Appendices

Appendix A—Administrative Background

In May 1985, the Washington Legislature adopted a law authorizing the identification of ground water management areas and the identification of groundwater management procedures.[1] Shortly thereafter, the Department of Ecology adopted "guidelines, criteria, and procedures for the designation of groundwater management areas, subareas or zones."[2] They set forth "a process for the development of groundwater management programs for such areas, subareas, or zones, in order to protect groundwater quality, to assure groundwater quantity, and to provide for efficient management of water resources for meeting future needs while recognizing existing water rights." The regulations adopted an approach intended to "forge a partnership between a diversity of local, state, tribal and federal interests in cooperatively protecting the state's groundwater resources."

In February 2010, the Department of Agriculture, Department of Ecology, Department of Health, Yakima County Department of Public Works and U.S. Environmental Protection Agency published a report entitled *Lower Yakima Valley Groundwater Quality, Preliminary Assessment and Recommendations Document.*[3] That Preliminary Assessment found that:

> "The existing studies and related water quality data indicate that nitrate and bacterial contamination of groundwater exist in the Lower Yakima Valley."[4]

and that:

> "Over 2,000 people in the area are exposed to nitrate over the maximum contaminant level (MCL) through their drinking water. While not all groundwater supplies have been impacted, many residents rely on private wells that are in the most vulnerable portions of the aquifer. Approximately 12% of domestic well users

[1] Ch. 453, Laws of 1985 (RCW 90.44.400-.440.)

[2] December 1985, pursuant to RCW 90.44.430,

[3] *Lower Yakima Valley Groundwater Quality, Preliminary Assessment and Recommendations Document*, Washington State Department of Agriculture, Washington State Department of Ecology, Washington State Department of Health, Yakima County Department of Public Works, U.S. Environmental Protection Agency, Ecology Publication No. 10-10-009, February 2010. (Hereafter, "*Preliminary Assessment*.")

[4] *Preliminary Assessment* p. ES 2.

are exposed to nitrate levels in their drinking water that exceed the health-based standard of 10 mg/L."[5]

The *Preliminary Assessment* made recommendations for subsequent action, including:

- Development of a conceptual site model for the Lower Valley
- Development of a nitrogen loading model for the Yakima basin
- Acknowledgement of the connection between groundwater and surface water
- Determination of the sources of contamination
- Identification of agricultural operations that use flood irrigation
- Assessment of agricultural applications of nitrogen fertilizers and Best Management Practices
- Education and outreach regarding nitrates and bacteria
- Assessment of cumulative risk factoring in synergistic health effects
- Exploration of shifting residents to public water systems where feasible
- Involvement of the Yakima Health District
- Exploration of the concept of developing a groundwater management area as one potential funding option
- Development of measures of success
- Identification and implementation of appropriate enforcement actions

The *Preliminary Assessment* also identified four "needs":

1. Better characterization of vulnerable groundwater supplies.
2. Improve water quality monitoring and coordination of data that can identify trends in water quality.
3. Funding options to support lower valley initiatives to better manage potential contaminant sources and improve groundwater quality.
4. A mechanism to coordinate future efforts and implement actions that result in improved water quality.

[5] *Preliminary Assessment*, p. ES 2.

On April 17, 2012, the Department of Ecology and Yakima County executed an Interagency Agreement. The Agreement provided funds from Ecology to the County for the formation of a Groundwater Management Area for the lower Yakima Valley as set forth in WAC 173-100. The Agreement stated that "The purpose of the GWMA is to reduce nitrate contamination in groundwater to below state drinking water standards."

Yakima County was charged by the Agreement with performing the actions of Lead Agency[6] for the development of a groundwater management program, prepare a work plan, budget for development of a GWMA Program. The contents of a GWMA Program are identified in RCW 90.44.410.[7] Yakima County has therefore conducted studies, collected and analyzed data, drawn conclusions, and drafted reports related to hydrogeology, water quality, water use, land use, and population projections for GWAC review.

The GWMA Program, adopted by the Groundwater Management Committee, is implemented by the Department of Ecology.[8]

---

[6] The role of lead agency is described in WAC 173-100-080.

