

SOLANO COUNTY

2016 ANNUAL BIOSOLIDS LAND APPLICATION REPORT



Prepared by:
Matthew Geisert, Hazardous Materials Supervisor
Jeffrey Bell, Sr. Environmental Health Specialist
Misty Kaltreider, Geologist
Anthony Endow, Environmental Health Specialist

Presented to the Board of Supervisors: March 28, 2017

2016 Annual Biosolids Land Application Report

Executive Summary

Exhibit I: 2016 Registered Biosolids Land Application Sites in Solano County

Exhibit II: Quantities and Acreages of Biosolids Land Applied 2002-2016

Exhibit III: Percentage Breakdown of Biosolids Land Applied by Generator

Exhibit IV: 2016 Biosolids Heavy Metal Analyses

Exhibit V: 2016 Protests, Complaints, and Comments Received

Exhibit VI: Stakeholders Group Meetings Summary

Exhibit VII: Biosolids Research Study

Exhibit VIII: Biosolids Industry Update

Exhibit IX: Other Agency Reports – Bay Area Clean Water Agency Report

2016 Annual Biosolids Land Application Report

EXECUTIVE SUMMARY

Solano County Department of Resource Management provides this annual summary report documenting activity conducted during the 2016 biosolids land application season (April 15 through October 15, 2016) as part of Chapter 25 of the Solano County Code. Work performed by Solano County staff related to the land application of biosolids during the 2016 season included: conducting stakeholder meetings; performing field inspections and monitoring prior to and during land application work; and preparing this annual report. This report also includes the 2016 Bay Area Clean Water Agency Report which summarizes the biosolids generator's progress toward evaluating alternative use technologies for biosolids.

Recommendations: The Department of Resource Management recommends no changes to the Solano County Code, Chapter 25 as the code is protective of public health and the environment.

Acres, Tonnages, and Sources: During the 2016 biosolids land application season, 1,481 acres of pasture and rangelands in Solano County received 7,304 calculated dry tons of class B biosolids as a soil amendment. A map presented in Exhibit I illustrates the location of fields utilized for land application in 2016. A graph that summarizes the historic and current tonnage quantities received and areas applied from 2002 through 2016 is presented in Exhibit II.

Biosolids were supplied by thirteen regional generators including: Burlingame, Calistoga, Central Marin Sanitation District, Daly City, Delta Diablo, Ironhouse, Millbrae, Pacifica, San Francisco (two sites), San Mateo, Silicon Valley Sanitation District, Union Sanitary District, and the City of Windsor. Exhibit III illustrates the percentage of biosolids received from each generator in 2016.

Chapter 25 requires the applicators to notify the Environmental Health Division prior to bulk application of biosolids compost. During the 2016 season, no notices of bulk application of biosolid compost were received by the Environmental Health Division.

Staffing: During the 2016 biosolids land application season, three Environmental Health Specialists conducted 23 field inspections at the land application sites. Staff spent 218 hours reviewing applications, performing inspections, reviewing reports, responding to public comments and requests for information, preparing and facilitating the biosolids stakeholder meetings, reviewing current industry trends, overseeing and evaluating research project work, and preparing this annual biosolids summary report and the Solano County Board of Supervisors report.

Monitoring and Reporting: Prior to approving the receipt of biosolids from a generator source, biosolids samples must be analyzed for heavy metal concentrations and compared to the US EPA Part 503 acceptance criteria. Only biosolids that are within the Class B Part 503 heavy metal concentration criteria are accepted for land application in Solano County. In addition, Solano County staff collects field samples of the biosolids material received for heavy metal comparison analysis. The analyzed biosolids samples collected from each generator and collected by Solano County Staff were all below Class B threshold limits established by the Part 503 Federal regulations for heavy metals. Exhibit IV discusses and illustrates the biosolids heavy metal analyses performed.

During field application, a field weather station was used at each land application site to measure wind speed and duration. Precipitation was also monitored by visual inspection and through daily weather reports. Based on the data reviewed, wind speed did not exceed 25 mph for a period of 60 minutes during land spreading activity.

Protests and Complaint Investigations: Solano County Code Chapter 25 allows for the opportunity to submit a protest by an adjacent resident to a field proposed for biosolids land spreading. No protests were filed during the 2016 biosolids land application season for the applied fields.

Five complaints were received and verified regarding the tracking of biosolids material onto the County roads. Exhibit V provides additional details regarding protests and complaint investigations.

Biosolids Stakeholder Group Meetings: The Biosolids Stakeholder Group met once in 2016, on December 13, 2016. The meeting summary is presented in Exhibit VI.

Solano County Research Study: Blankenship and Associates, Inc., an independent consulting firm, was awarded the biosolids research contract in June 2015 by the Solano County Board of Supervisors. The research contract is paid through the Biosolids Education and Research Trust Fund fee of \$15.00 for every acre land applied with biosolids in Solano County.

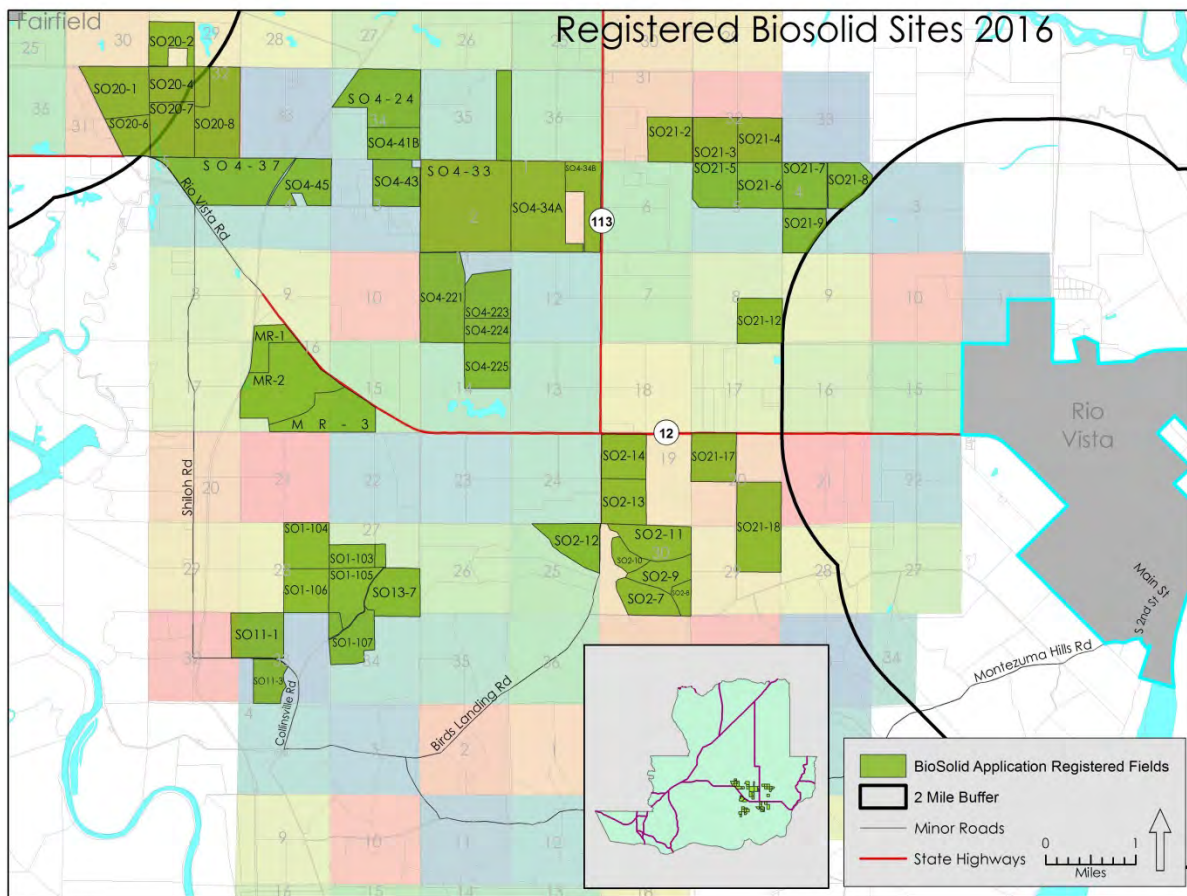
The Blankenship and Associates research project includes conducting field-specific studies in Solano County to evaluate the agronomic effects, potential carbon sequestration, and determine the accumulation of trace heavy metals associated with biosolids applications on rangelands within Solano County. Over 1,000 data points were generated from the samples collected at the selected sites. Over 30 constituents were measured at each sample site and depth interval, including nutrients, metals, texture, and moisture retention.

Blankenship and Associates continues to coordinate the field sampling and evaluations. Exhibit VII provides additional details on the research study.

Biosolids Industry Update: Canadian based Lystek Company has entered into agreement with the Fairfield Suisun Sewer District to lease facilities on the grounds of the treatment plant in Fairfield, California. Lystek is producing a biosolids derived licensed fertilizer product. Lystek is licensed by the California Department of Food and Agriculture as a fertilizer company. The fertilizer product is in liquid form and is typically applied by shallow subsurface injection into the soil matrix. As a licensed fertilizer product subject to oversight by the Department of Food and Agriculture, it is by definition, not biosolids compost and not regulated under Chapter 25.

Other Agency Reports – Bay Area Clean Water Agency Report: In accordance with Solano County Code, generators that provide biosolids for land application in Solano County are required to present a summary of material supplied and an update on each agency's efforts toward developing alternative energy sources and uses of biosolids. The report is presented by the Bay Area Clean Water Agencies (BACWA) and provides a summary on the development and use of alternative treatment technologies for biosolids. Based on the December 2016 annual report, all generators that provided biosolids to Solano County for land applications have either participated in biosolids-to-energy programs to develop alternative biosolids/energy options or are diverting a portion of their generated biosolids to Class A material. Exhibit VIII includes the BACWA report and additional information on the BACWA activities.

