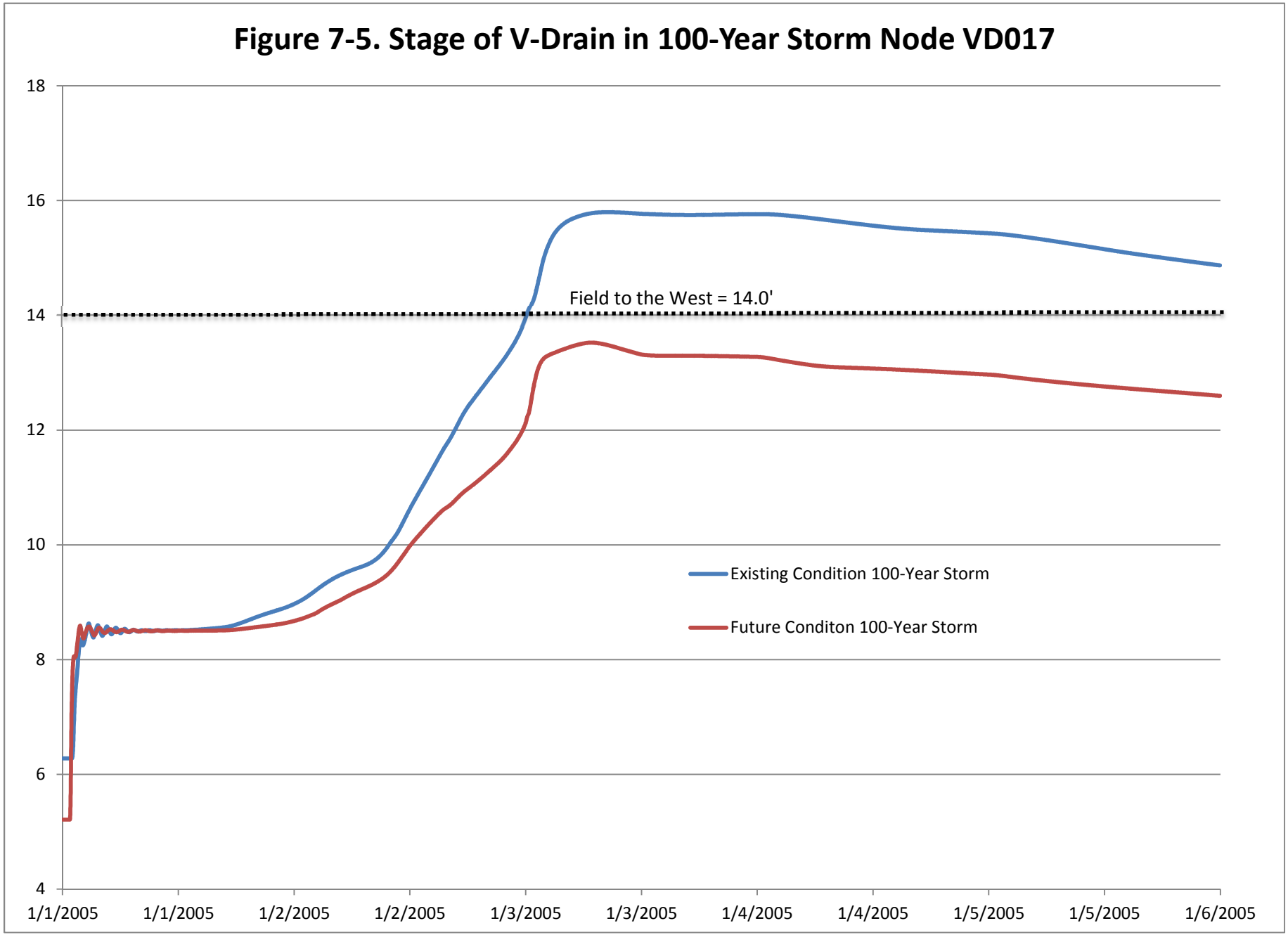
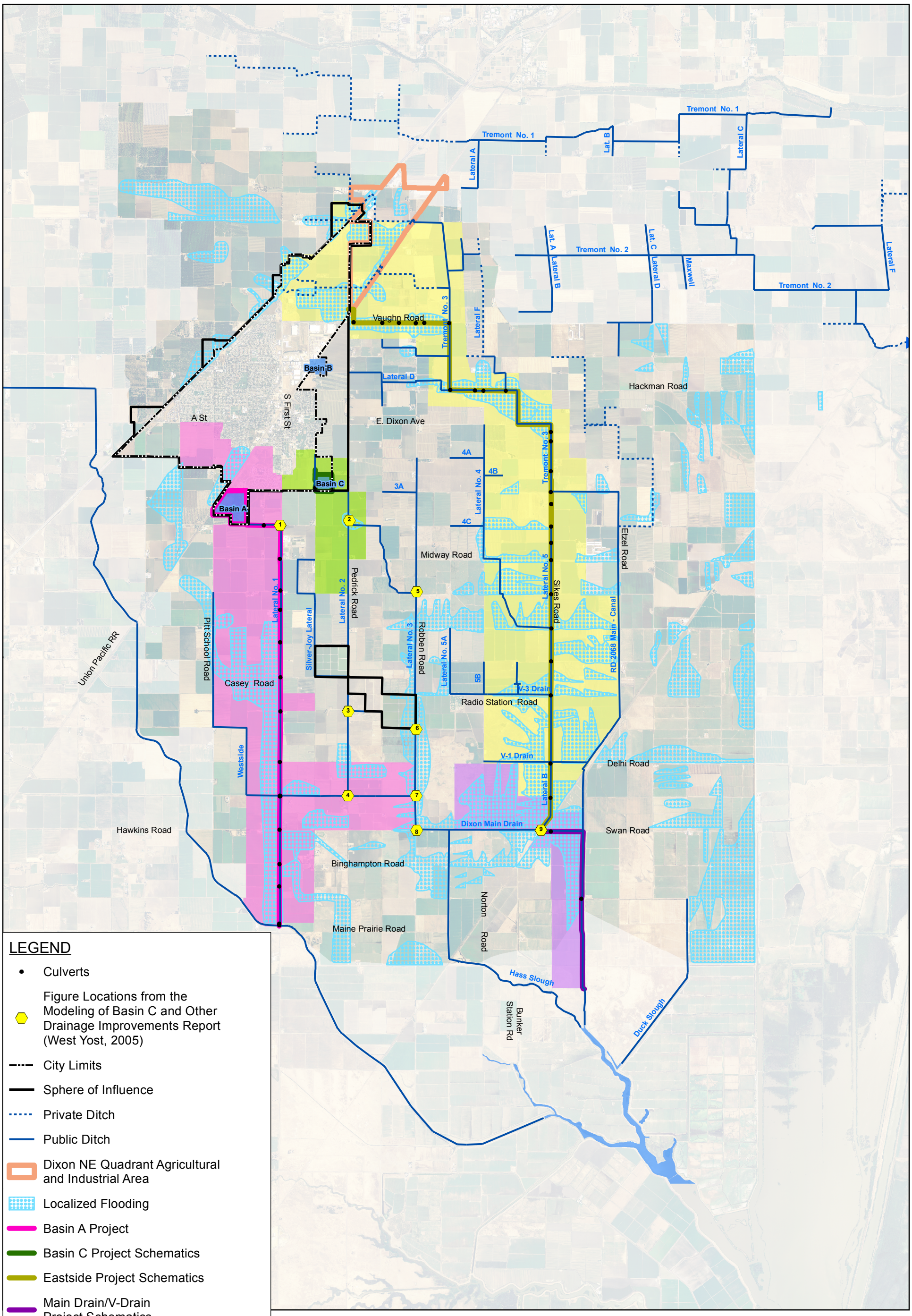


Figure 7-5. Stage of V-Drain in 100-Year Storm Node VD017
18
16
14
12
10
8
6
4
Field to the West = 14.0'
Existing Condition 100-Year Storm
Future Conditon 100-Year Storm
1/1/2005
1/1/2005
1/2/2005
1/2/2005
1/3/2005
1/3/2005
1/4/2005
1/4/2005
1/5/2005
1/5/2005
1/6/2005



LEGEND

- Culverts
- Figure Locations from the Modeling of Basin C and Other Drainage Improvements Report (West Yost, 2005)
- City Limits
- Sphere of Influence
- Private Ditch
- Public Ditch
- Dixon NE Quadrant Agricultural and Industrial Area
- Localized Flooding
- Basin A Project
- Basin C Project Schematics
- Eastside Project Schematics
- Main Drain/V-Drain Project Schematics
- Basin A / Lateral 1 Benefit
- Basin C / Lateral 2 Benefit
- Eastside Drainage Project Benefit Area
- Main Drain/V-Drain Benefit

N

0 3,500 7,000

Scale in Feet

FIGURE 7-6

Dixon Regional Watershed JPA
Proposition 1E Grant Proposal

BENEFIT MAP

WEST YOST ASSOCIATES
Consulting Engineers

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