> The lead agency shall be responsible for coordinating and undertaking the activities necessary for development of the groundwater management program. These activities shall include collecting data and conducting studies related to hydrogeology, water quality, water use, land use, and population projections; scheduling and coordinating advisory committee meetings; presenting draft materials to the committee for review; responding to comments from the committee; coordinating SEPA review; executing interlocal agreements or other contracts; and other duties as may be necessary. The lead agency shall also prepare a work plan, schedule, and budget for the development of the program that shows the responsibilities and roles of each of the advisory committee members as agreed upon by the committee. Data collection, data analysis and other elements of the program development may be delegated by the lead agency to other advisory committee members.

[7] See Appendix A.

[88] Pursuant to RCW 90.44.420, See Appendix A.

Appendix B—RCW 90.44.410

Requirements for groundwater management programs—Review of programs.

(1) The groundwater area or sub-area management programs shall include:

(a) A description of the specific groundwater area or sub-areas, or separate depth zones within any such area or sub-area, and the relationship of this zone or area to the land use management responsibilities of county government;

(b) A management program based on long-term monitoring and resource management objectives for the area or sub-area;

(c) Identification of water resources and the allocation of the resources to meet state and local needs;

(d) Projection of water supply needs for existing and future identified user groups and beneficial uses;

(e) Identification of water resource management policies and/or practices that may impact the recharge of the designated area or policies that may affect the safe yield and quantity of water available for future appropriation;

(f) Identification of land use and other activities that may impact the quality and efficient use of the groundwater, including domestic, industrial, solid, and other waste disposal, underground storage facilities, or storm water management practices;

(g) The design of the program necessary to manage the resource to assure long-term benefits to the citizens of the state;

(h) Identification of water quality objectives for the aquifer system which recognize existing and future uses of the aquifer and that are in accordance with department of ecology and department of social and health services drinking and surface water quality standards;

(i) Long-term policies and construction practices necessary to protect existing water rights and subsequent facilities installed in accordance with the groundwater area or sub-area management programs and/or other water right procedures;

(j) Annual withdrawal rates and safe yield guidelines which are directed by the long-term management programs that recognize annual variations in aquifer recharge;

(k) A description of conditions and potential conflicts and identification of a program to resolve conflicts with existing water rights;

(l) Alternative management programs to meet future needs and existing conditions, including water conservation plans; and

(m) A process for the periodic review of the groundwater management program and monitoring of the implementation of the program.

(2) The groundwater area or sub-area management programs shall be submitted for review in accordance with the state environmental policy act.

Appendix C—WAC 173-100-100

Groundwater management program content.

The program for each groundwater management area will be tailored to the specific conditions of the area. The following guidelines on program content are intended to serve as a general framework for the program, to be adapted to the particular needs of each area. Each program shall include, as appropriate, the following:

(1) An area characterization section comprised of:

(a) A delineation of the groundwater area, subarea or depth zone boundaries and the rationale for those boundaries;

(b) A map showing the jurisdictional boundaries of all state, local, tribal, and federal governments within the groundwater management area;

(c) Land and water use management authorities, policies, goals and responsibilities of state, local, tribal, and federal governments that may affect the area's groundwater quality and quantity;

(d) A general description of the locale, including a brief description of the topography, geology, climate, population, land use, water use and water resources;

(e) A description of the area's hydrogeology, including the delineation of aquifers, aquitards, hydrogeologic cross-sections, porosity and horizontal and vertical permeability estimates, direction and quantity of groundwater flow, water-table contour and potentiometric maps by aquifer, locations of wells, perennial streams and springs, the locations of aquifer recharge and discharge areas, and the distribution and quantity of natural and man-induced aquifer recharge and discharge;

(f) Characterization of the historical and existing groundwater quality;

(g) Estimates of the historical and current rates of groundwater use and purposes of such use within the area;

(h) Projections of groundwater supply needs and rates of withdrawal based upon alternative population and land use projections;

(i) References including sources of data, methods and accuracy of measurements, quality control used in data collection and measurement programs, and documentation for and construction details of any computer models used.