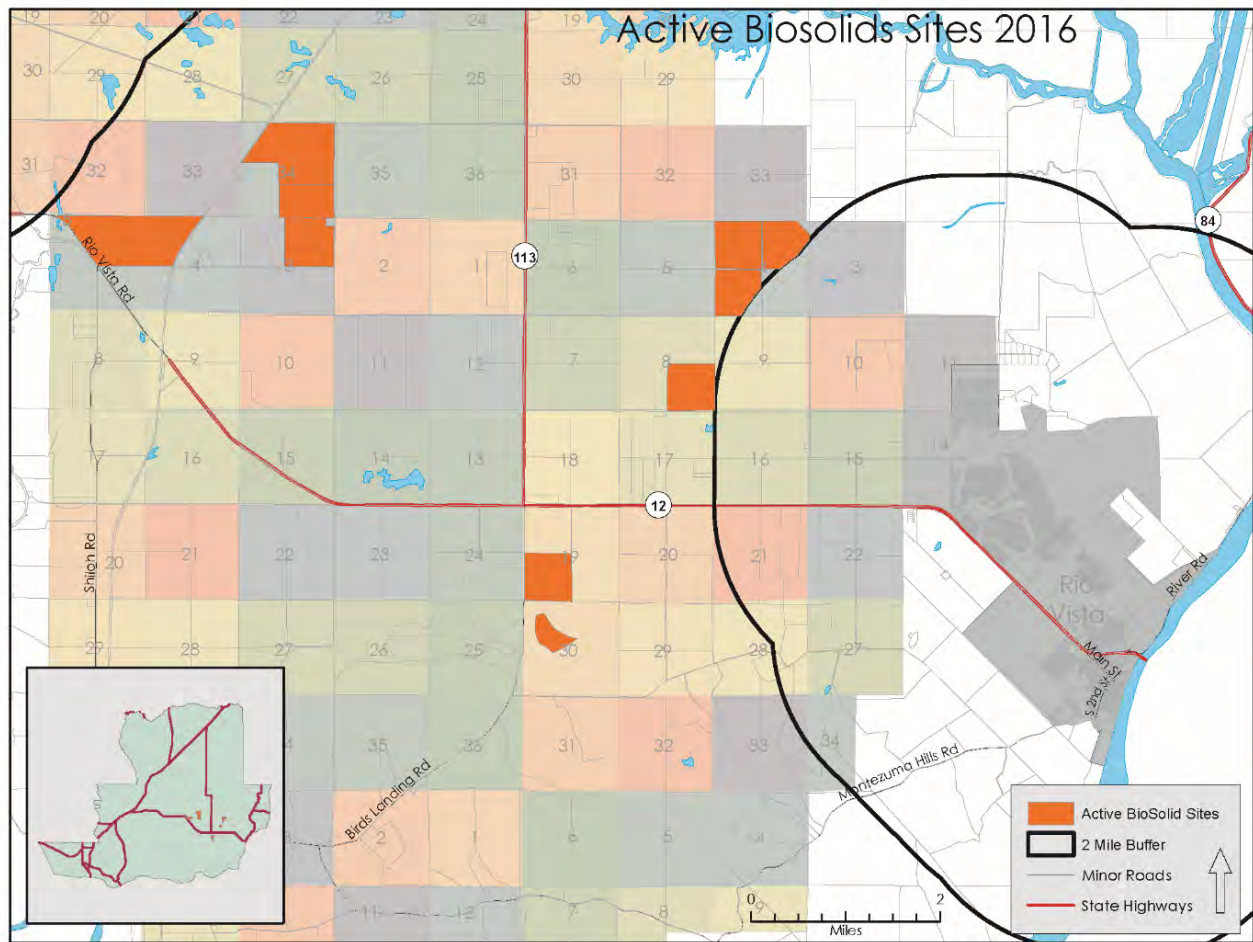
EXHIBIT I – Map of All Registered Sites in Solano County - 2016



The above map illustrates the locations of all currently registered biosolids sites in Solano County. There are a total of 7,742 acres registered by field, allowing this acreage for the land application of biosolids included in seven ranches: Emigh Ltd Ranch (SO-4), Anderson Ranch (SO1), Zadwick Ranch (SO11), Peterson Ranch (SO20), Mayhood Ranch (MR), Hamilton Ranch (SO2), and McCormack Ranch (SO21).

Emigh Ltd Ranch	SO4-24,33,34,37,41,42,43,45,221,223,224,225	2605 acres
Anderson Ranch	SO1-101,102,103,104,105,106,107	1506 acres
Zadwick Ranch	SO11-1,3	212 acres
Peterson Ranch	SO20-1,2,3,4,5,6,7,8	1084 acres
Mayhood Ranch	MR-1,2,3	736 acres
Hamilton Ranch	SO2-7,8,9,10,11,12,13,14	910 acres
McCormack Ranch	SO21-7,8,9,17,18	689 acres

Map of All Active Biosolid Land Application Sites in Solano County - 2016



The above map illustrates the location of the fields utilized during the 2016 biosolids land application period (April 15 through October 15, 2016). These fields belong to sites registered by Emigh Limited Ranch (SO4), McCormack Ranch (SO21) and Hamilton Brothers Ranch (SO2). Site inspections are conducted before, during, and after biosolids land applications.

EXHIBIT II – Applied Quantities and Acreage of Land

A total of 1,481 acres of farmland received 7,304 calculated dry tons of Class B biosolids as soil amendments in 2016, which is a 14% increase in tonnages when compared to 2015. The total acreage that biosolids were land applied increased 24% compared to 2015.

The below graph illustrates the historical and current annual amounts. Since 2002, the amount of biosolids by weight land spread in Solano County is decreasing in general, with the least amount of material land spread in the year 2010. (5,090 dry tons spread in 2010). The use of three registered land spreading sites in 2016, instead of the typical use of two registered spreading sites during the application period may account for slight increases in tonnages for 2016. Current use of material has averaged at 6,698 dry tons per year when considering the last five years of biosolids land application to farmland in unincorporated Solano County.

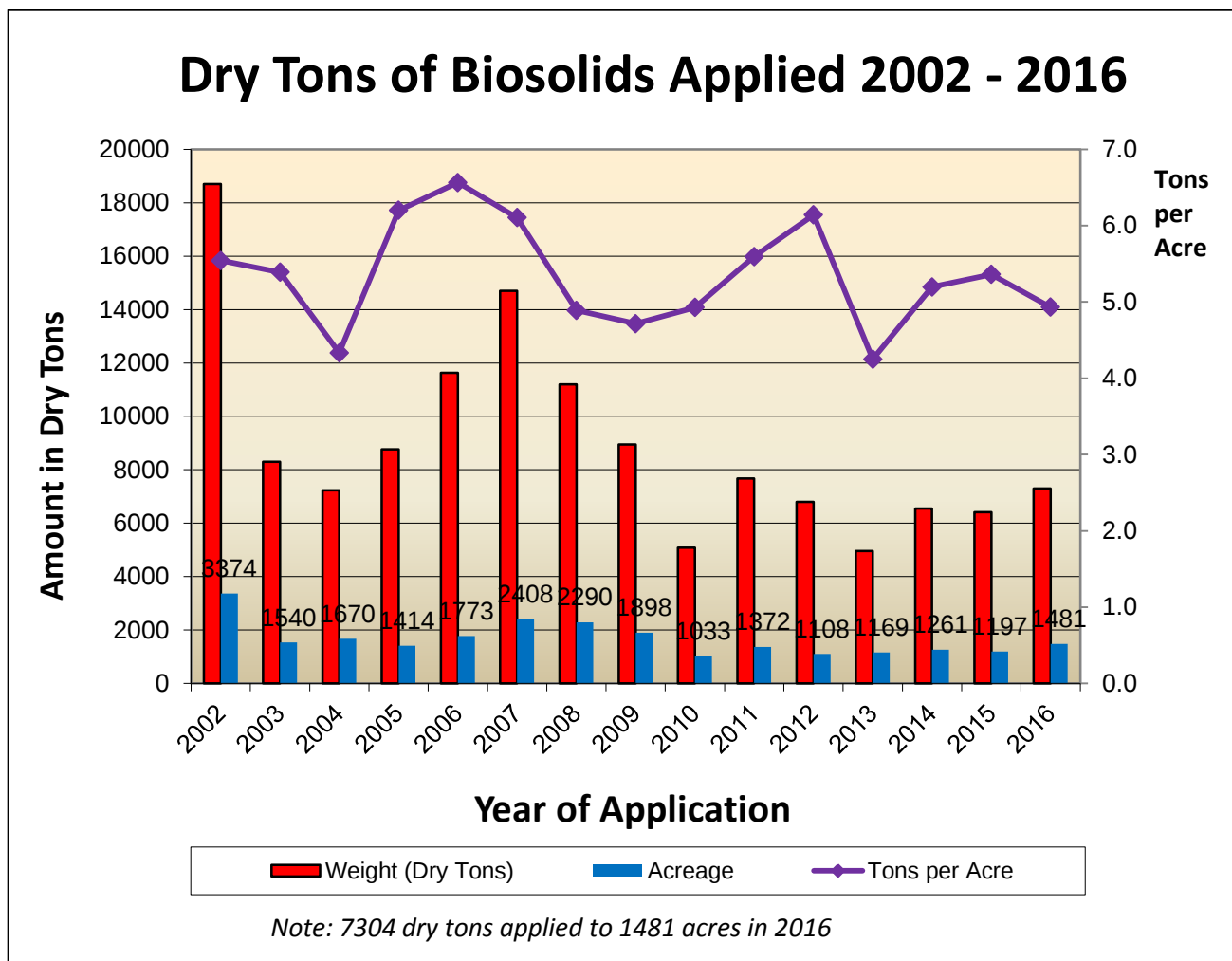


EXHIBIT III – Generators and Percent of Biosolids Land Applied in Solano County in 2016

In 2016, thirteen generators provided biosolids for land application in Solano County. The below graph illustrates the percentage of biosolids provided by these generators.

The generators that provided biosolids for land application in 2016 included: Burlingame, Calistoga, Central Marin Sanitation District, Daly City, Delta Diablo, Ironhouse, Millbrae, Pacifica, San Francisco (two sites – San Francisco Southeast and San Francisco Oceanside Treatment Works), San Mateo, Silicon Valley, Union City (which serves Union City, Fremont and Newark), and the City of Windsor.

The two San Francisco Public Utilities Districts (San Francisco Oceanside and San Francisco Southeast) together accounted for approximately 66.3% (4,840 calculated dry tons) of the total biosolids received for the 2016 season.

