Exhibit D Need/Extent of the Problem

State of Iowa

Iowa_PhaseII_Need-Extent.pdf

Need/Extent of the Problem

a. Unmet Recovery Needs and Target Geography

Environmental MID-URN from 2011–2013 impact 24 of Iowa's 99 counties, reflecting Iowa's primary land use—agriculture. The scattered distribution of environmental MID-URN areas is reflective of 2011–2013 storm patterns. Most of Iowa is vulnerable to, and has suffered from, significant soil loss and water-quality degradation from major (and even moderate) flood events in recent history.

As noted in Phase I and Phase II Threshold and Phase I Need, much of Iowa's most impacted and distressed rural areas suffer from environmental damages caused by soil erosion and transport during floods. In 2013, storms in Tama County, for example, resulted in an estimated loss of *2.5–5.0 tons of soil per acre*. This exceeds any conceivable sustainable annual soil loss and poses a threat to Iowa's economy and environment. This unmet recovery need distribution and extent as related to soil loss described in Phase I is unchanged, other than additional added areas (Phase II, Threshold). These areas continue to experience irreplaceable soil loss during high flow events. This also harms water quality in MID-URN areas and downstream. As also described in Phase I, much of Iowa's rural MID-URN areas also suffer environmental degradation from impaired water quality. This also remains unchanged, other than added areas (Phase II, Threshold); it poses a threat to the environment, city drinking water, recreation, and tourism. If unchecked, water quality will continue to degrade, especially during high flow events.

The Iowa Watersheds Approach (IWA) area served is narrowed to nine watersheds, including one in Dubuque (Attachment E, Map 1 and Attachment F, Census Tract List). Rural watersheds and counties include: West Nishnabotna (Mills, Fremont): East Nishnabotna (Fremont): North Raccoon (Buena Vista, Pocahontas); Middle Cedar (Tama, Benton); Clear

Creek (Iowa, Johnson); English (Iowa); Upper Wapsipinicon (Buchanan, Delaware); and the Upper Iowa (Allamakee, Winneshiek).

The IWA addresses needs by reducing future flood damage through implementation of projects to increase the land's flood resilience. IWA will significantly reduce water flow (decreasing soil loss and infrastructure damage) and water-quality degradation during high flow events. Leverage funds include 25% of construction costs (direct leverage) from all landowners and complementary projects (supporting leverage) to reduce flow, improve water quality, and protect resources. Community programming will focus on increasing local flood resilience.

The IWA will impact environmental, economic, and resilience needs at many levels. Built projects will benefit the area (*local benefit to MID-URN*) through: the retention of soil and nutrients, which benefits the landowner economically (greater yields, reduced nutrient application costs); recreational benefits (e.g., cleaner water for swimming or fishing); and environmental benefits (e.g., habitat formation, reduced erosion). The hydrologic assessments and watershed plans will provide a vision for the larger (*multi-county*) watersheds. Projects will collectively *benefit the region* by: reducing peak streamflow, which lessens environmental damage (streambank erosion) and infrastructure damage; improving water quality (e.g., for drinking water, recreational use); improving quality of life; bolstering economies (tourism activities – fishing, swimming, boating); preserving Iowa's agricultural foundation; and retaining businesses that might otherwise be damaged by floodwaters. These benefits will propagate beyond Iowa, impacting major waterways south to the Gulf of Mexico and its hypoxia zone.

The health of Iowa's agricultural resources impacts markets *globally*; Iowa ranks second nationally in the export of agricultural commodities, with about $11.3B in exports in 2012.

Direct leverage from the Iowa Flood Center ($1M) will support watershed data collection, monitoring, and modeling. Direct support from the Iowa Farm Bureau will support outreach

dissemination in the target watersheds. Many collaborators have offered supporting leverage representing complementary projects, outreach, and infrastructure (Phase II, Leverage).

Infrastructure MID-URN from 2011–2013. The IWA includes projects to address significant unmet infrastructure needs in Dubuque, Coralville, and Storm Lake.

