Section 2 Understanding Environmental Regulations and Procedures for Evaluating Alternative Technologies

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Topics

- Understanding EPA CAFO regulations
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Purpose

For small and medium AFOs, VTSs may provide an option for avoiding classification as a CAFO and the associated permitting process. For large CAFOs, VTS may provide an option for meeting the Effluent Limitation Guidelines (ELG) of the CAFO regulations and obtaining the required environmental permit. A copy of the CAFO regulations can be found at *http://cfpub.epa.gov/npdes/afo/cafofinalrule.cfm*. The information in this section reviews the federal ELG for CAFOs, the performance requirements that a VTS must meet as an alternative technology, and tools currently available for comparing performance of a VTS with the currently accepted baseline technology. State-specific environmental regulations should also be considered in the implementation of alternative technologies.

Caution for large CAFOs

Existing large CAFOs have been required to control open lot runoff and maintain a NPDES permit since the mid-1970s. Open lot beef cattle and dairy operations with more than 1,000 and 700 head capacity, respectively, without an NPDES permit (or letter of exemption) are out of compliance. Additional implementation delays for a runoff control system produce significant legal liability and environmental risk until the date of achieving compliance. If implementation of a VTS will add to this delay, a more conventional system should be strongly considered.

Research and field performance studies on VTS have been done exclusively on smaller open lot systems. At the time of this document, no performance evaluations of VTS on large CAFOs have been conducted. The design, siting, and management recommendations are the combined best professional judgment of a team of researchers from land grant university and ARS, field engineers from NRCS and private sector, and regulatory representatives. Those recommendations target VTS application to large CAFOs based upon the currently available knowledge.

However, if the recommendations contained in this document are carefully followed, producers and design consultants must recognize that permitting of a VTS on large CAFOs will include a burden of proof not required of a baseline technology. In addition, there are risks associated with alternative technologies if that burden of proof is not met during the design phase or in field performance is less than predicted during the operation of the VTS.

Understanding the CAFO regulations

Large CAFOs

The EPA CAFO ELG, published on February 12, 2003, are applicable to operations that meet the definition of a large CAFO. The CAFO ELG establishes the technology-based standards that must be included in NPDES permits for large CAFOs (more than 1,000 beef feeders or dairy heifers or 700 mature dairy cattle). For beef or dairy CAFOs that are below these sizes, the CAFO ELG does not apply, and the permit writer will develop effluent limitations for the permit on a case-by-case basis. If these technology-based effluent limitations are not stringent enough to assure that in-stream Water Quality Standards are maintained, water-quality-based limits or conditions must be included in the permit.

The ELG includes specific requirements for both the production areas and land application areas under the control of the CAFO owner or operator. A large CAFO must not discharge manure or process wastewater pollutants from the production area except in accordance with a narrowly defined exception. Discharges due to precipitation-caused overflow are allowed if specific design, construction, and management criteria are met. A limited amount of overflow (due to extreme rainfall events) can be authorized in a permit

Baseline ELG and exceptions

ELGs for the production area for dairy cows and cattle states that there must be no discharge of manure, liter, or process wastewater pollutants into water in the United States from the production *except* when precipitation causes an overflow, and the

- Production area is designed, constructed, operated, and maintained to contain all manure, litter, and process wastewater including the runoff and the direct precipitation from a 25-year, 24-hour rainfall event
- Production area is operated in accordance with the additional measures required for visual inspections, depth markers, corrective actions for deficiencies identified from inspections, proper disposal of mortalities, record keeping (inspections, depth of impoundment, correction of deficiencies, mortality, storage structure design)

from a system that meets the exception. No discharges are allowed in the absence of a properly designed, constructed, operated, and maintained storage structure.

The CAFO can request that voluntary alternative performance standards be used as the basis for its NPDES permit requirements instead of the ELG requirements as described above. VTS applications on large CAFOs must meet the criteria established under these provisions. Those criteria will be described later.