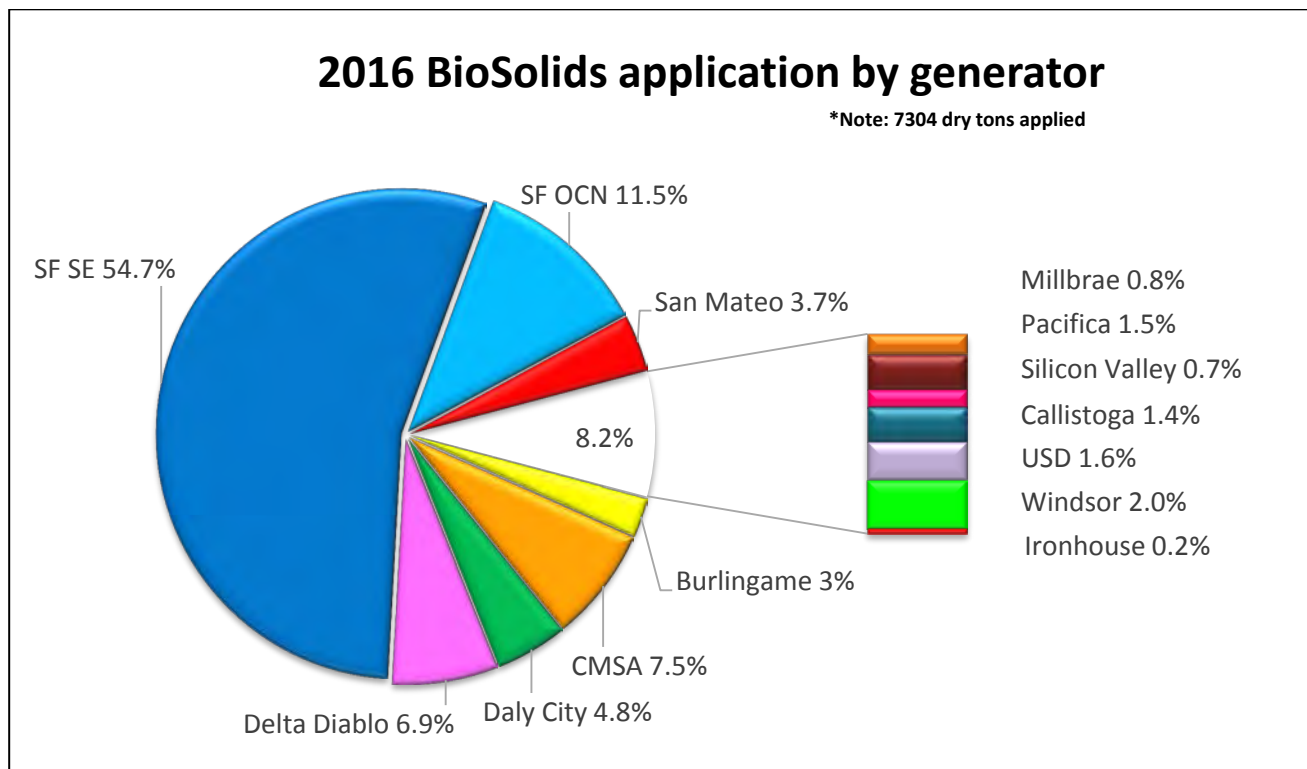


EXHIBIT IV – Heavy Metals in Biosolids

The United States Environmental Protection Agency (US EPA) published Title 40 of the Code of Federal Regulations (CFR) Part 503 in 1993, commonly referred to as Part 503. Part 503 provides a regulatory framework for the land application of biosolids, including heavy metal concentration limits. Solano County Code Chapter 25 adopted by reference Title 40 CFR, Part 503 as part of its biosolids regulations.

As specified under Part 503, prior to biosolids land application, the biosolids generator must provide documentation of Notice and Necessary Information (NANI) that demonstrates the Class B biosolid materials proposed for land application meet standards for heavy metal and nitrogen concentrations, class and method of pathogen reduction, and method of vector attraction reduction.

Heavy metal concentration limits are specified under Part 503 for Arsenic, Cadmium, Copper, Lead, Mercury, Nickel, Selenium, and Zinc. US EPA eliminated Chromium concentration limits for biosolids in 1995 as the risk of concentrated hexavalent chromium in biosolids (12,000 mg/kg) was found to be negligible.

Solano County only permits the application of biosolids from generators that provide the Notice and Necessary Information. In addition, biosolids material that exceed Part 503 Class B heavy metal concentrations are not accepted for land application in Solano County. As part of the application review process, prior to land application, all generators for the 2016 biosolids season submitted documentation of the Notice and Necessary Information.

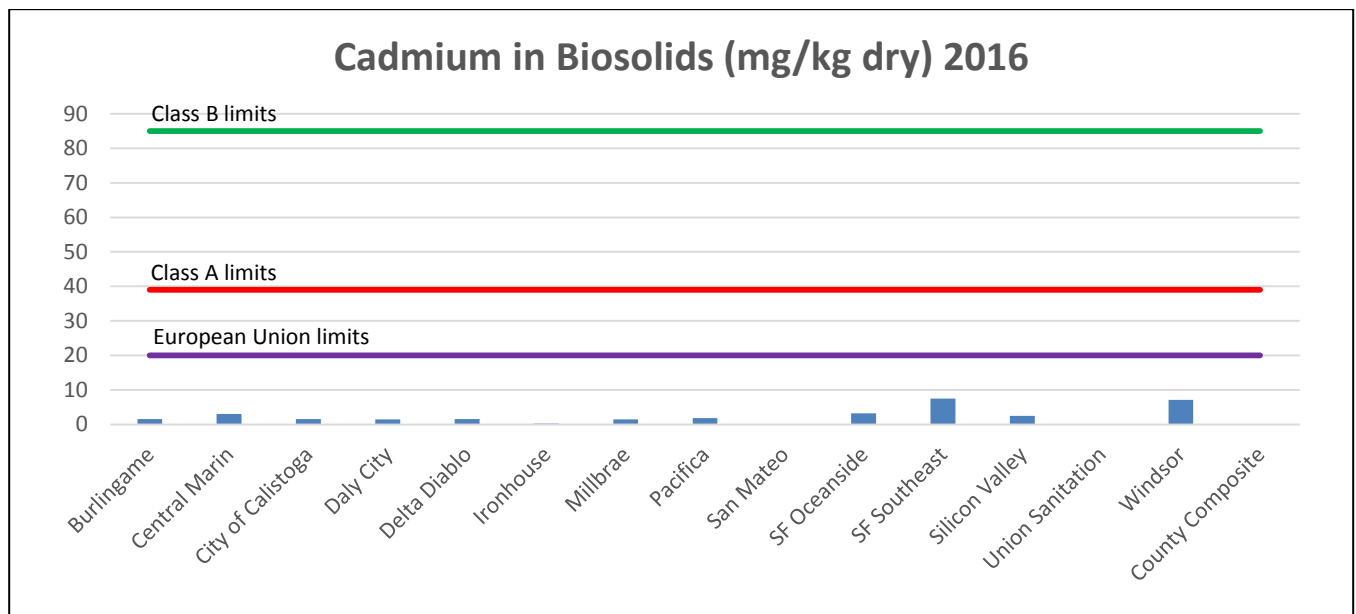
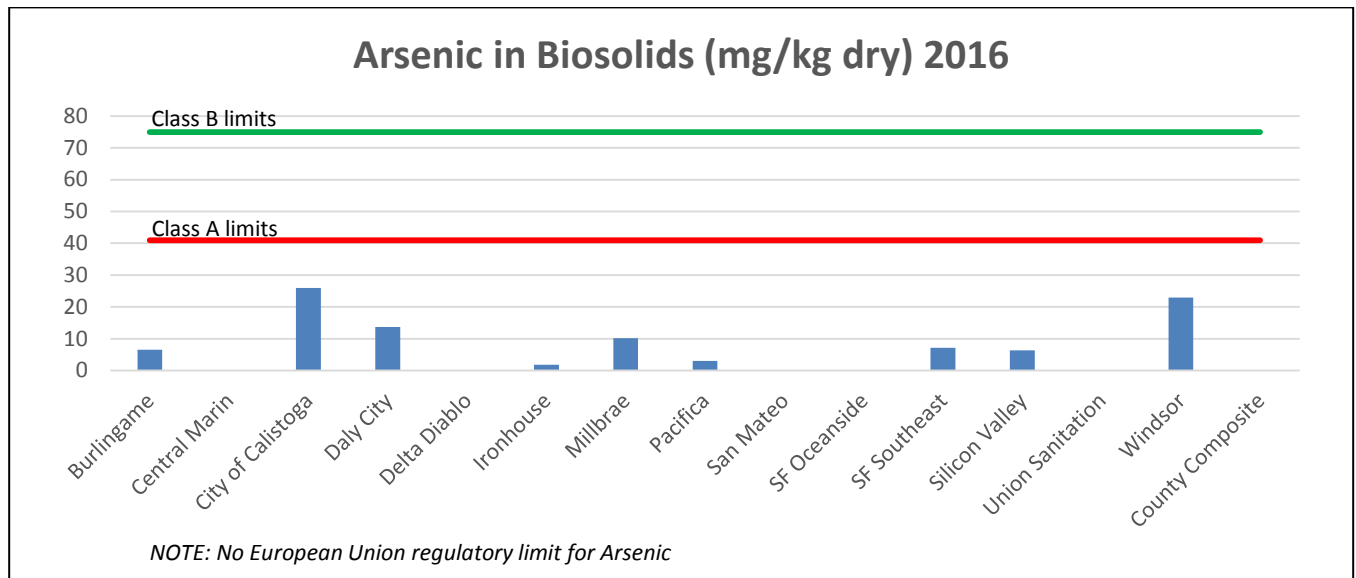
With the exception of copper levels (exceeds class A standard) and selenium (exceeds EU Standard), from the City of Windsor, all metal concentrations were found to meet the Part 503 Class A, Class B and European Union standard limits. The City of Windsor biosolids material met the copper and selenium threshold for Class B material.

The European Union (EU) limits are taken from the European Council Directive 86/278/EEC of 12 June 1986, Annex 1B. EU limits are not required for land application of biosolids in Solano County but are presented herein as a reference. There are no EU limits for Arsenic, Chromium, or Selenium.

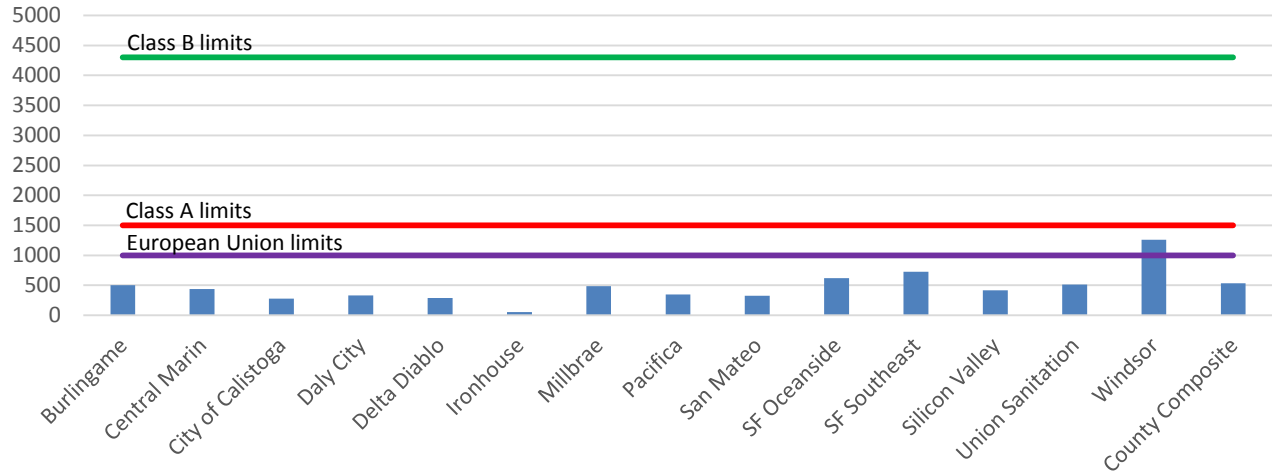
In addition to the sampling performed by the generators as part of the application process, Solano County staff collected four samples of the Class B biosolids during the 2016 land application season. All samples were within the acceptable criteria for heavy metals established by the Part 503 Federal regulations for Class A and Class B biosolids. As demonstrated in analytical results from prior years, heavy metals in the biosolids material received are within acceptable heavy metal limits and do not pose a significant concern over the short term.

