

Congratulation
to all City of
Richmond employees
on their successful
certification with
NBP EMS Program



Biosolids Management Program Performance Report

The Environmental Management System (EMS) approach proved to be a good fit for the goals set by the facility for good quality production of biosolids. Biosolids are the organic products resulting from the treatment of domestic sewage in a treatment facility and are rich in nutrients. According to USEPA, they can be safely recycled and applied as fertilizer to sustainably improve and maintain productive soils and stimulate plant growth. The EMS is a structured program comprised of elements that cover all aspects of biosolids management including - process efficiency, communication with interested stakeholders, and training along with other crucial factors.

Consistent with the City's Environmental Policy Statement, the Richmond Wastewater Treatment Plant is committed to the following principles of conduct set forth in the Code of Good Practice. The treatment plant focuses its available resources to produce Class B Biosolids. The treatment plant strives to maintain, improve, and protect the environment through its treatment/production of biosolids. The treatment plant makes every effort to ensure that the public is not endangered by the treatment/production of biosolids at the treatment plant during transportation, storage or application at permitted sites. The treatment plant shall obey all applicable federal, state, county, and local laws, rules, and regulations. We pledge to "do the right thing" and uphold the following principles of conduct.

A- COMPLIANCE:

To commit to compliance with all applicable federal, state, and local requirements regarding production at the wastewater treatment facility, the Richmond Wastewater Treatment Plant facility has elected to:

- 1) Meet concentration limits,
- 2) Meet class "B" pathogen standards;
- 3) Achieve 38% volatile solids reduction for vector control

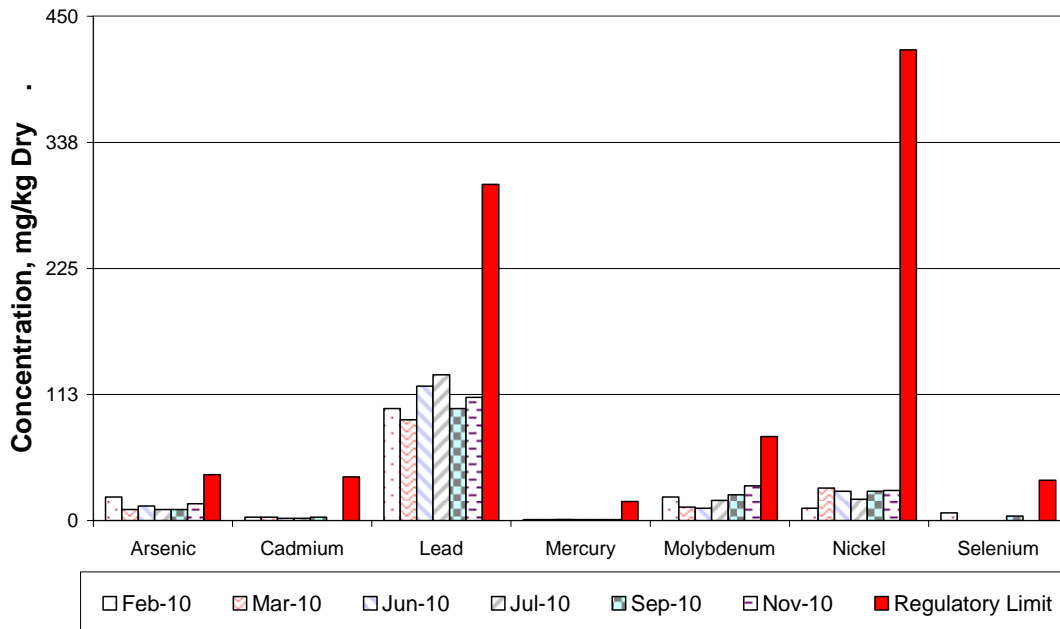
As treatment for its anaerobically digested biosolids, Primary biosolids is collected from our primary clarifiers, grit removed by hydro-grit units and thickened in four gravity thickeners. Waste activated sludge is pulled from the return biosolids stream and thickened in four thickening centrifuges (some sent to gravity thickeners as a means of fine tuning solids retention). Biosolids is then pumped to one of the five anaerobic

digesters then to another holding digester. Overflow from the digesters is stored in one of the 2 biosolids storage tanks and pumped to one of the five dewatering centrifuges where polymer is added. Once dewatered, biosolids is stored on the plant's storage pads and then hauled to a land application site by a hauling/land application contractor (New contract signed with Recyc system in Dec, 2010).