Small and medium CAFOs

AFOs can be defined as a medium CAFO (300–999 beef feeders or dairy heifers or 200–699 mature dairy cows) if confined animals are in contact with water bodies of the United States or if a constructed ditch or pipe carries manure, wastewater, or runoff from the animal housing or feeding area to the water. An AFO can be designated as a small CAFO (< 300 beef feeders or dairy heifers or < 200 mature dairy cows) if either of the previously mentioned situations exist and the regulatory authority determines that the operation is contributing significant pollutants to surface water.

For small or medium CAFOs, the ELG described for the large CAFO does not apply. The permit writer will develop effluent limitations for these permitted facilities based upon best professional judgment. A system based upon a VTS can be used in place of the standard holding pond system if the permitting authority agrees to the site-specific application of the VTS. At a minimum, an onsite inspection by the permitting authority would be needed to verify the acceptability of a VTS.

AFOs can avoid being defined or designated as a CAFO if any direct connection for runoff from an open lot to surface water can be eliminated. VTS provides one alternative for eliminating a direct connection if properly designed and managed.

AFOs

Smaller animal feeding operations that are not defined as CAFOs are not required to meet the CAFO ELG. However, steps should be taken by any size of open lot facility to minimize the risk to water quality from precipitation related runoff. Depending upon the site conditions at a specific AFO, a VTS may be a low-cost alternative for minimizing runoff related water quality risks.

State-specific requirements

State livestock regulatory programs can be more stringent or have additional requirements than those mandated by the EPA CAFO NPDES permit program and regulations. Producers should always identify both the NPDES permit requirements and any additional state-specific requirements before deciding what type of runoff control system to build and operate. They should also be aware of any state construction permits required before system construction. Additionally, if more than 1 acre is to be disturbed during construction of the system, an NPDES storm water permit is also necessary.

EPA regulations address surface water quality issues only. Many state regulations also address ground water issues. Those regulations may include requirements for maximum seepage rates from manure storage facilities, ground water monitoring requirements, and minimum separation distances to wells (including abandoned wells) and ground water or geology that creates a direct connection to ground water (bedrock or karst topography). Planning of a VTS should include an evaluation of ground water risks and state environmental regulations specific to ground water.

Performance requirements for alternative technologies

A large CAFO can request that *voluntary alternative performance standards* be used as the basis for its NPDES permit requirements instead of the ELG requirements. Any alternative technology proposed for a CAFO must meet at least the performance of the baseline ELG. Since the production area baseline ELG provides for no discharge except in specified circumstances, the target for the alternative standard performance should take into account those circumstances where authorized discharges do occur under the baseline ELG.

The EPA CAFO regulations accomplish this primarily by requiring calculation of the median annual overflow volume based on 25 years of actual rainfall data. Using this volume and data on pollutants in the overflow, a predicted average annual discharge of pollutants is calculated. This is the target that the alternative technology must be designed to meet. The quantity of pollutants discharged from the production area using the alternative technology must be equal to or less than the quantity of pollutants that would be discharged under the baseline ELG. Both the analysis of the baseline performance and the alternative technology performance must be done on a site-specific basis.

A VTS represents one alternative technology for managing runoff from open lot livestock systems. Iowa State University faculty developed computer models with appropriate weather data sets for several High Plains and Corn Belt locations to assist producers in comparing a VTS with a baseline system (runoff storage pond). If the appropriate documentation can demonstrate equal or better performance for the VTS, an NPDES permit for the alternative technology can be issued.

Voluntary alternative performance standards

A large CAFO seeking permit conditions based on the voluntary alternative performance standards must establish the predicted discharge of the:

- Baseline ELG (the narrowly defined exception)
- Proposed alternative technologies and management practices result

The documentation must demonstrate that the proposed alternative will achieve a discharge from the production area equal to or less than quantity of pollutants that would be discharged under the baseline ELG. This would be done by the large CAFO submitting technical analyses and other relevant information and data as specified in the regulations.