The below graphs present the highest detectable concentrations of metals reported in from each generator during the 2016 season.

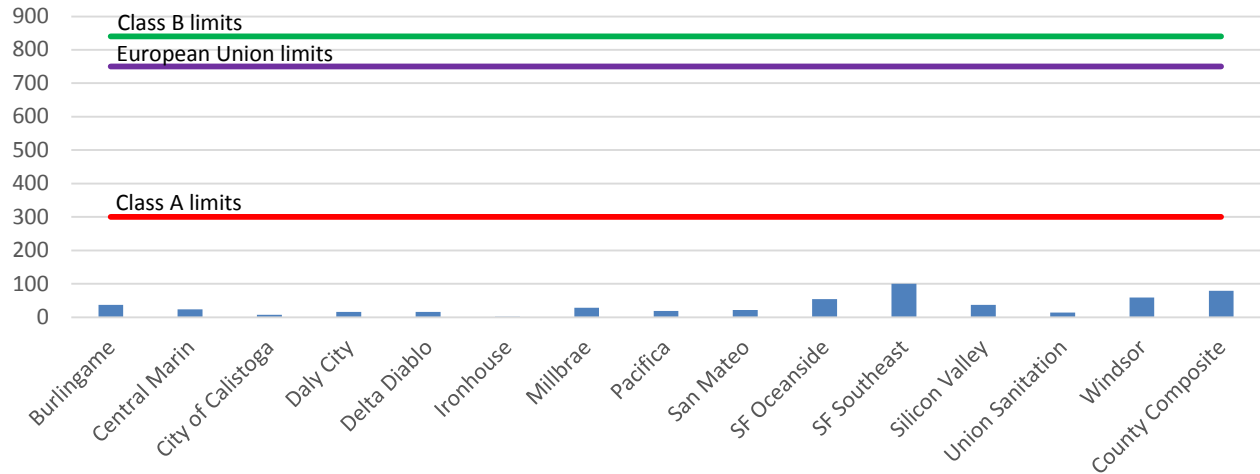
Highest Detectable Heavy Metal Concentration by Generator 2016



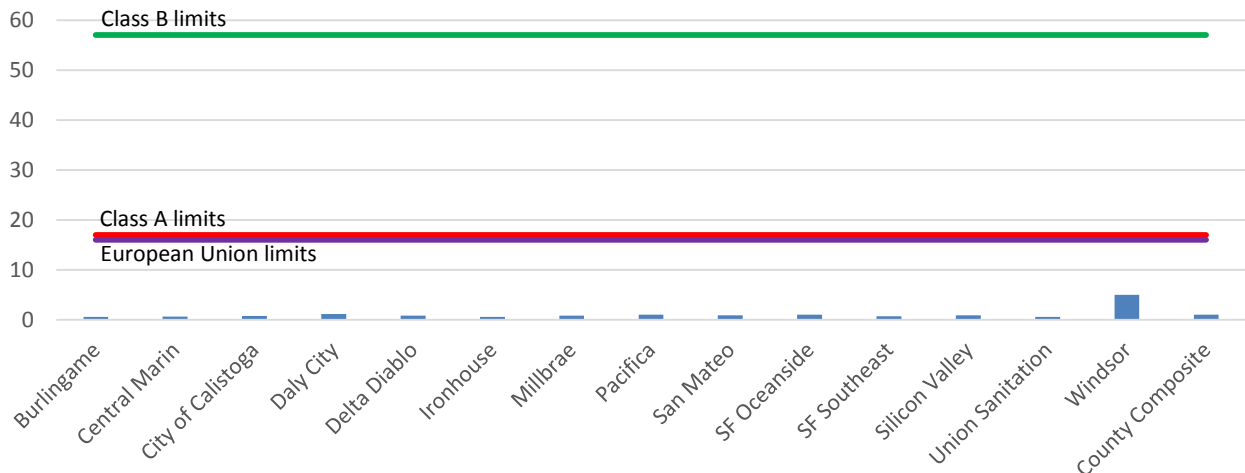
Copper in Biosolids (mg/kg dry) 2016



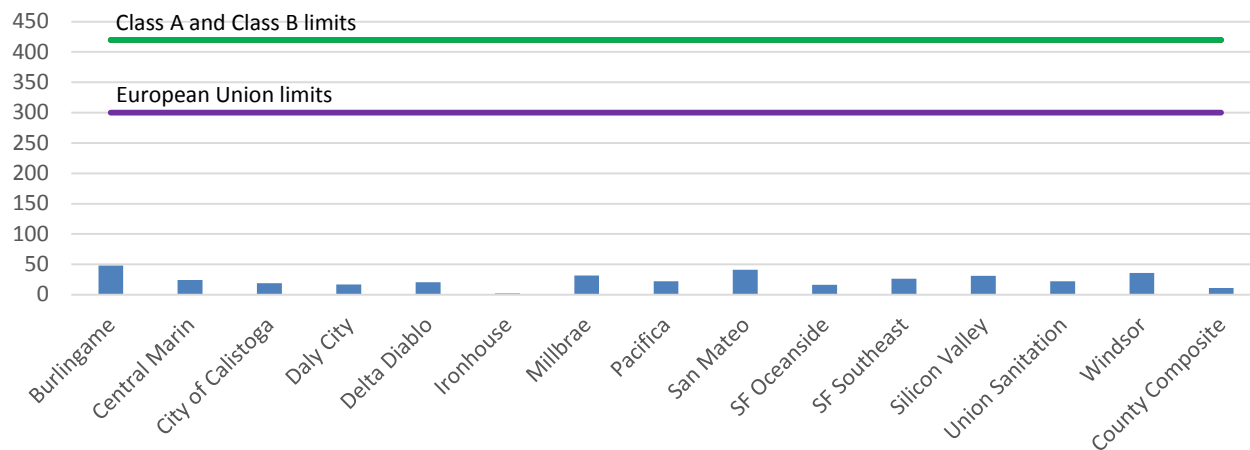
Lead in Biosolids (mg/kg dry) 2016



Mercury in Biosolids (mg/kg dry) 2016

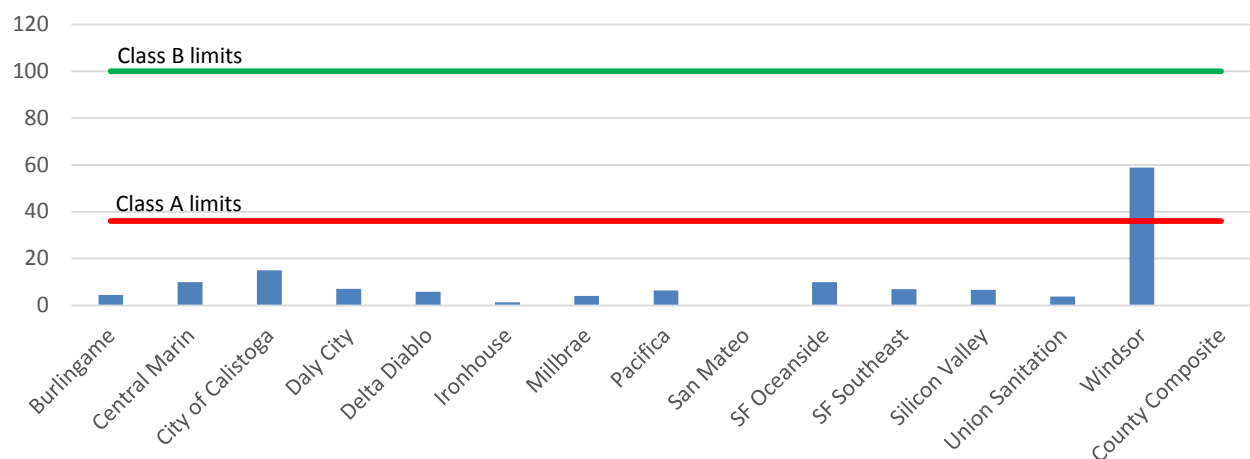


Nickel in Biosolids (mg/kg dry) 2016



NOTE: US Federal Class A and Class B limits are the same for Nickel

Selenium in Biosolids (mg/kg dry) 2016



NOTE: No European Union regulatory limit for Selenium

Zinc in Biosolids (mg/kg dry) 2016

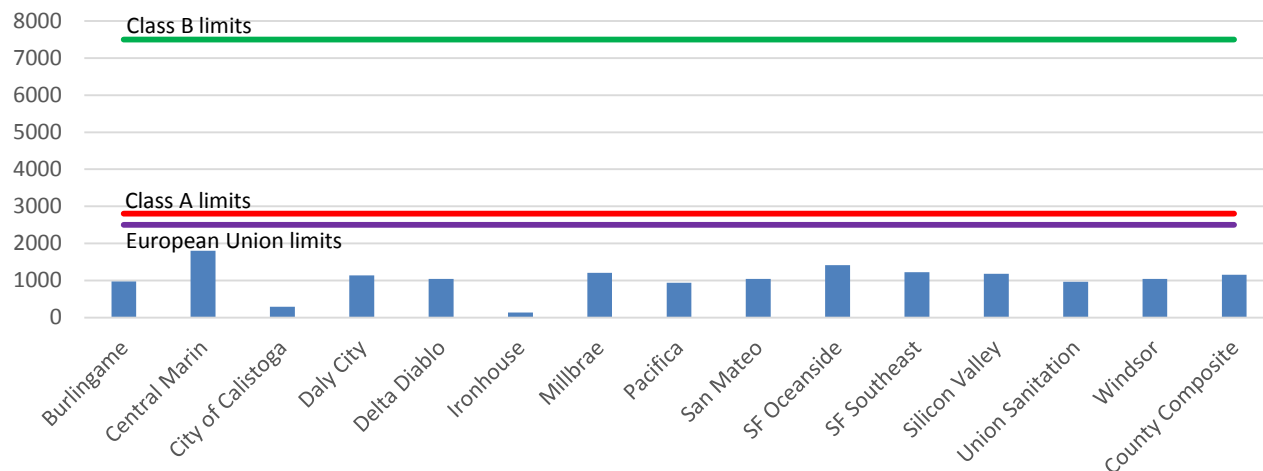


EXHIBIT V – Protests Received and Complaint Investigations

Protests Received:

Solano County Code Chapter 25 allows a resident adjacent to a field proposed for biosolids land spreading the opportunity to protest the land application of biosolids. As required by Chapter 25, the biosolids applicator, Synagro¹ provided notices of biosolids land application to residents adjacent to proposed land application sites at least 14 to a maximum of 45 days prior to commencement of land spreading operations.