(2) A problem definition section that discusses land and water use activities potentially affecting the groundwater quality or quantity of the area. These activities may include but are not limited to:

- Commercial, municipal, and industrial discharges
- Underground or surface storage of harmful materials in containers susceptible to leakage
- Accidental spills
- Waste disposal, including liquid, solid, and hazardous waste
- Storm water disposal
- Mining activities
- Application and storage of roadway deicing chemicals

- Agricultural activities
- Artificial recharge of the aquifer by injection wells, seepage ponds, land spreading, or irrigation
- Aquifer over-utilization causing seawater intrusion, other contamination, water table declines or depletion of surface waters
- Improperly constructed or abandoned wells
- Confined animal feeding activities

The discussion should define the extent of the groundwater problems caused or potentially caused by each activity, including effects which may extend across groundwater management area boundaries, supported by as much documentation as possible. The section should analyze historical trends in water quality in terms of their likely causes, document declining water table levels and other water use conflicts, establish the relationship between water withdrawal distribution and rates and water level changes within each aquifer or zone, and predict the likelihood of future problems and conflicts if no action is taken. The discussion should also identify land and water use management policies that affect groundwater quality and quantity in the area. Areas where insufficient data exists to define the nature and extent of existing or potential groundwater problems shall be documented.

(3) A section identifying water quantity and quality goals and objectives for the area which (a) recognize existing and future uses of the aquifer, (b) are in accordance with water quality standards of the department, the department of social and health services, and the federal environmental protection agency, and (c) recognize annual variations in aquifer recharge and other significant hydrogeologic factors;

(4) An alternatives section outlining various land and water use management strategies for reaching the program's goals and objectives that address each of the groundwater problems discussed in the problem definition section. If necessary, alternative data collection and analysis programs shall be defined to enable better characterization of the groundwater and potential quality and quantity problems. Each of the alternative strategies shall be evaluated in terms of feasibility, effectiveness, cost, time and difficulty to implement, and degree of consistency with local comprehensive plans and water management programs such as the coordinated water system plan, the water supply reservation program, and others. The alternative management strategies shall address water conservation, conflicts with existing water rights and minimum instream flow requirements, programs to resolve such conflicts, and long-term policies and construction practices necessary to protect existing water rights and subsequent facilities installed in accordance with the groundwater management area program and/or other water right procedures.

(5) A recommendations section containing those management strategies chosen from the alternatives section that are recommended for implementation. The rationale for choosing these strategies as opposed to the other alternatives identified shall be given;

(6) An implementation section comprised of:

(a) A detailed work plan for implementing each aspect of the groundwater management strategies as presented in the recommendations section. For each recommended management action, the parties responsible for initiating the action and a schedule for implementation shall be identified. Where possible, the implementation plan should include specifically worded statements such as model ordinances, recommended governmental policy statements, interagency agreements,

proposed legislative changes, and proposed amendments to local comprehensive plans, coordinated water system plans, basin management programs, and others as appropriate;

(b) A monitoring system for evaluating the effectiveness of the program;

(c) A process for the periodic review and revision of the groundwater management program.

Appendix D—BMPs Recommended by Irrigated Agriculture Work Group

Best Management Practices for Irrigated Cropland
OB = objective; MT = management target; BMP = best management practice
The IAWG has reviewed the list of BMPs compiled by HDR that could be implemented on irrigated cropland activities which may provide protections to nitrate (N) leaching to groundwater. These include irrigation practices, cropping practices, and N source management (type, quantity, and timing). The IAWG believes that the core BMPs to reduce negative impacts to ground water are 1) managing nutrient inputs to ensure that the 4R's are utilized (right amount, the right source, the right timing, and the right location) (accounting for all sources including soil amendments, compost, biosolids, manure and commercial fertilizer) and 2) irrigation water management. The IAWG felt that these two BMPs had the greatest potential to reduce the problem. They are also beneficial to all parties. The IAWG believes the BMPs included in the table below will not replace the core BMPs above but may provide additional proctections to ground water. The BMPs listed in the table below have a range of applicability in the Lower Yakima Valley GWMA. Some are potentially very effective, some moderately effective, and some that have no applicability in this GWMA. The comments in the right hand column are a compilation of input from the IAWG and are intended to provide the GWAC with some sense of the effectiveness of the BMPs as they would apply to this specific GWMA. The IAWG emphasized that the BMPs are voluntary, not always suited to a particular farm, and still require the judgment of the farm operator to achieve the desired results.