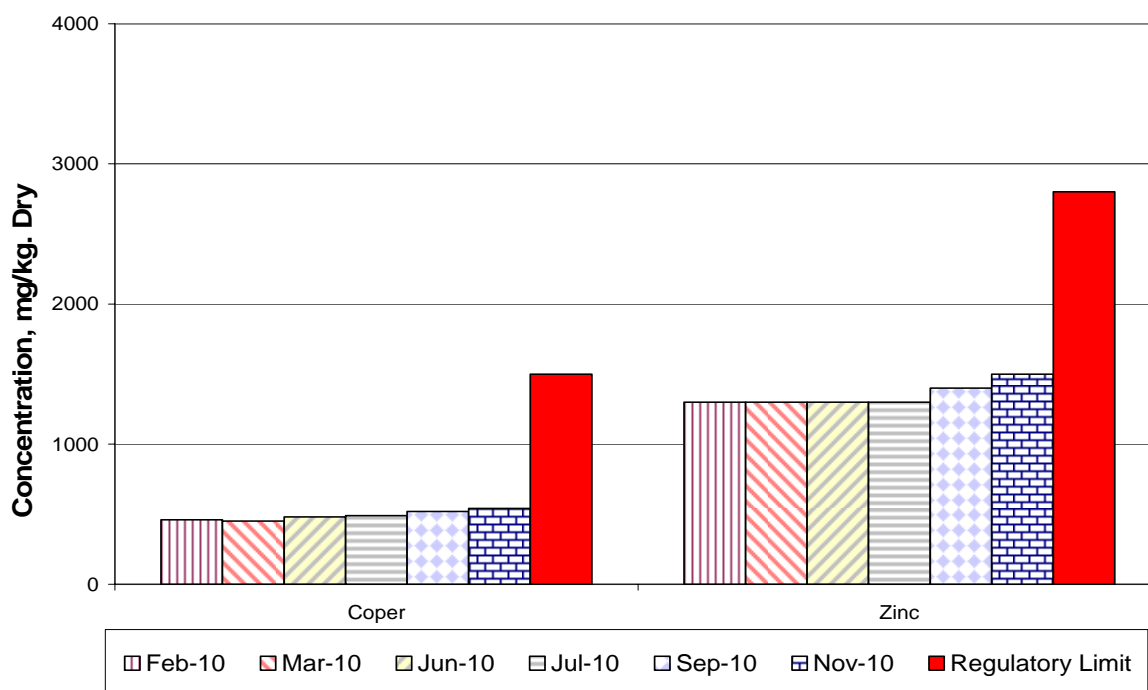
1- Concentration Limits.

All metal analytical results were under the required concentration limits as shown below on the chart (chromium is no longer required per EPA staff).

2010 Biosolids Metals



2010 Biosolids Metals



2- Pathogen Reduction:

The temperature optimum required for microorganisms to stabilize the organic matter is 95F.

Therefore the monthly average temperature and detention time must be above 95F and 15 days respectively to comply with the federal regulation [40 CFR 503.32(b) (3)].

In 2010, the EMS biosolids team has set a goal to maintain the digesters' temperature above 95F every day by monitoring the facility properly 24 hours. This goal was accomplished 99.2% during 2010; however, all monthly averages met standards (i.e. all above 95°F and 15 days detention time).