Establishing baseline ELG performance

The CAFO ELG is specific about the comparison that must be done in determining what performance a voluntary alternative performance standard must meet. The supporting technical analysis must include calculation of the quantity of pollutants discharged from the baseline or conventional technology on a mass basis, where appropriate. The technical analysis of the discharge of pollutants must include (Section 412.21 for Voluntary Alternative Performance Standards, Concentrated Animal Feeding Operations Point Source Category, Federal Register, Vol. 68 No 29, February 12, 2003):

- All daily inputs to the storage system including manure, litter, all process wastewaters, direct precipitation, and runoff. For most open lots, only direct precipitation, runoff, and milking parlor process water (for dairies) are directed to the holding pond.
- All daily outputs from the storage system, including losses due to evaporation, sludge removal, and the removal of wastewater for use on cropland at the CAFO or transport off site.
- A calculation determining the predicted median annual overflow volume based on a 25-year period of actual rainfall data applicable to the site. If (and only if) the median is zero, the facility may use the 25-year mean (average over 25-yr period of analysis) to determine baseline best available technology (BAT).
- Site-specific pollutant data, including nitrogen (N), phosphorus (P), 5-day biochemical oxygen demand (BOD_5), total suspended solids (TSS), for the CAFO from representative sampling and analysis of all sources of input to the storage system, or other appropriate pollutant data.
- Predicted annual average discharge of pollutants, expressed where appropriate, as a mass discharge on a daily basis (lb/d), and calculated considering above data.

Thus, the *target* for the alternative system is the performance of the baseline or conventional technology.

This target must be quantified, by regulation, in terms of a mass discharge on a daily basis (lb/d) where appropriate). It must include at least the pollutants of N, P, BOD_5, and TSS.

The performance model of the baseline technology must be based upon a conventional holding pond sized to meet the minimum ELGs of the CAFO regulations. The ELG states that the containment facility must be "designed, constructed, operated, and maintained to contain all manure, litter, and process wastewater including the runoff and the direct precipitation from a 25-year, 24-hour rainfall event." Additional ELG requirements identify the specific visual inspection and record keeping requirements associated with this baseline technology. The modeled performance must be for a baseline system that meets these size and management requirements.

For sizing of a runoff holding pond, accepted engineering design procedures should be followed such as those detailed in section 10 of the USDA Agricultural Waste Management Field Handbook (Soil Conservation Service 1992), ASAE's Manure Storages standard (ASAE 2004), or software design tools such as Animal Waste Management software (NRCS 2005).

Comparing VTS systems against baseline ELG performance

A similar analysis of performance for the alternative technology to that described for the baseline technology must be performed. As one can surmise from this information, the regulations are written so that it is not straight forward to make a comparison when the discharge from a proposed alternative system, such as a VTS, is weather and site condition dependant, rather than being a consistent discharge that occurs everyday. To make the comparison, modeling of the performance of a VTS will be necessary. Since the acceptance of any alternative system is a site-specific decision to be made by the permitting authority, agreement should be reached with the permitting authority about what documentation is needed as early in the process as possible.

This demonstration of equal or better performance of a VTS to the baseline technology must be provided to the permitting authority as of the date of the permit coverage. For existing facilities, the VTS shall attain a performance level that meets the ELGs for the baseline technology by the date of the permit coverage (see paragraph 412.31 (a) of the CAFO regulations, *http://cfpub.epa.gov/npdes/afo/cafofinalrule.cfm*).

Tools for predicting VTS and baseline performance

Predicting baseline system performance

A computer model was originally developed by Kansas State University (Koelliker et al. 1975) to predict the portion of runoff controlled by the baseline technology defined in the ELG (runoff holding pond and irrigation system). The same model was more recently adapted to current computer technology by Iowa State University (Wulf et al. 2003) and is being used to model performance for EPA baseline technology. The Iowa State University model is one option for predicting the performance of a baseline technology for an individual farm. An example from the Iowa State University model is illustrated in table 2–1(a) for the baseline technology.

Based upon this model, researchers have predicted that the baseline technology has a greater risk of an unplanned release of runoff in climates with higher precipitation (fig. 2–1). A well-managed baseline technology using current design requirements specified in the CAFO ELG performs well under the lower rainfall conditions of the High Plains where field conditions commonly exist for irrigation of runoff from the holding pond. However, the model also suggests that in climates with higher precipitation and lower evaporation rates (Corn Belt states), fewer opportunities exist for land application of runoff. Under this scenario, a higher frequency of unplanned releases will most likely occur in higher rainfall regions. For additional information on the performance of baseline systems, refer to the literature review in section 9.