Management Target	Best Management Practices	References	Work Group Comments
MT 1.1.1 Perform irrigation system evaluation and monitoring	BMP 1.1.1.1 Conduct irrigation system performance evaluation	EM 4885 – IP 2.01.03; PNW 293; EM4828	More practical to preform routine maintenance and observe uniformity of coverage.
	BMP 1.1.1.2 Install and use flow meters or other measuring devices to track water volume applied to each field at each irrigation	EM 4885 – IP 2.01.01	Meters not practical; soil moisture sensing devices are used effecively - even required in some cases, to monitor and schedule irrigation.
	BMP 1.1.1.3 Conduct pump performance tests	EM 4885 – IP 2.01.02	Relatively simple and easy to do. Requires an ultrasonic flow meter and pressure gage.
MT 1.1.2 Improve irrigation scheduling	BMP 1.1.2.1 Use weather based irrigation scheduling	EM 4885 – IP 2.01.05, 2.01.06	This is one of the most practical way to help solve the issues. It is now free and easy to do. (http://weather.wsu.edu/is)
	BMP 1.1.2.2 Use plant-based irrigation scheduling	EM 4885 – IP 2.01.05, 2.01.06; EM4821; EB1513	Time consuming to do, unless there are automated sensors. Research is still being done in this area. It is not easy or very accurate.
	BMP 1.1.2.3 Measure soil moisture content to guide irrigation timing and amount	EM 4885 – IP 2.01.05, 2.01.06; PNW0475	Soil moistures sensors are expensive and data-interpretation requires assistance.
	BMP 1.1.2.4 Avoid heavy pre-plant or fallow irrigations		Depends on definition of "heavy"

MT 1.1.3 Improve surface gravity system design and operation	BMP 1.1.3.1 Convert to surge irrigation	EM 4885 – IP 2.02.03; EM4826	A good idea, but requires a certain field setup. Most people who have tried surge, migrate back to conventional rill irrigation. Better to encourage to conversion to sprinkler or drip.
	BMP 1.1.3.2 Use high flow rates initially, then cut back to finish off the irrigation	EM 4885 – IP 2.02.10; EM4828	Good idea, but difficult to implement unless irrigation delivery can be variable.
	BMP 1.1.3.3 Reduce irrigation run distances and decrease set times	EM 4885 – IP 2.02.04; EM4828	Good, but increases labor and equipment costs
	BMP 1.1.3.4 Increase flow uniformity among furrows (e.g., compaction furrows)	EM 4885 – IP 2.02.02	Encourange use of PAM
	BMP 1.1.3.5 Grade fields as uniformly as possible	EM 4885 – IP 2.02.05, 2.02.05	Good but within constraints of topography.
	BMP 1.1.3.6 Where high uniformity and efficiency are not possible, convert to drip, center pivot, or linear move systems	EM 4885 – IP 2.01.08	Good

MT 1.1.4 Improve sprinkler system design and operation	BMP 1.1.4.1 Monitor flow and pressure variations throughout system	EM 4885 – IP 2.03.02	Good idea on district scale (they already do much of this), but logging pressure and flow variation is not cost-effective for individual growers.
	BMP 1.1.4.2 Repair leaks and malfunctioning sprinklers, follow manufacturer recommended replacement intervals	EM 4885 – IP 1.00.05, 2.03.03	Power companies often have monitary energy savings incentives for repair of irrigation systems.
	BMP 1.1.4.3 Operate sprinklers during the least windy periods	EM 4885 – IP 2.03.05	For the most part not possible when water delivered by a major irrigation entitiy.
	BMP 1.1.4.4 Reduce distance between lateral lines or alternate lateral line location over successive irrigations	EM 4885 – IP 2.03.04, 2.03.06	Requires additional moves (labor $) and sometimes additional hardware (e.g. an additional wheel line). Get a good design!
	BMP 1.1.4.5 When pressure variation is excessive, use flow control or pressure regulating nozzles	EM 4885 – IP 2.03.02	Good.
MT 1.1.5 Improve micro-irrigation system design and operation	BMP 1.1.5.1 Use appropriate lateral hose length to improve uniformity	EM 4885 – IP 2.04.02	Good. i.e. get a good and appropriate irrigation system design.
	BMP 1.1.5.2 Check for clogging potential and prevent or correct clogging	EM 4885 – IP 2.04.03	Good and necessary for good crop yields and uniformity.
MT 1.1.6 Make other irrigation infrastructure improvements	BMP 1.1.6.1 Installation of subsurface drains	EM 4885 – IP 5.01.01	Good. When necessary.
	BMP 1.1.6.2 Backflow prevention	EM 4885 – IP 6.00.03, EB1722	Required by law if chemigating.