The *City of Dubuque* experienced severe flooding in July 2011, causing substantial damage, especially in the historic Bee Branch Creek Watershed. The Bee Branch Healthy Homes Resiliency Program (BBHHRP) addresses unmet recovery needs identified in Phase 1 (Attachment E, Map 2). Dubuque's 2014 windshield survey identified 23 units with damage from 2011. Few, if any, efforts have been made to make the homes more flood resilient. In 2015, 24 inspections and interviews confirmed homes damaged by the 2011 flood.

The BBHHRP is aligned with the Bee Branch Creek Restoration Project. Census tracts 1, 4, 5, 6, and 11.02 qualify as LMI (Attachment E, Map 2). The target area includes the area's most affordable housing. Direct leverage includes $800K for a Lead & Healthy Homes project. Supporting leverage ($500K) will fund micro-lending and first-time homeowners.

Dubuque's unmet infrastructure needs include three storm water management projects to safely convey water. About 900 homes remain at risk for future flooding until these projects are complete. Dubuque will leverage $21.6M in direct funds for the three infrastructure projects and $39M in supporting leverage for other watershed improvements.

A *Storm Lake* infrastructure project will help to address MID-URN in an LMI area flooded in 2011 and 2013. Flash flooding severely damaged its storm water system; water and sewage backed up into homes and were released into the environment, causing a health hazard and environmental degradation. Storm Lake commits $2,158,250 in direct leverage toward upgrading its storm sewer system. Upstream watershed projects in Outlet Creek will complement these activities and further reduce flooding in Storm Lake.

Coralville has also seen repeated flooding (including 2013) in the MID-URN area. Modifications to two storm water pump stations (the weak links in a new flood protection system) are the final step to protect more than 178 acres of businesses and multi-family residences in a vulnerable LMI area. Coralville commits $611,600 in direct leverage for project implementation.

b. Resilience Needs Within Recovery Needs

Based on soil loss estimates by an ISU agronomy professor (BCA narrative), the Iowa Department of Agriculture and Land Stewardship estimates it would cost more than $69.78M to repair environmental degradation related to soil loss caused by qualifying disasters in all the MID-URN areas in the target watersheds. IWA projects would have drastically reduced soil erosion and introduction of soil (and nutrients) into surface water.

The MID-URN areas in the target rural watersheds comprise about 90 HUC 12 watersheds out of about 1,660 statewide. The IWA proposes activities in 40. Inclusion of the remaining 50 in the target MID-URN areas would require an additional $82.7M in design and construction costs (including cost sharing); about $2.4B would be needed to implement the IWA in the rest of Iowa.

Except for the 2011 Missouri River flood, Iowa flood victims did not qualify for federal individual property damage assistance during this period. The Iowa Individual Assistance Grant Program, which allocates up to $5K to individuals making less than 200% of the federal poverty level, provided the following assistance in target county areas in 2013: Johnson, $31,500; Allamakee and Winneshiek, $164,000; Buchanan, $40,700; and Buena Vista (primarily Storm Lake), $222,700.

Infrastructure damage in the target watersheds from the qualifying events included: $2.75M in the Upper Iowa; $4.95M in the Middle Cedar; and $5.6M in the North Raccoon. Several hundred homes in Storm Lake (unofficial sources indicate up to 1,500) and 200 homes in Bee

Branch Creek reported damage. All of these areas would have experienced reduced flooding and thus reduced infrastructure damage if the watersheds projects had been in place to retain water. Infrastructure damage in Buena Vista County could have been substantially avoided with the combination of watershed projects and improvements to Storm Lake's storm sewer system.

Crop-loss data are readily available for two areas impacted by flooding in 2011. The Iowa Farm Bureau estimated $52.2M in crop loss in Fremont County (E. Nishnabotna) and $22.2M in Mills County (W. Nishnabotna).

Vulnerable populations in Iowa, including minorities (8.5%), elderly (18.4%), disabled (11.4%), and those in poverty (12.4%), are often disproportionately affected by floods. Flood impacts on vulnerable populations may include loss of affordable housing, loss of work, strained food budgets, mental and physical health impacts, and transportation difficulties.