Predicting VTS performance

An Iowa State University VTS software-modeling tool predicts the performance of a site-specific VTS following the Alternative Voluntary Performance Standards described by the ELG of the new EPA CAFO rules (table 2–1(b)). The VTS model performs site-specific modeling using daily weather inputs to estimate the performance of VTS coupled to specific feedlots and VTS designs. The model is run for 25 weather years so that the performance of the alternative VTS (median VTS outflow for 25-year period multiplied by pollutant concentration) can be compared to the performance (median overflow for 25-year period multiplied by pollutant concentrations) of a baseline containment system at the same site. VTS model outputs include runoff and four pollutants into and out of the VTS along with the percentage of runoff controlled. User inputs into the VTS model include feedlot area, feedlot slope, feedlot length/width ratio, settling basin (if selected) depth, settling basin capacity, and settling basin outlet pipe diameter. If a settling basin is not selected, a settling bench is assumed by the model. The VTS also has the following user inputs for the vegetative component:

- VTA length
- VTA width
- VTA slope
- VTA vegetation (from a database internal to the model, expandable)
- VTA soil macroporosity
- VTA soil type (from a database internal to the model, expandable)

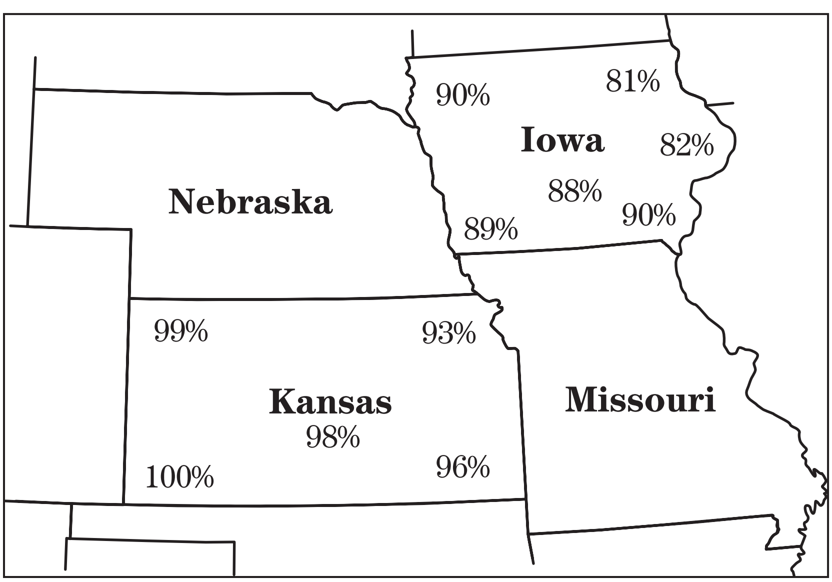
The soils database currently contains soil parameters for about 80 specific soils and 14 soil classes (loam, silty clay loam, sandy clay) with the potential to add additional soils.

The VTS model is primarily used as a model to estimate the performance of a VTS. It can be used as a tool to evaluate the importance of infiltration area of the VTA and release rate from the settling basin for a specific feedlot through one or more runs of the model. From such an evaluation, a preferred VTA size and release rate for an individual site can be identified.

After final VTS design has been completed, the VTS model is then run for each of the 25 years and the predicted average annual discharge of pollutants in the VTS outflow over this time period calculated. An acceptable system has been identified if this design results in equal or less discharge than the median (or mean) overflow from the baseline containment system at the same site.

This software has been approved by EPA as one option for the documentation necessary for an NPDES application for an alternative technology. This software is available from the Agricultural and Biosystems Engineering Department at Iowa State University, Ames, Iowa.

Figure 2–1 KS and IA studies suggest that the degree of runoff control (shown as a percent of total runoff volume) varies with region (typically related to annual precipitation) for the baseline holding pond and irrigation runoff control technologies as defined by the ELG for large CAFOs (Koelliker et al. 1975; Wulf et al. 2003). The runoff control values are conceptual examples and do not represent the site-specific performance of holding pond-based systems.