Public notices were published on March 19, June 22, and August 19, 2016 in the Fairfield Daily Republic, and on March 23, June 23, and August 20, 2016 in the Vacaville Reporter. No protests were received for the 2016 land spreading season.

Complaint Investigations:

The Department received five complaints from the public throughout the 2016 biosolids land application season. The initial complaint was submitted to the Department via the EHcomplaints@solanocounty.com complaint email box on 9/1/2016, and subsequent complaints were received on 9/2/2016, 9/6/2016, 9/7/2016 and 9/8/2016. All the complaints were regarding the same application field, and stated that delivery trucks were tracking biosolids material onto the road. Solano County Code Chapter 25, Section 25-400(j.1) specifically prohibits biosolids delivery or transport vehicles from tracking mud or debris onto County or State roadways.

Staff responded to each of the complaints the same day that the complaint was received. All the complaints were verified. Notices of Violation were issued to the applicator for each of the five incidents reported.

In response to the initial complaint investigation, Synagro had representatives remove biosolids material from the road area, moved the vehicle wash down area further into the field, and discussed proper biosolids unloading technique with the delivery drivers. Escalating actions by Synagro after subsequent complaints involved re-training of all delivery drivers on unloading protocols, the use of hay as truck bedding to facilitate thorough unloading, and the placement of a staff person to monitor exiting delivery vehicles for cleanliness. Specific delivery drivers for S & S Trucking, under subcontract with the SF Public Utilities Commission, that were determined not to be following proscribed unloading protocols were reprimanded and suspended.

Despite the control measures put in place, when the complaint received on 9/8/2016 for tracking of biosolids material onto the road was verified, a Notice of Violation was issued that directed Synagro to immediately cease land application operations at the specified field. Synagro redirected remaining loads for that day to the landfill and began preparations for land application operations at a different approved site.

Synagro has provided a written procedural document, Solano County Land Application Procedures, dated February 16, 2017. The procedures document is labeled as “proprietary – not for copying or distribution at this time.” Ongoing training, education and procedural methods as stated in the procedural documents, will occur with full implementation in the 2017 land application season. Synagro West LLC is an active participant in the Solano County Biosolids Program. Synagro is the only permit holder for the land application of biosolids in Solano County at this time.

For comparison, the number of complaints received in previous years is indicated below.

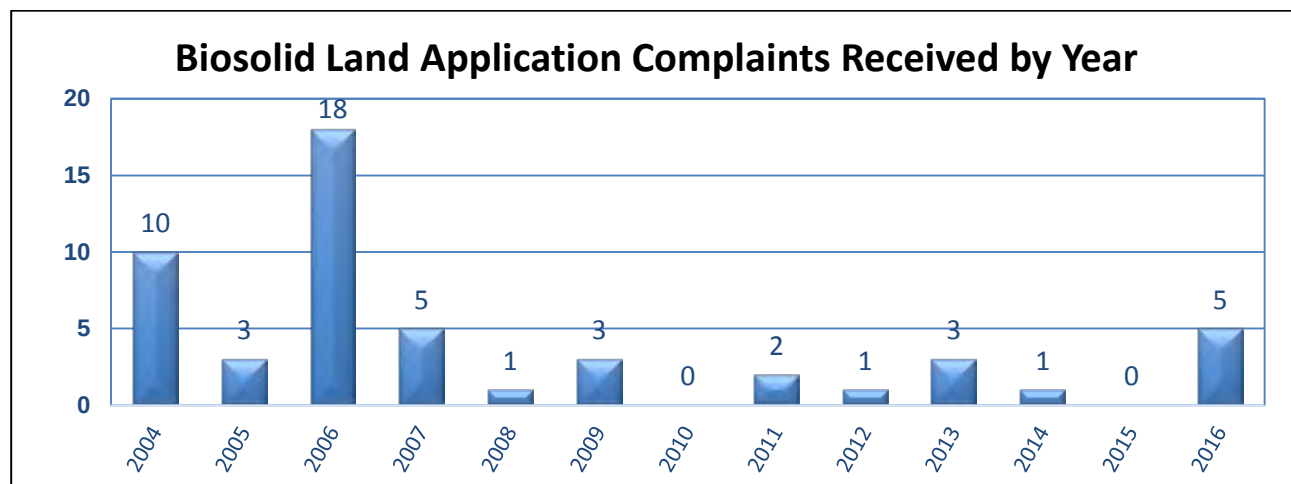


EXHIBIT VI – Biosolids Stakeholder Group Meetings Summary

A Stakeholder Group meeting was held December 13, 2016. A summary of this meeting is presented below.

December 13, 2016:

Participants in the December 2016 Stakeholder Group Meeting included: Solano County Environmental Health staff, Synagro, San Francisco PUC, Fairfield-Suisun Sewer District, Lystek, S & S Trucking, Blankenship research team and a resident of the McCormack Ranch area, in unincorporated Solano County.

Staff provided a summary of the 2016 application season including the total acres and total tons of biosolids land applied during the 2016 season.

Dry tonnage calculations were provided for all generators – dry tonnage calculation methodology was briefly discussed. Staff noted all biosolids were applied to the fields at the approved agronomic rates as required in the permit conditions.

Staff attended the Regional Biosolids Conference – Residuals and Biosolids 2016 in Milwaukee, Wisconsin, with exposure to recent developments in biosolids studies and applications. San Francisco Public Utilities and East Bay Municipal Sanitation District also participated in the Regional Biosolids Conference. Energy use, reclamation, and treatment works methodology were a focus at the conference. The increasing cost of energy, including natural gas and variation in electrical tier rates based on energy use and consumption and demand create dynamic challenges for treatment plant operations. Focus of interest includes incineration technology, anaerobic digestion technology, biogas production and use, heat recovery technology and combined heat and power systems. San Francisco Public Utilities presented a research paper, "Selection of Gas Turbines for Energy Recovery at San Francisco South-East Plant", by Ho, Engel, Tse et al. New technologies and implementation allow for innovation and discussions which are part of this evolving dynamic industry.

It was noted that north of Highway 12 in the vicinity of Denverton Road, the designated area of the Suisun Marsh may have been revised, potentially allowing for biosolids land application to those areas. A representative of Synagro stated they would investigate the matter further.

Presentation was made to the group as to the compliance actions taken regarding the issue of tracking biosolids onto the County roads in the proximity of biosolids land application sites. Staff coordinated with Synagro, San Francisco Public Utilities Commission (SFPUC), and S & S Trucking representatives to initiate quality control methods, including constant site monitoring by Synagro staff at the actual land spreading site location. It was noted that SFPUC ended their annual contract with S & S Trucking early, ceasing land application deliveries to Synagro short of the full season in order to assess operational deficiencies and prevent potential further violations.

A resident of the McCormack Ranch area voiced concerns regarding the tracking of biosolids material onto the County roads in the vicinity of his residence. He stated his opinion that Synagro's response to the initial Notice of Violation for tracking of biosolids materials on the road was inadequate, and subsequent verified instances of biosolids material being tracked onto the road were unacceptable. He commented that the County was responsive to the problem, but questioned if the biosolids regulations were protective enough. Additional details of the complaints received during the season are provided in Exhibit V.

The selected research team from Blankenship and Associates Inc., made a brief introduction and summary of the research project to date. The research team anticipated having a final report by end of Summer 2017. Additional details of the research project are provided in Exhibit VII.

EXHIBIT VII – Research Study – “Assess Agronomic Effects and Potential Carbon Sequestration Associated with Biosolids Applications on Rangelands in Solano County”

In 2004, the Board of Supervisors established a biosolids scientific research and education fee as a per-acre surcharge, charged to the applicator of land applied biosolids, to provide funding for the Biosolids Education and Research Trust Fund. The Biosolids Education and Research Trust Fund funds research that studies impacts of biosolids land application in Solano County. Prior biosolids research performed in Solano County has included evaluation of potential accumulation of heavy metals and synthetic chemicals associated with land-applied biosolids.

Through a stakeholder input process in 2013, the Department identified potential projects to be conducted as part of future research, including:

- Assess the agronomic effects of biosolids applications on Solano County rangeland;
- Quantify the nutritional value of vegetation on biosolids vs non-biosolids applied fields for grazing animal stock (sheep and cattle);
- Evaluate the potential carbon sequestration enhancement in biosolids-applied soil; and
- Quantify the accumulation rates of metals associated with biosolids land applications on Solano County rangeland soil to develop site-specific application rates.

Discussions with stakeholders who have used biosolids applications on rangeland areas in Solano County describe a substantial increase in forage growth and quality. Understanding and quantifying the effects of biosolids applications on rangeland forage production will help in evaluating the effects of biosolids applications on plant productivity and forage quality. Changes to soil carbon levels will help in evaluating potential for enhanced carbon sequestration.

Through a request for proposal and available funding from the Biosolids Education and Research Trust Fund, a contract of \$99,700 was awarded on June 23, 2015 to Blankinship & Associates, Inc. to “Assess Agronomic Effects and Potential Carbon Sequestration Associated with Biosolids Applications on Rangelands in Solano County.”

The Blankinship team consists of agronomists, Certified Crop Advisers, engineers, Certified Professional Soil Scientists, University of California Cooperative Extension experts in grazing and forage crops, and veterinarians. The project aims to meet the research goals discussed during 2013 and 2014 biosolids stakeholder and County Board meetings.

The team selected sites in areas that have historically received biosolids applications, paired with control sites that have not received biosolids application. Two fields were selected, with two control sites and two sites that have historically received biosolids applications. Sites were selected in areas that received applications in 2015 to allow for examination of the effect of biosolids applications on plant growth in the subsequent growing season (i.e. winter and spring of 2016).

The field work included the collection of soil and forage samples from areas that received applications of biosolids and comparing them to areas that did not receive biosolids. Sampling and analysis of forage and soil was completed during the summer of 2016, with some lab work extending into the fall of 2016. Soil pits were dug using a backhoe and samples were collected at intervals from the surface to 5 feet deep. Over 1,000 data points were generated from the samples collected at the sites. Over 30 constituents were measured at each sample site and depth interval, including nutrients, metals, texture, and moisture retention.

Near the soil pit locations, the team constructed fenced enclosures to prevent disturbance of forage plants by livestock that was grazing in the study fields. Examples of the fenced enclosures are shown the photographs, below. The enclosures were sampled three times at one month intervals and data was collected on the forage height, weight, forage species and diversity present within the sampled plot. Analysis of plant tissue samples was done for over 15 constituents including biomass, forage height, nutrients and digestibility metrics. Forage sampling done by the team resulted in over 380 data points.