MT 1.2.1 Modify crop rotation	BMP 1.2.1.1 Grow cover crops	EM 4885 – IP 5.01.01	Good in areas where they are not water limited. Probably not cost effective.
	BMP 1.2.1.2 Include deep-rooted or "nitrogen scavenger" crop species in annual crop rotations	PNW513	Good.
	BMP 1.2.1.3 Grow more crops per year (double cropping)	Bul 869	Utilize extra cropping to utilize excess nutrients on soil
	BMP 1.2.1.4 Include perennial crop rotation	PNW513	Encourage crop rotation
MT 1.2.2 Monitor crops	BMP 1.2.2.1 Monitor crop performance for each field including yield, nitrogen content, estimate of nitrogen removed from field versus remaining in field	NRCS Part 651. Ch. 13, Appendix 13B	Great
MT 1.3.1. Improve rate, timing, and placement of N fertilizers	BMP 1.3.1.1 Adjust nitrogen fertilization rates based on soil nitrate testing	EM 4885 – IP 3.02.01	Great
	BMP 1.3.1.2 Adjust timing of nitrogen fertilization based on plant tissue analysis	EM 4885 – IP 3.02.03	Good.
	BMP 1.3.1.3 Apply nitrogen fertilizer in small multiple doses rather than single large dose	EM 4885 – IP 3.02.05	Great - use chemigation
	BMP 1.3.1.4 Measure nitrate content of irrigation water and adjust fertilizer accordingly	EM 4885 – IP 3.02.02	Very little N in irrigation water. More in rainfall, but that is negligible in the Yakima River Basin.
	BMP 1.3.1.5 Use low rates of foliar nitrogen instead of higher rates applied		This is an OK method for micro-nutrients, but not for macro-nutrients.

MT 1.3.1. Improve rate, timing, and placement of N fertilizers	BMP 1.3.1.6 Vary nitrogen application rates within large fields according to expected needs (precision agriculture)	Peters and Davenport	Good.
	BMP 1.3.1.7 When fertilizing in surface gravity systems, use delayed injection procedures		Chemigating with surface gravity systems is not recommended
	BMP 1.3.1.8 Develop a nitrogen budget that includes crop nitrogen harvest removal, supply of nitrogen from soil, and other inputs	CSU-XCM-173	Good.
	BMP 1.3.1.9 Use controlled release fertilizers, nitrification inhibitors, and urease inhibitors	EM 4885 – IP 3.02.06	Good.
	BMP 1.3.1.10 Assess the risk of contamination of ground and surface water due to fertilizer leaching or runoff	EM 4885 – IP 3.01.01	Good.
	BMP 1.3.1.11 Maintain records of all soil, tissue, and water tests, cropping rotations, yields, and applications (dates, material, method, results)	CSU-XCM-173	Good.
	BMP 1.3.1.12 Develop realistic yield goals	EM 4885 – IP 3.02.07	Good.