Comparing the baseline and VTS performance

To complete this process, the results of the baseline and VTS performance must be compared (table 2–1(c)). At a minimum, the comparison must include four potential pollutants including total nitrogen, ammonium, total phosphorus, and biochemical oxygen demand. The regulations suggest that a comparison be made of the median annual value over the 25-year period for the mass of each pollutant in the unplanned runoff. If (and only if) the median is zero, the facility may use the 25-year mean (average over 25-yr period of analysis) to determine baseline best available technology.

At the time of this report, final development and validation of these models were being completed by Iowa State University. For the immediate future, requests for application of these models to individual farms should be made directly to the Agricultural and Biosystems Engineering Department at (515) 294-1434.

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Table 2–1(a) Sample comparison of baseline technology with alternative technology required from the individual livestock operation by the permitting authority to determine the appropriateness of granting an NPDES permit based upon an alternative technology (Lorimor and Wulf 2004)

Baseline System: Containment System Runoff Control Performance for Prime Rib Ranch (5.5-a feedlot) located in Anytown, USA.

	Precipitation (in)	Runoff (in)	Overflow (in)	Overflow (days)	Runoff control (%)	Land applied (in)	Pump (days)	Ending pond volume (ft^3)	Nutrients in feedlot runoff (lb/yr)				Nutrients in unplanned release (lb/yr)				Nutrient Control (%)
									TKN	NH_3^+	PO_4	BOD_5	TKN	NH_3^+	PO_4	BOD_5	
1970	31.64	10.59	0.00	0	100.0	10.40	21	10099	6801	5282	6602	80550	0	0	0	0	100.0
1971	28.82	10.83	0.00	0	100.0	9.90	20	31690	6951	5399	6749	82333	0	0	0	0	100.0
1972	31.07	9.82	0.00	0	108.0	8.91	18	45298	6304	4896	6120	74670	0	0	0	0	100.0
1973	60.88	32.05	9.30	16	71.0	24.75	50	58374	20574	15980	19975	243692	5333	4142	5178	63172	74.1
1974	31.30	11.20	0.00	0	100.0	13.86	28						0	0	0	0	100.0
1975	29.08	10.21	[illegible]	[illegible]	[illegible]	[illegible]	16	54123	6556	5092	6365	77652	0	0	0	0	100.0
1976	20.90	6.26	[illegible]	[illegible]	[illegible]	[illegible]	15	4097	4016	3119	3899	47565	0	0	0	0	100.0
1977	48.48	21.63	[illegible]	[illegible]	[illegible]	[illegible]	40	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1697	1318	1648	20104	87.8
1978	31.00	13.48	[illegible]	[illegible]	[illegible]	[illegible]	26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	0	0	0	100.0
1979	35.01	13.14	[illegible]	[illegible]	[illegible]	[illegible]	28	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	0	0	0	100.0
1980	32.04	15.09	[illegible]	[illegible]	[illegible]	[illegible]	30	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	0	0	0	100.0
1981	40.57	15.88	[illegible]	[illegible]	[illegible]	[illegible]	30	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1332	1034	1293	15774	86.9
1982	38.26	12.72	1.74	2	[illegible]	[illegible]	23	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	990	769	961	11726	87.9
1983	36.54	13.30	0.00	0	100.0	13.37	27	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	0	0	0	100.0
1984	37.45	12.82	0.32	1	97.5	12.87	26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	184	143	178	2176	97.8
1985	45.11	16.92	2.57	3	84.8	15.84	32	16926	10860	8435	10544	128637	1451	1127	1409	17184	86.6
1986	37.39	13.88	0.00	0	100.0	15.35	31	797	8909	6920	8650	105529	0	0	0	0	100.0
1987	36.96	12.30	0.00	0	100.0	11.88	24	13599	7893	6131	7664	93495	0	0	0	0	100.0
1988	19.42	6.38	0.00	0	100.0	5.94	12	5438	4096	3181	3977	48516	0	0	0	0	100.0
1989	38.72	18.56	4.39	4	76.4	14.85	30	6126	11915	9254	11568	141127	2517	1955	2443	29810	78.9
1990	33.90	10.63	0.00	0	100.0	10.89	22	305	6822	5299	6623	80804	0	0	0	0	100.0
1991	29.46	9.17	0.00	0	100.0	7.92	16	20262	5885	4571	5713	69703	0	0	0	0	100.0
1992	36.18	12.40	0.00	0	100.0	10.40	21	72076	7961	6183	7729	94296	0	0	0	0	100.0
1993	35.33	13.84	1.80	4	87.0	15.35	31	2939	8885	6901	8626	105234	1105	858	1073	13087	87.6
1994	27.75	9.05	0.00	0	100.0	8.42	17	2029	5811	4514	5642	68834	0	0	0	0	100.0
1995	36.04	13.33	3.09	7	76.8	9.90	20	4044	8558	6647	8309	101372	1744	1354	1693	20653	79.6