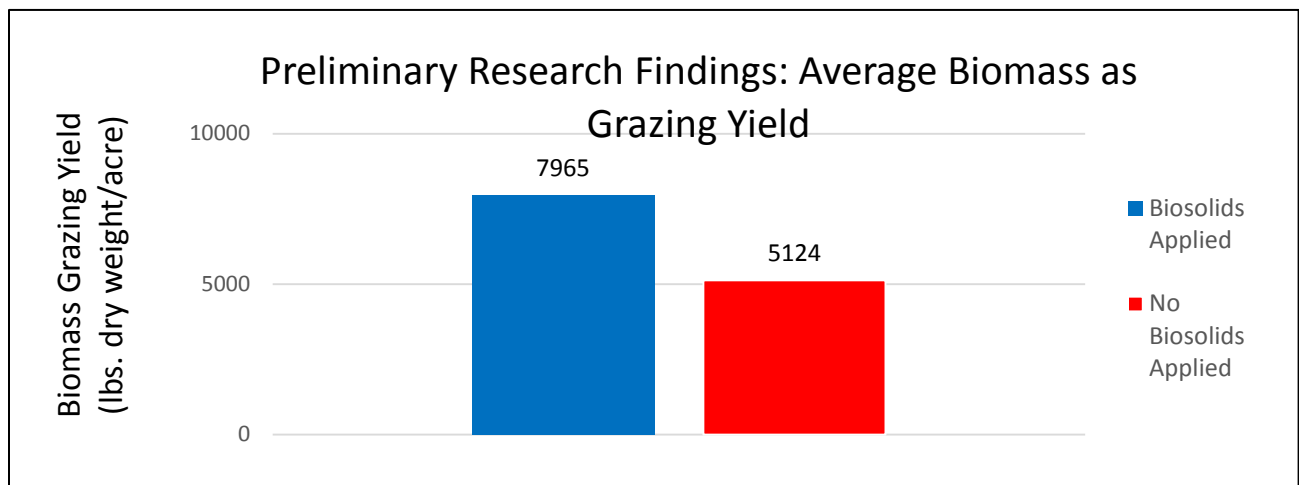


Site segregated fenced enclosure for study of forage growth rates

The team is in the process of evaluating the data to establish patterns and trends, and to quantify the differences between treatments. The team and collaborators are incorporating the data into agronomic and animal growth models.

Specific items evaluated through soil and forage sampling include: potential benefits to soils based on addition of macro and micronutrients; effects on drainage, water infiltration and soil moisture retention; determination of potential for carbon sequestration through the addition of organic material to the soil profile; fate and movement, if any, of heavy metals through the soil profile; and a review of agronomic application rate of biosolids. Based on differences between areas that receive biosolids and those that do not, the research team will compare yield and forage nutritional values.

A preliminary review of data indicates a benefit to the overall productivity of areas that receive biosolids application when looking at the grazing yield per acre on a dry weight basis. In general grazing yields are found to increase with biosolids application at agronomic rates.



The research team presented the preliminary findings at the December 2016 stakeholder meeting. The team is analyzing the data and working to establish trends, patterns and inputs for the animal and agronomic models. The team anticipates providing a report in April 2017 documenting the final results of the field work. The final report of the research findings will be included in the 2017 Annual Report.

EXHIBIT IX Biosolids Industry Update

On October 21, 2016 Lystek International Inc. (“Lystek”) had a grand opening for its new Organic Material Recovery Center at the Fairfield Suisun Sewer District (OMRC-FSSD) location on Chadbourne Road. Founded in 2000 and based out of the City of Cambridge, in Ontario Canada, Lystek uses a patented¹ thermal hydrolysis process to provide biosolids solutions to municipalities and wastewater treatment plants in North America.

Although not yet at full capacity, the Lystek OMRF-FSSD facility may eventually process up to 150,000 tons of waste per year, including the 14,000 tons produced annually at the co-located Fairfield-Suisun Sewer District facility.

According to the company website, the proprietary “LystMize” process uses a combination of heat, alkali, and high shearing to effectively breakdown the biological material in biosolids. The company states that the LystMize process increases biogas production, which is typically reclaimed for energy, reduces biosolids output volumes, and reduces offensive odors.

The processed product is termed “LystGro” and is a slurry (consisting of 14-17% suspended solids) that is applied via subsurface injection into fields. The product has been classified by the US EPA as Class A EQ material² – approved for use without restriction. Lystek has been issued a license³ by the California Department of Food and Agriculture Fertilizer Materials Inspection Program (CDFA-FMIP) and intends to market the material as a fertilizer product in 2017.

The processed material is considered fertilizer products; therefore this material does not meet the definition of biosolids. There are no current plans to regulate this material under Solano County Code Chapter 25 – the Biosolids Land Application regulations.

Further information on Lystek can be found at: www.lystek.com

Footnote 1: US Patent 6,808,636 B2 – “Treatment of Sewage Sludge”. Patent issued October 26, 2004, to Lystek International Inc. Abstract of the patent reads:

“A method for reducing sludge viscosity of a sewage sludge having a solids concentration of at least 10% (w/w). The method comprises the steps of increasing the pH of the sludge to 9.5-12.5%, at least one step selected from subjecting the sludge to a holding step of at least one day and adding inorganic or organic chemicals to facilitate viscosity reduction, followed by incubating the sludge at temperature up to 100° C., and subjecting the sludge to a shearing or disintegration step. The method provides sludge, especially concentrated sludge, that is more readily pumped or transported.”

More information regarding US Patent 6,808,636 B2 can be found at the United States Patent and Trademark Office website at www.uspto.gov

Footnote 2: EQ – “Exceptional Quality” biosolids material have demonstrated to the US EPA that they meet the following three criteria:

1. **Pollutant Level Limits** – Both ceiling concentration limits (Table 1 of 40 CFR 503.13) and monthly average pollutant concentration limits (Table 3 of 40 CFR 503.13) for arsenic, cadmium, copper, lead, molybdenum, mercury, nickel, selenium, and zinc have been met. Note: There is only a ceiling concentration limit (Table 1) for molybdenum in Table 1 of 40 CFR 503.13.
2. **Pathogen Reduction** – The treatment process used has demonstrated that it meets one of the six Class A Pathogen Reduction Alternatives set of criteria, as specified under 40 CFR 503.32.
3. **Vector Attraction Reduction** – The treatment process used has demonstrated that it meets one of the eight Options for Vector Attraction Reduction set of criteria, as specified under 40 CFR 503.33.

Note: Pollutant Levels, Pathogen Reduction, and Vector Attraction Reduction criteria must be monitored and continually re-verified at frequencies ranging from once per year to once per month depending on the amount of biosolid material processed, as specified by 40 CFR 503.16. More information on the Code of Federal Regulations, Title 40, Chapter 1, Subchapter O, Part 503 can be found at: <http://www.ecfr.gov/>

Footnote 3: California Department of Food and Agriculture, Fertilizer Materials Inspection Program (CDFA-FMIP) lists Lystek International LTD under license #447783. Further information can be found at the CDFA website: <https://www.cdfa.ca.gov/is/ffldrs/fertilizer.html>

EXHIBIT IX - Report to Board of Supervisors by Bay Area Clean Water Agencies (BACWA) Regarding Alternatives to Class B Biosolids Land Spreading

BACWA is a joint powers agency providing technical expertise and financial support from a Public Utilities perspective. BACWA's charter members are the five largest wastewater treatment agencies in the San Francisco Bay Area. BACWA continues to explore emerging issues including climate change mitigation. For example, Senate Bill 1383, adopted September 2016 reduces the amount of organics going to landfill. Production of Class A biosolids and the use of energy driven technologies such as biogas production are continually being explored. Alternatives for the use of biosolids are becoming more critical as the ability to dispose of the product as a waste product in our landfills is not a long term environmentally effective solution. Air emission standards are at issue with landfilling the residual organics. Air emission standards are also challenging while in development of energy capture and energy conversion technologies associated with biosolids residuals.

The BACWA Principals are East Bay Municipal Utilities District, East Bay Dischargers Association, San Francisco Public Utilities Commission, Central Contra Costa Sanitary District and the City of San Jose. BACWA has submitted their updated report (dated December 2016). The report summarized the land application of biosolids conducted in 2016 and provided an update on Agency efforts toward other options for beneficial reuse of biosolids. Options for reuse, recycling and disposal of biosolids are evaluated, including exploring technologies for extracting energy and nutrients from the biosolids material. Land application and the beneficial use as alternative daily cover still seem dominant in California, and trends from 2014 to 2015 remain similar. The report provides a breakdown of 2015 generators providing material to Synagro for land spreading in Solano County. BACWA is currently gathering data in order to include end use data for biosolids in the State of California. BACWA anticipates providing the State biosolids data for inclusion in their 2017 Report to the Solano County Board of Supervisors. In 2016, San Francisco Public Utilities Commission provided more than 65% of all biosolids material land spread in Solano County. San Francisco Public Utilities Commission continues to provide the majority of biosolids material land spread in Solano County.

The Bay Area Biosolids to Energy Coalition is focusing on a regional treatment facility for biosolids. The coalition consists of nineteen member agencies: City of Burlingame, Fairfield-Suisun Sewer District, City of Livermore, Ironhouse Sanitary District, City of Millbrae, North San Mateo County Sanitation District, City of Palo Alto, San Francisco Public Utilities Commission, City of Richmond, Sausalito-Marin City Sanitary District, City of San Jose, South Bayside System Authority, City of Santa Rosa, Union Sanitary District, Central Marin Sanitation Agency, Vallejo Sanitation District, Delta Diablo Sanitation District, West County Wastewater District, and Dublin San Ramon Services District. Individual agency reporting is included as part of the 2016 BACWA report. Additional information is available at www.bayareabiosolids.com



All agencies providing biosolids for land spreading in Solano County either participated in the BAB2E Coalition and / or diverted a portion of their biosolids to Class A material.



ANNUAL REPORT to the SOLANO COUNTY BOARD OF SUPERVISORS

LAND APPLICATION OF BIOSOLIDS in SOLANO COUNTY



**Prepared by the BACWA Biosolids Committee
December 2016**

Introduction

With the 2016 application season recently completed, the Bay Area Clean Water Agencies (BACWA) Biosolids Committee is pleased to present its annual summary report on land application of biosolids in Solano County. BACWA wishes to express its sincere appreciation to the staff of the Environmental Health Services Division of the Department of Resource Management for the continuing support of the biosolids land spreading program, which permits many of our member agencies to continue to apply biosolids to agricultural land in the County. We believe this partnership provides a valuable resource to the Solano County agricultural industry and provides many Bay Area agencies with an opportunity to cost- effectively and beneficially use biosolids and make a positive impact on the environment.