Dubuque's Bee Branch flood-prone MID-URN area includes census tracts 1, 4, 5, 6, and 11.02, representing about 35% of Dubuque's population. About 60% of residents are renters. The city's main method of providing affordable housing for qualifying residents is the Housing Choice Voucher Program. Participants may use vouchers anywhere in Dubuque; however, usage is concentrated in the target area (Attachment E, Map 3). Dubuque has small but concentrated non-English speaking and minority populations. According to American Community Survey (ACS) estimates, 3% of Dubuque residents are non-English speaking. Of these, 27% reside in the flood-prone area. In 2015, Dubuque completed an Analysis of Impediments to fair housing. HUD considers a subarea of a micropolitan impacted if its proportion of residents of color (non-Hispanic White) exceeds 50%. No Dubuque block groups (BG) qualify. Another benchmark pertains to the percentage of residents in poverty. For micropolitan areas, this is either 40%, or a benchmark three times the average tract poverty level of the jurisdiction. HUD defines an area a Racial/Ethnic Concentrated Area of Poverty (R/E-CAP) if it exceeds benchmark values for race

and poverty. Using ACS five-year (2008–2012) estimates, the average BG poverty rate was 12.58%, yielding a benchmark poverty concentration ratio of 37.7. Again, no Dubuque BG qualifies as R/E-CAP; however the 40% racial benchmark is too high for an eastern-central plains micropolitan area. Using 20%, two BGs cross thresholds for poverty and racial concentration: Tract 5- BG 4 has an estimated R/E concentration of 36.4% and a below-poverty level percent of 51.4%. Track 1 BG 1 has corresponding values of 23.7 R/E and 43.7% (Attachment E, Map 4). This is where the most vulnerable populations live, and the areas most impacted by 2011 flooding.

The Bee Branch flood mitigation project will protect nearly 1,400 flood-prone homes and businesses and prevent an estimated $582M in damage over its 100-year life. This does not include environmental, health, and other difficult-to-quantify benefits (see BCA Narrative).

The ACS reports that the median household income in the *North Raccoon River Watershed* MID-URN area is $47,589, compared to $51,843 in Iowa (2009–2013). Storm Lake has a meat packing industry and higher minority (non-white) and Hispanic populations than the rest of Iowa. In the MID-URN area, 22.4% of residents identify as Hispanic (32% in Tracts 9604 and 9605) compared to 5.1% in Iowa, and 18.6% non-white compared to 8.5% statewide. Vulnerable populations, such as the elderly, were most impacted during DR-4126 as they struggled to find help removing damaged materials from their homes.

The MID-URN areas of the *Upper Iowa River Watershed* have a median household income of $56,910. This includes L/M income areas of Allamakee County (Tract 9602), where 10.4% of the population is in poverty and the unemployment rate is higher than in neighboring areas. In 2013, homeowners faced water in their basements caused by flash flooding on saturated soils. According to community action agency partners, low income homeowners experienced a gap in resources. Many do not live in the floodplain and are not eligible for flood insurance. Like many

rural LMI areas in Iowa, Allamakee County is facing declining population and loss of or lack of employers. Households with mobility have relocated; those unable to relocate remain.

The median annual household income in MID-URN areas of the *Upper Wapsipinicon River Watershed* in Buchanan and Delaware counties is $61,377. The median annual household income in MID-URN areas of the *Middle Cedar River Watershed* in Benton and Tama counties is $56,904. Tract 9604 in Benton County includes a higher population of disabled persons (18.4%) with the presence of a special needs facility. The median annual household income in MID-URN areas of the *English River Watershed* in Iowa County is $61,830.

The MID-URN area served by the *Clear Creek Watershed* project in Johnson and Iowa counties has 55.3% L/M income, but is not entirely residential. The *Coralville infrastructure* protects a qualifying LMI area (54.49%), with demographics as follows [average income / minority (non-white) percentage]: Tract 2: $39,583 / 24.2%; Tract 4: $40,381 / 33.2%; Tract 5: $50,420 / 17.7%; Tract 23: $44,300 / 12.6%, as compared to $53,424 / 14.4% countywide.