Performance of baseline technology must be predicted for the farm upon which an alternative technology is being reviewed for an NPDES permit.

Performance of baseline technology and VTS must be predicted for total nitrogen, ammonium, phosphorus, and biochemical oxygen demand.

Containment summary

Mean	**34.97**	**13.29**	**1.09**	**1.81**	**94.3**	**12.5**	**25.2**	**17473**	**8530**	**6625**	**8281**	**101032**	**629**	**488**	**611**	**7449**	**94.9**
Median	**35.17**	**12.77**	**0.00**	**0.00**	**100.0**	**12.4**	**25.0**	**10315**	**8198**	**6368**	**7959**	**97106**	**0**	**0**	**0**	**0**	**100.0**

Table 2–1(b) Sample comparison of baseline technology with alternative technology—Continued

Alternative Technology: VTS Performance for Prime Rib Ranch (5.5 acre feedlot) located in Anytown, USA.
260-foot-long x 800-foot-wide VTS in Elmont soil located below a 5.5-acre feedlot with a 20-foot-wide settling bench.

		Feedlot runoff				Nutrients in runoff (lb/yr)				Nutrients in unplanned release (lb/yr)			
	Precipitation (in)	Total (in)	Snow melt (in)	VTA runoff (in)	Runoff control (%)	TKN	NH_3	PO_4	BOD_5	TKN	NH_3^+	PO_4	BOD_5
1970	31.64	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1971	28.82	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1972	31.07	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0
1973	60.88	[illegible]	[illegible]	[illegible]	[illegible]	18776	14583	18229	222396	340	192	240	3664
1974	31.30	9.98	0.28	0	100.0	6867	5533	6917	84384	0	0	0	0
1975	29.08	7.15	1.77	0	100.0	4591	3566	4457	54376	0	0	0	0
1976	20.90	[illegible]	[illegible]	[illegible]	[illegible]	3531	2743	3429	41828	0	0	0	0
1977	48.48	[illegible]	[illegible]	[illegible]	[illegible]	13924	10815	13519	164927	113	64	80	1216
1978	31.00	[illegible]	[illegible]	[illegible]	[illegible]	7575	5884	7355	89725	41	23	29	441
1979	35.01	[illegible]	[illegible]	[illegible]	[illegible]	7757	6025	7531	91884	0	0	0	0
1980	32.04	[illegible]	[illegible]	[illegible]	[illegible]	10470	8132	10165	124019	37	22	27	397
1981	40.57	15.68	0.00	0	100.0	10066	7818	9773	119228	0	0	0	0
1982	38.26	11.29	0.51	0	100.0	7244	5626	7033	85801	0	0	0	0
1983	36.54	11.63	0.33	0	100.0	7466	5799	7249	88433	0	0	0	0
1984	37.45	11.71	1.65	1.00	91.5	7466	5799	7249	88434	141	80	100	1520
1985	45.11	15.61	0.17	0.08	99.5	10021	7783	9729	118696	0	0	0	0
1986	37.39	12.28	0.08	0	100.0	7883	6123	7654	93375	0	0	0	0
1987	36.96	12.25	0.61	0.81	93.4	7864	6108	7635	93147	114	89	111	1355
1988	19.42	5.58	0.17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	0	0	0
1989	38.72	18.34	0.16	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	75	94	1429
1990	33.90	10.70	0.02	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	0	0	0
1991	29.46	7.48	1.20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	0	0	0
1992	36.18	9.97	0.78	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1	1	1	15
1993	35.33	13.82	0.00	0	100.0	8872	6891	8614	105085	0	0	0	0
1994	27.75	8.60	0.05	0.14	98.4	5527	4293	5366	65469	20	15	19	234
1995	36.04	15.53	0.31	0	100.0	9957	77.33	9667	117936	0	0	0	0
Mean	34.97	12.34	0.53	0.26	98.5	7947	6180	7725	94242	36	22	27	395
Median	35.15	11.67	0.36	0	100.0	7466	5799	7249	88433	0	0	0	0