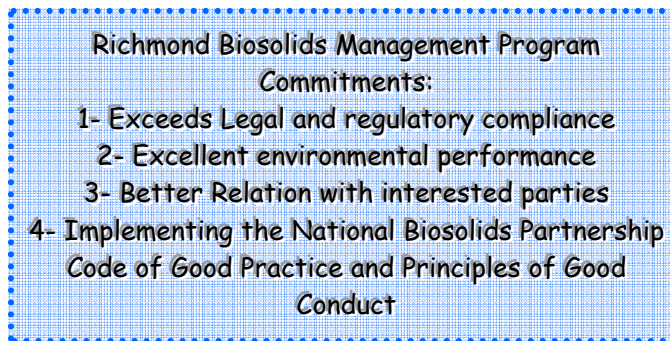
3- Vector Attraction Reduction: [40 CFR 503.33(b) (1)/alt (10)].

Samples are pulled at least 1x/2 months; if the reduction is less than 38% additional samples are pulled until 38% is achieved as directed by EPA personnel; sludge failing to realize a 38% reduction (i.e. between testing) is incorporated into the ground within six hours.

B- PRODUCT & QUALITY MONITORING:

To provide biosolids that meets the applicable standards for their intended use or disposal, the Richmond Biosolids program is built around the concept of beneficial reuse of nutrients contained within the biosolids produced from our treatment process. During 2010, we recycled 18538 tons of class B biosolids for our agricultural customers in rural Virginia.

The City of Richmond Biosolids quality meets or surpasses the applicable regulatory compliance requirements, as mentioned in the chart above.



C- ENVIRONMENTAL MANAGEMENT SYSTEM:

To develop an Environmental Management System for biosolids that includes a method of internal audit and independent third-party verification to ensure effective ongoing biosolids operations.

AUDIT FINDING

In 2009, the City of Richmond has conducted an EMS Biosolids internal audit by trained personnel.

In November 2010, the NSF-International Strategic Registrations, Ltd. (NSF-ISR) conducted a third party verification audit of the City of Richmond's Wastewater Biosolids Environmental Management System. The verification began with a document review desk audit and operational readiness review (ORR) completed in early November. The process continued with an on-site verification audit from 13 December through 17 December 2010.

The physical biosolids facilities included in the audit and visited during the operational readiness review and verification audit included the Richmond Wastewater Treatment Plant, specifically the following critical control points of the biosolids value chain: hauled waste discharge point, bar screens, grit removal system, primary settling tanks, primary

solids grit removal cyclones, primary solids gravity thickening tanks, activated sludge aeration tanks, secondary clarifiers, waste-activated sludge centrifuges, anaerobic digesters, two biosolids storage tanks, final dewatering centrifuges, truck biosolids loading facilities, and concrete pad biosolids storage area. Additionally the following land application sites were observed: James River Correctional Facility land application site 46B in Powhatan County and the David E. Hawkes land application sites NWDEH 9-12 in Nottoway County.

The results of the desk audit/ORR provided a number of observations and opportunities for improvement. This initial effort resulted in 7 observations and 12 opportunities for improvement and four positive commendations.

Most of the observations identified during the desk audit/ORR were found to have been corrected at the time of the verification audit. In addition, almost all of the opportunities for improvement identified during the initial audit/review were also addressed.

The verification audit covered all elements of the standard in considerably greater detail than the desk audit/ORR. The former was performed by one auditor over a period of five days and the results demonstrated an improvement in the system. The verification audit found 4 minor non-conformances, 11 opportunities for improvement and 5 commendations or positive observations. For an environmental management system, which is more challenging than the ISO 14001 standard, this is an impressive accomplishment.

Positive Observations

The City of Richmond Wastewater Treatment Plant Biosolids Value Chain personnel involved in the biosolids environmental management system development should be recognized for their outstanding achievements, and the exceptional features of their Biosolids EMS. The following are those observations made during the audit that deserve commendations.

- The Facility has developed an excellent use of internet links to various web sites which present sources of information related to federal and state regulations
- The city participates in a benchmark program for training their internal EMS auditors. It is the highest level of EMS training observed in the NBP program.
- The city personnel have prepared excellent and detailed set of Standard Operating Procedures (SOPs) for operations of biosolids critical control points.

- The land application contractor, Recyc, has prepared exemplary "Site Books" for each of the land application sites over which they have control. These books go above and beyond the basic legal requirements for biosolids land application.
- The audit checklist developed for the internal audit is a model which could be used by all organizations interested in the biosolids EMS program.