The median annual household income in MID-URN areas of the *East Nishnabotna River Watershed* in Fremont County is $55,476. The median annual household income in MID-URN areas of the *West Nishnabotna River Watershed* in Fremont and Mills counties is $54,250. The disabled population (17.3%) is larger than the state average (11.4%). One identified area served (Tract 401, BG 1) in Mills County includes 53.66% L/M income.

c. Appropriate Approaches

Flooding is the most significant and costly hazard facing Iowa. From 1960–2009, flood events were responsible for more than $12B in losses. Disaster recovery efforts must include programs within and across watersheds to reduce flood impacts and support engagement activities to make communities more resilient. *Four lines of evidence demonstrate the appropriateness of the Iowa Watershed Approach*: 1) increasing trends in precipitation and

flooding; 2) the success of the current Iowa Watersheds Project and Bee Branch activities; 3) past evidence of success using upstream projects to decrease downstream flooding; and 4) community-led development of resilience strategies.

Precipitation and flooding trends: The central United States is experiencing a marked increase in the frequency of heavy precipitation and flood events. University of Iowa (UI) researchers analyzed data from 774 USGS stream gauges and found an increasing trend in flood frequency during the past 50 years, especially through a wide geographic tract from N. Dakota and S. Dakota down through Iowa and Missouri and east to Illinois, Indiana, and Ohio (Mallakpour, I., and G. Villarini, "The changing nature of flooding across the central United States," *Nature Climate Change*, 5, 250-254, 2015). This study also demonstrated a similar increase in the frequency of heavy rainfall days and in temperature data across the same region. Scientists at Iowa State University's (ISU) Climate Science Program, who have been examining precipitation and flooding trends across Iowa for decades, have reached similar conclusions. Research at UI, ISU, and other institutions is underway to develop and analyze new models incorporating recent trends into future scenarios. The models consistently demonstrate a continued upward trend in extreme precipitation and flood events in Iowa. This means that the probability of a 100-year flood occurring in Dubuque, for example, is now more than 1% each year.

In the face of changing precipitation patterns and Iowa's fragile and heavily-managed landscape, reducing flood risk requires complementary approaches that improve infrastructure resilience and counteract the impacts of intensive land use and changing precipitation patterns.

Current Iowa Watersheds Project and Bee Branch Activities: The proposed Iowa Watersheds Approach mirrors the Iowa Watersheds Project (IWP). The IWP is successful because it: engages a wide range of stakeholders; follows a logical progression; and results in a suite of projects

proven to reduce flow and improve water quality. The hydrologic models used to assess each watershed and develop watershed plans can be updated over time through adjustment of precipitation and flooding patterns as observed or expected. This may result in adjustments to selection, siting, and size of future watershed projects. Dubuque's approach also considers the entire watershed and the latest climate data. The city participated in Iowa's risk and vulnerability assessment to identify optimal programs and projects to improve disaster recovery and resilience in its distressed areas. These sources framed the development of the Bee Branch Healthy Homes Resiliency Program and led the city to develop a watershed approach targeting infrastructure improvements and resiliency programs for at-risk residents.

Evidence of past success: The IWA's success can be assessed by studying a more mature project—the Soap Creek Watershed in Southeast Iowa. Stakeholders there have been working together since 1985 to reduce flood damage to farmland and roads. They developed a watershed plan and, over 30 years, built 132 water retention basins. IFC models show a 28% reduction in streamflow at the watershed outlet, with even greater localized reductions. IFC hydrologists estimate these structures also reduced downstream sediment and nutrient delivery by 20–25%. The Soap Creek WMA claims $892K/year reduction in agricultural flood damage and $155,800/year reduction in non-agricultural flood damage.

Programming to Increase Resilience: Community resilience engagement activities will help communities prepare for, plan for, respond to, recover from, and adapt to floods. This program is appropriate because: 1) local stakeholders will determine and start to address their own unique resilience needs; 2) an evaluation component will continually evaluate needs and impacts to guide programming; 3) communities will have access to the latest scientific data; and 4) programs will engage many partners, including Watershed Management Authorities, Emergency Management Coordinators, Community Action Programs, and others.