MT 1.3.2. Improve rate, timing, and placement of animal manure applications	BMP 1.3.2.1 Apply moderate rates of manure and compost, and use materials with high nitrogen content (inorganic fertilizer) to meet the peak nitrogen demand		Good.
	BMP 1.3.2.2 Incorporate solid manure immediately to decrease ammonia volatilization loss	EM 4885 – IP 3.03.05	Good.
	BMP 1.3.2.3 When applying liquid manure in surface gravity irrigation systems, use the delayed injection procedure to improve application uniformity		Not recommended
	BMP 1.3.2.4 Use quick test methods to monitor dairy lagoon water nitrogen content immediately before and during application, and adjust application rate accordingly		By law, dairies are required to test waste water once in the spring prior to the first application.
	BMP 1.3.2.5 Develop a nitrogen budget that includes crop nitrogen harvest removal, supply of nitrogen from manure, and other inputs	CSU-XCM-173; USU 2010	Good.
	BMP 1.3.2.6 Calibrate solid manure and compost spreaders	EM 4885 – IP 3.03.01; NRCS Part 651. Ch. 13, Appendix 13A	Good.
	BMP 1.3.2.7 Ensure uniformity of application with manure	EM 4885 – IP 3.03.07	Good.
	BMP 1.3.2.8 Do not apply manure to frozen ground, especially sloping fields	EM 4885 – IP 3.03.08	Good. Although this is a surface runoff issue, not a groundwater issue.
	BMP 1.3.2.9 Test manure or other waste materials for nutrient content	EM 4885 – IP 3.02.04; NRCS Part 651. Ch. 13, Appendix 13B	Great
	BMP 1.3.2.10 Use synchronized rate nutrient application of lagoon water to reduce or eliminate the need for fertilizer	NDESC 2005 (II)	

MT 1.3.3. Use fertilizer guides to determine and apply appropriate fertilizer amounted.	BMP 1.3.3.1 Follow recommendations of Fertilizer Guide: Home Vegetable Gardens, Irrigated Central Washington	FG0052	Good.
	BMP 1.3.3.2 Follow recommendations of Fertilizer Guide: Irrigated Alfalfa Central Washington	FG0003	All FG need to be looked at to make sure they are not outdated.
	BMP 1.3.3.3 Follow recommendations of Fertilizer Guide: Irrigated Asparagus	FG0012	Good.
	BMP 1.3.3.4 Follow recommendations of Fertilizer Guide: Irrigated Field Beans for Central Washington	FG0005	Good.
	BMP 1.3.3.5 Follow recommendations of Fertilizer Guide: Irrigated Field Corn for Grain or Silage	FG0006	Good.
	BMP 1.3.3.6 Follow recommendations of Fertilizer Guide: Irrigated Hops for Central Washington	FG0011	Good.
	BMP 1.3.3.7 Follow recommendations of Fertilizer Guide: Irrigated Mint Central Washington	FG0008	Good.
	BMP 1.3.3.8 Follow recommendations of Fertilizer Guide: Irrigated Peas for Central Washington	FG0033	Good.

MT 1.3.3. Use fertilizer guides to determine and apply appropriate fertilizer amounted.	BMP 1.3.3.9 Follow recommendations of Fertilizer Guide: Irrigated Small Grains, Central Washington	FG0009	Good.
	BMP 1.3.3.10 Follow recommendations of Fertilizer Guide: Irrigated Sudangrass Pasture or Silage	FG0036	Good.
	BMP 1.3.3.11 Follow recommendations of Fertilizer Guide: Irrigated Vineyards for Entire State	FG0013	Good.
	BMP 1.3.3.12 Follow recommendations of Fertilizer Guide: Ornamentals, Entire State Except Central Irrigated Washington	FG0049	Does not pertain to Irrigated AG
	BMP 1.3.3.13 Follow recommendations of Fertilizer Guide: Vegetable and Flower Gardens, Except Irrigated Central Washington	FG0050	Does not pertain to Irrigated AG
	BMP 1.3.3.14 Follow recommendations of Fertilizer Guide: Improved Pasture, Hay, Eastern Washington	FG0037	Good.
	BMP 1.3.3.15 Follow recommendations of Fertilizer Guide: Grass Seed for Eastern Washington	FG0038	Good.