Minor Non-conformances

1- Requirements 4.2 and 1.6 - Table 4.1 represents general broad regulations and permits. The information given does not clearly include or cross-reference what specific standards, limits, etc. the facility must meet in order to be in compliance; or the operational controls, procedures, processes, and other management methods used to achieve and maintain compliance. Presently in the table there are no specific detailed legal reference to those applicable sections of 40 CFR 503 regulations, the State of Virginia Land Application Regulations, the land application section of the City of Richmond VPDES Permit and the specific regulations that apply to the contractors land application permit/operations.

2- Requirement 8.4 - The loading and hauling subcontractor has not received the required biosolids critical control point training and EMS awareness training.

3- Requirement 12.2 - The EMS procedure 12 does not precisely describe the exact method that is used for properly marking the EMS manual and Standard Operating Procedure documents with version numbers, effective dates, and references to replaced or superseded versions (revision histories), etc.

Requirement 15.1 - The periodic biosolids program and EMS performance reports prepared for 2008 and 2009 did not contain summaries of the performance of the biosolids program relative to the goals and objectives and the progress made in each of the required four outcome areas. Also a specific detailed summary of how the city performed in meeting each of the regulatory requirements associated with Class B biosolids production and land application were not included.

Opportunities for Improvement

1- Requirement 1 - Consider performing a global search and replace throughout the EMS manual for the term "sludge" and substitute the terms "solids" or "biosolids" where appropriate.

2- Requirement 3 - In the column of Table 3.1 that addresses "responsible staff" consider including the City of Richmond position responsible for overseeing the land application contractor for those critical control points assigned to the contractor.

3- Requirement 3.2 - The last column in Table 3.1 entitled "potential environmental impacts" is excellent in identifying operational impacts associated with critical control points, however not all of the actual or potential environmental impacts are specifically identified associated with each critical control point.

4- Requirement 5.1 - For Goal 1.6 of the 2011 list of goals and objectives clarify the details of improved response time for maintenance work requests, which are composed of two parts - the time from the initiation of the work request to the time for issuance of the work order, and second the time from the issuance of the work order to the time for completion of the work order.

5- Requirement 5.2 - Consider establishing as a biosolids EMS goal for 2011 the public information personnel's idea of having a television presentation of the City of Richmond's biosolids program on Richmond's PBS program entitled Virginia Currents and/or having TV reporter Mark Holmberg present a story on the same subject.

6- Requirement 7.4 - Clarify in the roles and responsibilities section of the Element 7 procedure that the land application contractor has a subcontractor that is responsible for loading and hauling biosolids to land application sites and is an integral part of the biosolids EMS value chain.

7- Requirement 7.4 - Consider including a link to the land application contractor's proposal for satisfying the requirements of the request for proposal which have

become part of the service agreement for that contract.

8- Requirement 8.1 - Consider centralizing and consolidating all of the training records for ease in tracking by training activity and individual. These training activities would include but not be limited to certification training, process cross-training, contractor training, EMS awareness training, etc.

9- Requirement 12.3 - EMS procedure 12 does not identify the method used to establish and maintain records of biosolids management activities relative to the retention period. This shortfall is for EMS documents as well as federal and state regulatory records.

10- Requirement 14.6 - EMS procedure 14 does not presently reference the use of the P-drive and "main saver" for tracking progress in completing EMS audit corrective actions.

11- Requirement 16 - Consider referencing or linking the internal audit checklist and the internal audit report form as templates to be used for all future internal audits. (Note: the biosolids EMS outcomes are not fully addressed in sufficient detail in the internal audit procedure.)

All observations and opportunities for improvement were addressed, and finally, the hard work and dedication of the EMS team were acknowledged and the City of Richmond has been certified with NBP EMS program. Richmond is the second organization in the state of Virginia to achieve NBP certification.

D- Goals and Objectives:

The City of Richmond Public Utilities Biosolids Environmental Management System established 13 goals that cover each of the four outcome focal points of the NBP program as identified below:

- Environmental Performance,
- Regulatory Compliance,
- Relations with Interested Parties, and
- Quality Biosolids Management Practices.