This report provides information on trends in the use of biosolids resources in California and the Bay Area, an update on regional biosolids programs, and specific information on projects and other efforts by individual agencies currently applying biosolids in the County. This report highlights each agency's compliance with the requirement in Chapter 25, Article IV, Sec. 25-400 that "Class B biosolids may only be land applied provided that the generator of the Class B biosolids is individually or as part of a consortium having a portion of their biosolids produced as Class A Exceptional Quality biosolids, converting biosolids to energy, or otherwise diverting Class B biosolids away from land spreading or landfilling (as waste or as Alternative Daily Cover)." This report is intended as supplemental information to the report submitted by the County Department of Resource Management staff and by Synagro, contract haulers and appliers of biosolids.

This report has been prepared for the Solano County Board of Supervisors in response to the Board's request for an annual update on agency activities and progress towards compliance with the goals set forth in County Code (Chapter 25). The affected agencies have coordinated the required reporting through BACWA to produce a single report for the Board.

We would like to acknowledge the assistance of your staff in working with BACWA member agencies throughout the year, particularly Jeff Bell, Anthony Endow, Matthew Geisert, Misty Kaltreider, and Jagjinder Sahota.

Municipal Agencies Applying Biosolids in Solano County

The application of biosolids provides soil amendments and nutrients to enhance the productivity of the farmland using natural, recycled materials. Each agency that applies biosolids is required to meet strict standards and provides a report annually to the United States Environmental Protection Agency (USEPA) to demonstrate compliance. The following Bay Area agencies currently transport biosolids to agricultural land in Solano County under contract with Synagro:

Central Marin Sanitation Agency (CMSA)
 City of Burlingame
 City of Calistoga
 City of Millbrae
 City of Pacifica
 City of San Mateo
 Delta Diablo (serving Antioch, Pittsburg, Bay Point)
 Ironhouse Sanitary District (serving Oakley and Bethel Island)

North San Mateo County Sanitation District (Daly City)
 San Francisco Public Utilities Commission
 Southeast WPCP (SF-SEP)
 Oceanside WPCP(SF-OSP)
 Silicon Valley Clean Water (SWCW - serving Belmont, Redwood City and San Carlos)
 Town of Windsor
 Union Sanitary District (serving Fremont, Newark and Union City)

A total of 7,318 dry tons were land applied on agricultural sites in Solano County in 2016. The portion from each agency is shown in Figure 1.

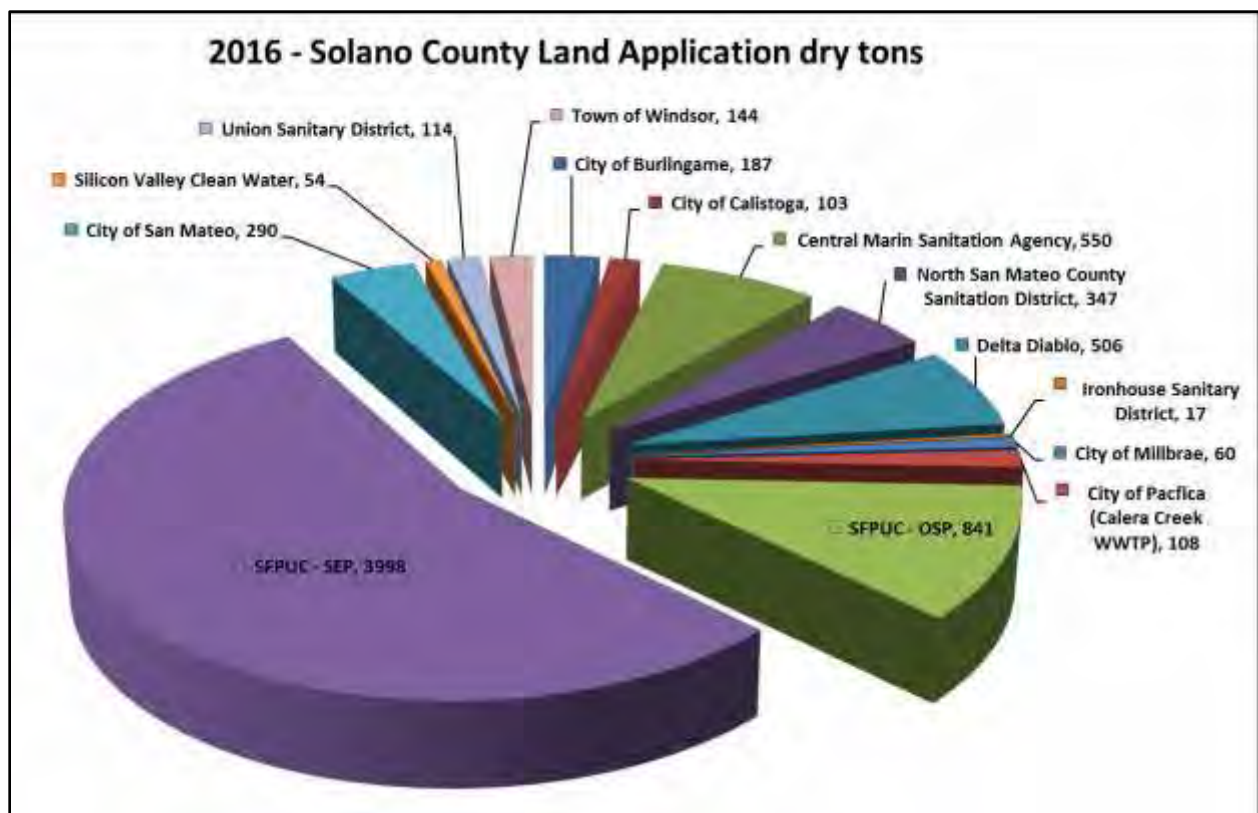


Figure 1. Amount of Biosolids Applied in Solano County by Each Agency in Dry Tons (2016). (Data provided by Synagro).

Data provided by Synagro indicates that the total quantity of biosolids applied to agricultural land in Solano County in 2016 was 14 percent greater compared to the 2015 application season.

Trends in Biosolids Usage in California

Wastewater agencies in California are continuing to identify and evaluate emerging options for biosolids reuse, recycling and disposal including technologies to extract energy and nutrients. However, traditional uses still dominate the biosolids landscape, primarily due to cost and reliability. Some agencies are also evaluating or implementing process changes to produce Class A biosolids.

Overall Use Summary. Figure 2 summarizes the use of biosolids in California for calendar years 2009 through 2015. Data for 2016 are not yet available and will be included in the 2017 report. The number one use statewide continues to be land application in various forms, including compost, Class B and Class A applications. From 2014 to 2015, land application of compost increased from 30 to 32 percent, land application of Class biosolids decreased from 25 to 18 percent, and land application of Class A biosolids increased from 9 percent to 11 percent. Biosolids have proven to be a safe, reliable and nutrient-rich soil amendment that offers a more cost-effective alternative to chemical fertilizers, which are increasingly expensive and very energy intensive to produce. Other significant methods for beneficial use and disposal include alternate daily cover (and other approved uses as a soil substitute) at landfills and landfill disposal.

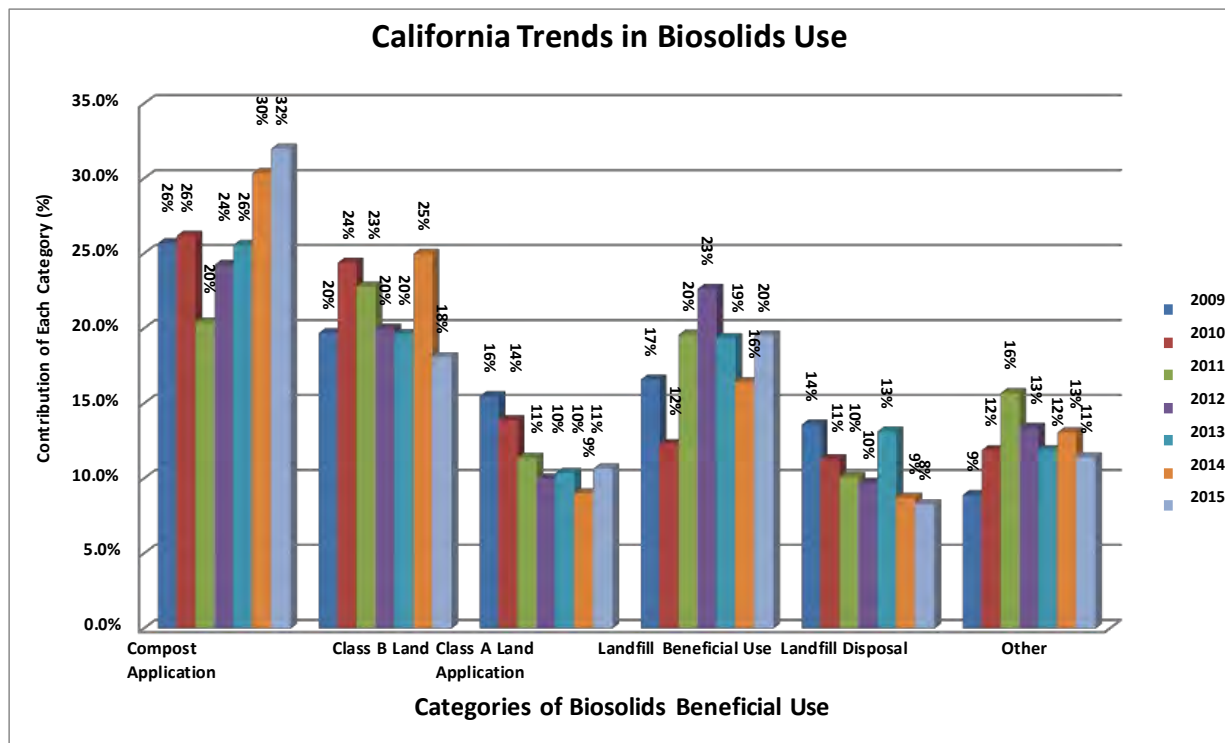


Figure 2. California Trends in Biosolids Use for the Years 2009 to 2015. (Data provided by EPA Region 9).

Bay Area Trends. In focusing on the Bay Area, Figure 3 illustrates uses of biosolids in the nine Bay Area counties. The primary uses continue to be landfill beneficial use, land application and incineration, which together account for over 90 percent of biosolids end uses in the Bay Area. Compost, landfill disposal, and surface disposal levels remained similar to 2014 percentages.