MT 1.3.3. Use fertilizer guides to determine and apply appropriate fertilizer amounted.	BMP 1.3.3.16 Follow recommendations of Fertilizer Guide: Barley for Eastern Washington	FG0029	Good.
	BMP 1.3.3.17 Follow recommendations of Fertilizer Guide: Soil Samples/Orchards	FG0028C	Good.
	BMP 1.3.3.18 Follow recommendations of Fertilizer Guide: Instructions for Tree Fruit Leaf Nutrient Analysis	FG0028E	Good.
	BMP 1.3.3.19 Follow recommendations of Fertilizer Guide: Peas and Lentils for Eastern Washington	FG0025	Good.
	BMP 1.3.3.20 Follow recommendations of Fertilizer Guide: Lawns, Playfields and Other Turf, East and Central Washington	FG0024	Good.

MT 1.4.1 Avoid fertilizer material and manure spills during transport, storage, and application	BMP 1.3.4.1 Do not overfill trailers or tanks. Cap or cover loads.	EM 4885 – IP 4.01.06	Good
	BMP 1.3.4.2 When transferring fertilizer, take care not to allow materials to accumulate on the soil		Good.
	BMP 1.3.4.3 Maintain all fertilizer storage facilities and protect them from the weather		Good.

MT 1.4.1 Avoid fertilizer material and manure spills during transport, storage, and application	BMP 1.3.4.4 Clean up fertilizer spills promptly		Good.
	BMP 1.3.4.5 Shut off fertilizer applicators during turns and use check valves		Good.
	BMP 1.3.4.6 Maintain proper calibration of fertilizer application equipment	EM 4885 – IP 3.03.01	Good.
	BMP 1.3.4.7 Create a buffer around wellheads from fertilizer and manure storage, handling, and application	EM 4885 – IP 6.00.02	Good.
	BMP 1.3.4.8 Distribute rinse water from fertilizer application equipment throughout field		Good.
	BMP 1.3.4.9 Avoid manure spills/discharges during transport, storage, and application		Good.
	BMP 1.3.4.10 Prevent back siphonage/flow of chemicals or nutrients down a well after injection	EM 4885 – IP 6.00.03, EB1722	Required by law.
	BMP 1.3.4.11 Identify and properly seal all abandoned and improperly constructed wells	EM 4885 – IP 6.00.04	Good.

Appendix E—BMPs Recommended by Livestock/CAFO Work Group

NRCS Standards Recommended by Livestock/CAFO Work Group	
Title	**Revision Date**
Amendments for Treatment of Agricultural Wastes (591) Standard	1/27/2014
Anaerobic Digester (366) Standard	1/11/2011
Animal Mortality Facility (316) Standard	1/11/2011
Composting Facility (317) Standard	1/11/2011
Dam (402) STANDARD	2/25/2013
Diversion (362) STANDARD	2/25/2013
Feed Management (592) Standard	1/15/2013
Filter Strip (393) Standard	2/11/2015
Heavy Use Area Protection (561) Standard	2/12/2015
Monitoring Well (353) Standard	2/11/2015
Nutrient Management (590) Standard	2/18/2014
Pond Sealing or Lining, Bentonite Sealant (521C) Standard	11/4/2015
Pond Sealing or Lining, Compacted Clay Treatment (521D) Standard	11/4/2015
Pond Sealing or Lining, Flexible Membrane (521A) STANDARD	2/25/2013
Pond Sealing or Lining, Soil Dispersant (521B) Standard	11/4/2015
Pumping Plant (533) Standard	2/12/2015
Roof Runoff Structure (558) STANDARD	2/12/2015

Short Term Storage of Animal Waste and By Products (318) – National NRCS Standard http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1263507.pdf	
Solid/Liquid Waste Separation Facility (632) Statement of Work	1/11/2008
Sprinkler System (442) Standard	11/4/2015
Stream Crossing (578) Standard	2/12/2015
VegetativeTreatment Area (635) Standard	1/29/2016
Waste Facility Closure (360) STANDARD	2/25/2013
Waste Recycling (633) STANDARD	2/25/2013
Waste Separation Facility (632) STANDARD	1/27/2014
Waste Storage Facility (313) Standard	2/11/2015
Waste Transfer (634) Standard	2/12/2015
Waste Treatment (629) Standard	2/12/2015
Waste Treatment Lagoon (359) STANDARD	2/25/2013
Water Well (642) Standard	2/12/2015
Well Decommissioning (351) Standard	2/11/2015
Groundwater Testing (355) Standard	2/11/2015