The system has incorporated the approach of SMART criteria in development of the objectives, the three goals of the City of Richmond's biosolids program are:

1. Meet or surpass applicable regulatory compliance requirements associated with biosolids product.
2. Optimize dewatering centrifuge operations/storage capacity and minimize costs.
3. Improve public understanding of biosolids land application in areas where Richmond DPU's biosolids are applied.

The initial objective of optimizing the dewatering centrifuge to produce and maintain 24% solids was established in 2010. Once this was accomplished with a degree of certainty and reliability the stretch goal of maintaining a monthly average of 25% solids was established for 2011.

Two additional environmental performance objectives established for 2010 were to improve the centrate quality produced by the dewatering centrifuges to maintain less than 500 mg/l at all times, and to ensure that the digesters maintain a minimum of 95 degrees F at all times. The former target of 500 mg/l was maintained throughout the performance period except for three excursions. Additionally, the digesters temperature was maintained for the entire time except for a total of two days. Both of these accomplishments represent greater than 99% attainment.

In the Relations with Interested Parties outcome area, the City of Richmond established the goal of improving public understanding of biosolids land application in areas where Richmond Department of Public Utilities biosolids are applied. In 2010 the City established the objectives of having the land application contractor develop a program to conduct public outreach activities. Some of these activities included:

- 1) Participation in biosolids technology forum held in Richmond conducted by the Virginia Biosolids Council and including participation by farmers, wastewater treatment plant professionals and state and federal government regulators;
- 2) Sponsorship of an EPA, DEQ and Virginia Tech land application demonstration;
- 3) Outreach and education to Goochland County farmers regarding biosolids land application program and DEQ permitting process;
- 4) Outreach and education provided to Goochland County Board of Supervisors and county administrators;

- 5) Participation in the annual meeting of the Virginia Association of Counties and
- 6) Outreach to farmers in Campbell County, Fauquier County and Lunenburg County. Additional outreach programs were planned for Charles City County, Powhatan County, King William County, Cumberland County and Amelia County.

The table below shows the City of Richmond goals and objectives for Continual Improvement.

**EMS Element 5.1 – Goals and Objectives for Continual Improvement
City of Richmond Public Utilities - Wastewater Treatment**

Date of Last Review 11/18/10	Revision 7	Revised By Biosolids Team	Revision Date 11/18/10	Supersedes all previous versions
		Approved By Biosolids Supervisor	Approval Date 11/19/10	

Table 5.1 - Biosolids EMS Goals and Objectives

Outcomes	Goals	Action Plan	Person(s) Responsible	Resources	Target Date	Progress to Date
Outcome 1 - Meet or surpass applicable regulatory compliance requirements associated with biosolids product <i>Outcome(s) Addressed: Environmental Performance, Regulatory Compliance</i>						
Goal 1.1	Test for the PCBs in the centrate, plant influent and effluent	<ul style="list-style-type: none"> This is a direct response to the input that the general public cares about PCBs ending up in the environment. HRSD Laboratory will be in charge of sampling and analyzing samples. Develop action plan related to sample findings, if needed. 	Biosolids Supervisor, Chief chemist	Staff time, financing for contract lab analysis	Dec 2010	As November 2010 signed contract with HRSD laboratory
Goal 1.2	Reuse 100% of methane gas produced from anaerobic digesters	<ul style="list-style-type: none"> Engineering study of feasibility of methane gas for boiler and cogeneration 	Biosolids Supervisor, Superintendent I and II	Staff time and engineer firm	Dec 2012	As November 2010 signed contract No5
Goal 1.3	Train all biosolids value chain staff on SOPs related to their job functions,	<ul style="list-style-type: none"> Update SOPs or manuals as needed. Provide training on SOPs for all biosolids functions Evaluate the areas that need more training 	Utility Plant Superintendent I & II,	Staff time	June 2011	Training on centrifuge conducted on November 2010.