Performance of alternative technology must be predicted for the same farm.

Performance modeling must be site-specific for an individual farm.

Performance for baseline and alternative technology must be predicted for a 25-yr period based upon records from nearby weather station.

The documentation must demonstrate that the proposed alternative will achieve a discharge from the production area of equal or less quantity of pollutants to that of the baseline ELG (table 2–1, part A).

Table 2–1(c) Sample comparison of baseline technology with alternative technology—Continued

Comparison of unplanned runoff from containment system vs. VTS for Prime Rib Ranch (5.5-a feedlot) located in Anytown, USA.

Year	Containment runoff control (%)	VTS runoff control (%)	TKN containment	VTS	NH_4+ containment	VTS	PO_4 containment	VTS	BOD_5 containment	VTS
1970	100.0	100.0	0	0	0	0	0	0	0	0
1971	100.0	100.0	0	0	0	0	0	0	0	0
1972	100.0	100.0	0	0	0	0	0	0	0	0
1973	71.0	91.8	5333	340	4142	192	5178	240	63172	3664
1974	100.0	100.0	0	0	0	0	0	0	0	0
1975	100.0	100.0	0	0	0	0	0	0	0	0
1976	100.0	100.0	0	0	0	0	0	0	0	0
1977	86.4	96.3	1697	113	1318	64	1648	80	20104	1216
1978	100.0	97.6	0	41	0	23	0	29	0	441
1979	100.0	100.0	0	0	0	0	0	0	0	0
1980	100.0	98.2	0	37	0	22	0	27	0	397
1981	85.7	100.0	1332	0	134	0	1293	0	15774	0
1982	86.3	100.0	990	0	769	0	961	0	11726	0
1983	100.0	100.0	0	0	0	0	0	0	0	0
1984	97.5	91.5	[illegible]	[illegible]	[illegible]	80	178	100	276	1520
1985	84.8	99.5	[illegible]	[illegible]	[illegible]	0	109	0	17184	0
1986	100.0	100.0	[illegible]	[illegible]	[illegible]	0	0	0	0	0
1987	100.0	93.4	[illegible]	[illegible]	[illegible]	89	0	111	0	1355
1988	100.0	100.0	[illegible]	[illegible]	[illegible]	0	0	0	0	0
1989	76.4	94.9	[illegible]	[illegible]	[illegible]	75	2443	94	29810	1429
1990	100.0	100.0	[illegible]	[illegible]	[illegible]	0	0	0	0	0
1991	100.0	100.0	[illegible]	[illegible]	[illegible]	0	0	0	0	0
1992	100.0	99.9	[illegible]	[illegible]	[illegible]	1	0	1	0	15
1993	87.0	100.0	[illegible]	[illegible]	[illegible]	0	1073	0	13087	0
1994	100.0	98.4	[illegible]	[illegible]	[illegible]	15	0	19	0	234
1995	76.8	100.0	1,744	0	1554	0	1693	0	20653	0
Mean	94.3	98.5	629	36	488	22	611	27	7449	395
Median	100.0	100.0	0	0	0	0	0	0	0	0

A calculation determining the predicted median annual overflow volume based on a 25-yr period of actual rainfall data applicable to the site is made. If (and only if) the median is zero, the facility may use the 25-yr mean (average over 25-yr period of analysis) to determine baseline BAT.

For this example, the means would be compared. The predictive model suggests that VTS will perform better than the conventional technology.