**EMS Element 5.1 – Goals and Objectives for Continual Improvement
City of Richmond Public Utilities – Wastewater Treatment**

Goal 1.4	Maintain a minimum digester temperature 95°F daily.	<ul style="list-style-type: none"> Monitor temperature 24 hours per day 	Biosolids Supervisor Operators	Staff Time	Dec 2010	99.4% Goal met as of November 2010
Goal 1.5	Upgrade dewatering centrifuges, digesters and thickening to produce class A biosolids	Evaluation of equipment condition assessment in dewatering centrifuges, digesters and thickening	Biosolids Supervisor Superintendent II	Staff time, financing for the assessment and the project	Dec 2013	As October 2010, Greely and Hanson contractor made assessment report for the city's management
Goal 1.6	Improve response time for maintenance work request to be approved within 7days	<p>Collect data on Response time</p> <p>Provide training on work request entry information requirement</p> <p>Truck all work requests every week to be discussed in the maintenance meeting.</p>	Project management analyst Utility plant superintendent II Maintenance superintendent	Staff Time	Dec 2011	Goal added on Dec 2010
<p>Outcome 2 - Optimize dewatering centrifuge operations/storage capacity and minimize costs. <i>Outcome(s) Addressed: Quality Biosolids Management Practices, Environmental Performance</i></p>						
Goal 2.1	Lower the polymer expenses by 3%	<ul style="list-style-type: none"> Automate polymer use system. Optimize the use of polymer. Train staff. Set polymer trial. 	Biosolids Supervisor, Operators	Staff Time, Polymer representatives	Dec 2011	As of 07/25/10 polymer concentration reduced by 10%, but it is not stable
Goal 2.2	Improve and maintain centrate's quality (TSS <500mg/L)	<ul style="list-style-type: none"> Optimize centrifuge operations by monitoring the pinion speed, torque, polymer dosage and sludge feed. 	Biosolids Supervisor, Operators	Staff Time	Dec 2011	Improvements made but quality is not yet consistent
Goal 2.3	Optimize dewatering centrifuge operation to maintain monthly average of 25% solids	<ul style="list-style-type: none"> Train employees on polymer usage and centrifuge operations 	Biosolids Supervisor	Staff Time	Dec 2010	Meeting goal as of November 2010
<p>Outcome 3 - Improve public understanding of biosolids land application in areas where Richmond DPU's biosolids are applied <i>Outcome(s) Addressed: Relations with Interested Parties</i></p>						

**EMS Element 5.1 – Goals and Objectives for Continual Improvement
City of Richmond Public Utilities – Wastewater Treatment**

Goal 3.1	One Soil and Water Conservation Bureau (SWCB) field trip to WWTP and field site in 2011 by the hauling/ land application contractor	<ul style="list-style-type: none"> Assist DEQ staff and VBC to schedule a field trip in 2011. 	Recyc Technical Manager	Staff Time	Oct 2011	VBC annual planning meeting Dec 2010
Goal 3.2	Conduct four public outreach activities in 2011 in areas where Richmond Biosolids will be used.	Schedule Events for 2011 Handout information sheet on Richmond biosolids to farmers and public.	Recyc Technical Manager Recyc Field Technicians	Staff Time	Dec 2011	As Dec 2010, two events scheduled for 2010
Goal 3.3	Schedule tours of the WWTP for 20 visitors per month	<ul style="list-style-type: none"> Provide plant tour for high school and hospital groups about water/wastewater activities. 	Utility Plant Superintendent II Biosolids Supervisor	Staff Time	Dec 2011	46% goal met as November 2010
Goal 3.4	Update biosolids web page on City website to make it easier to navigate and include information for public input and outreach. (Measurable as "done" or "not done.")	Identify material that should be posted on the website. Get permission from the City to upload it. Post it on the website. Identify areas that need formatting or other improvements. Get permission from the City to make improvements. Ensure improvements are made. Address appropriate contractor information in addressing above changes.	Biosolids Supervisor, Contract hauling/land application contractor, Public Relations Manager	Staff time	June 2011	Updates begun with addition of biosolids report and prominent display of policy.



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