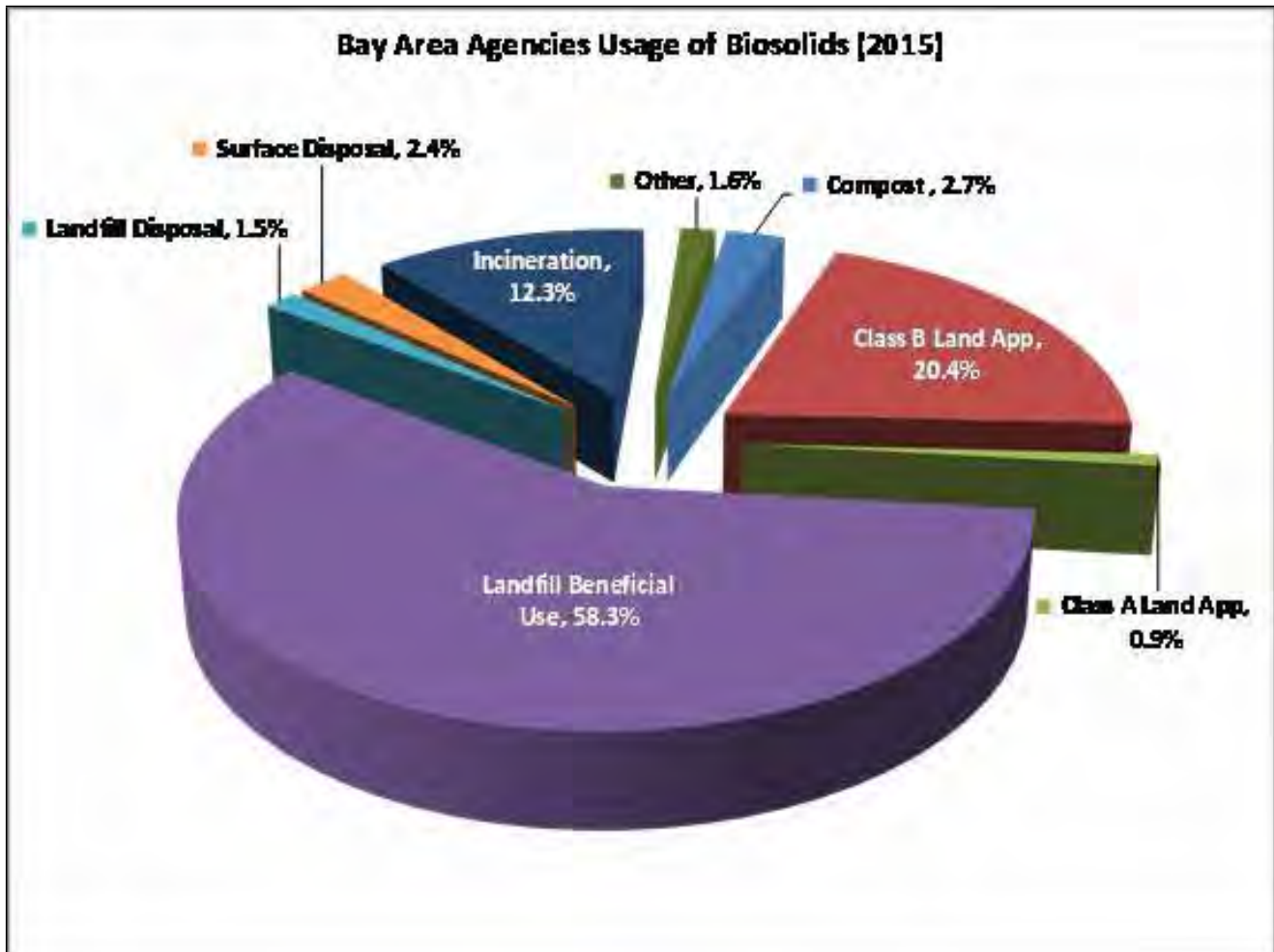


Figure 3. Bay Area Agencies Usage of Biosolids (2015). (Data Provided by EPA Region 9).
(The "Other" category typically includes storage.)

Biosolids were applied to agricultural land in four different Northern California counties in 2015 with Solano County ranking fourth at 8.33 percent, which is very similar to the previous year level of 7.8 percent. Figure 4 illustrates the distribution of land applied biosolids among the various counties.

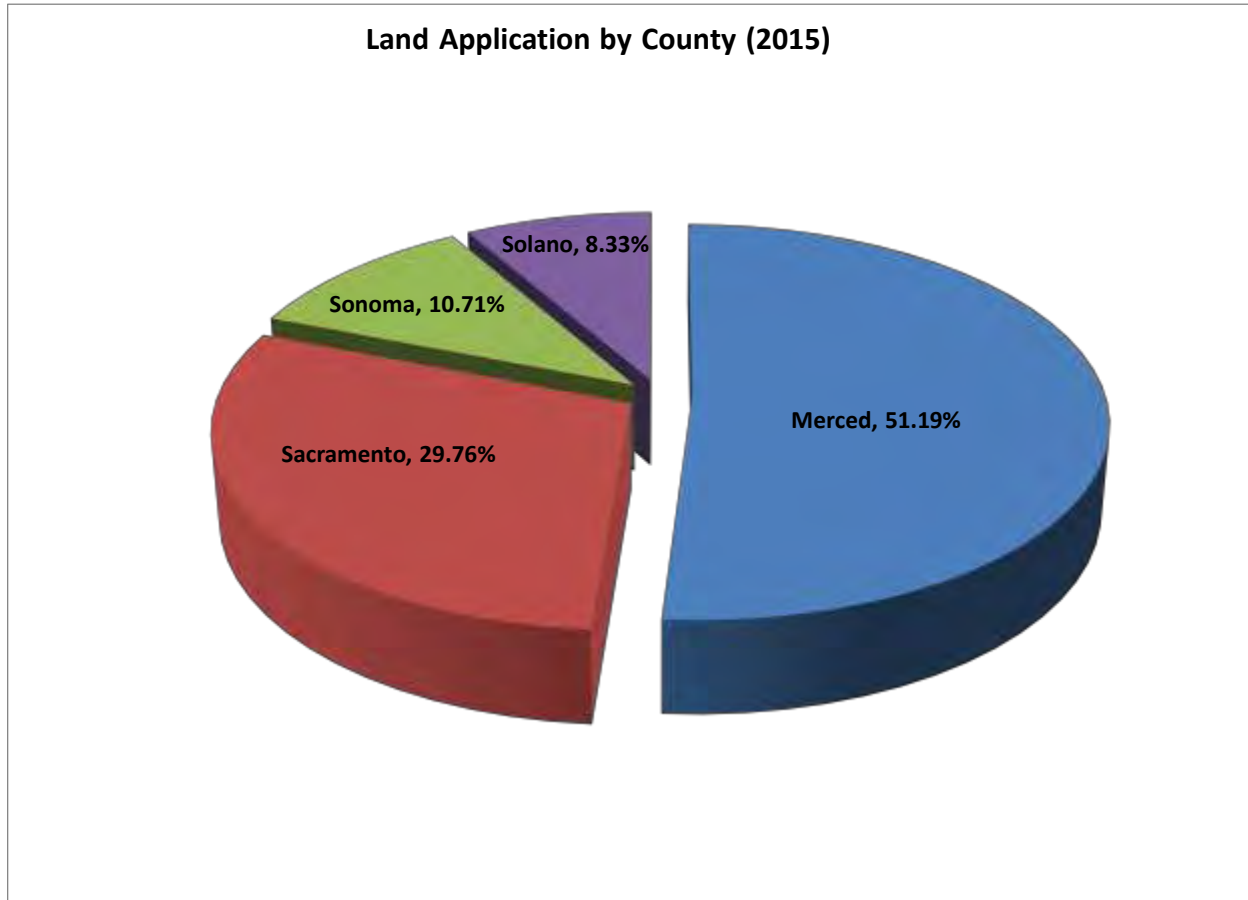


Figure 4. Distribution of Land Application of Biosolids among the Counties. (Data Provided By EPA Region 9).

Bay Area Regional Efforts

BACWA Biosolids Committee. The BACWA Biosolids Committee's (Committee) mission is to support the development and maintenance of cost-effective, sustainable biosolids management options for the more than 154,000 dry metric tons of biosolids produced in the Bay Area annually. The Committee continues to provide proactive support and information sharing to member agencies on regional biosolids issues, projects, and proposed regulations and legislation. The Committee holds quarterly meetings with an emphasis on biosolids technology information sharing among the participating agencies by providing facility tours and establishing a forum for vendors to present their products and technologies. In 2016, the Committee held four quarterly meetings. Two meetings were held at the Fairfield Suisun Sewer District, which included tours of its Organic Material Recovery Center during construction and operation. The Committee also met at the Central Marin Sanitation Agency and toured its Fats

Oils-Grease (FOG) and High-strength Waste Receiving Station. The Committee issued a Biosolids Trends Survey to all BACWA members and is currently compiling the results to show the production rates, current uses, costs, and future plans for biosolids management across Bay Area agencies.

Bay Area Biosolids to Energy Program. The Bay Area Biosolids to Energy (BAB2E) Coalition originally formed in 2004 when a group of agencies came together to evaluate the feasibility of a regional biosolids management project to avoid the threat of a potential ban on land application of biosolids. By 2008, the membership expanded and the group decided to officially brand itself as the BAB2E Coalition to take advantage of opportunities anticipated to be developed under new state legislation (specifically, Assembly Bill 32 or AB 32). Assembly Bill 32 was adopted in 2006 requiring the state to reduce greenhouse gas (GHG) emissions to 1990 levels by 2020 (with further reductions by 2050). To achieve GHG reductions, the state created numerous programs incentivizing renewable energy and low carbon fuel production. This legislation served as a driver to prioritize the conversion of biosolids to energy over other Class A or B options, which also satisfies the Solano County Code requirements for land application of biosolids (Chapter 25, Article IV, Sec. 25-400), specifically:

“Class B biosolids may only be land applied provided that the generator of the Class B biosolids is individually or as part of a consortium having a portion of their biosolids produced as Class A Exceptional Quality biosolids, **converting biosolids to energy**, or otherwise diverting Class B biosolids away from land spreading or landfilling (as waste or as Alternative Daily Cover).”

A decade later, Governor Brown announced five overarching "pillars" by which he plans to achieve the 2030 GHG reduction target under Senate Bill 32 (SB 32). These pillars recognize that several major areas of the California economy will need to reduce emissions.

1. Reducing today's petroleum use in cars and trucks by up to 50 percent
2. Increasing from 33 to 50 percent our electricity derived from renewable sources
3. Doubling the energy efficiency savings achieved at existing buildings and making heating fuels cleaner
4. Reducing the release of methane, black carbon, and other short-lived climate pollutants
5. Managing farms, rangelands, forests and wetlands so they can store carbon

While the Coalition continues to be vigilant in ensuring the benefits of recycling biosolids for land application are understood, its mission is to also ensure there is support for innovative technologies that may be able to extract energy directly from biosolids, manage additional nutrient loading, and produce other value-added products.

The Coalition continues to develop the six subregional projects within the Bay Area that beneficially utilize biosolids as a renewable resource. Producing energy from biosolids remains an emerging field with multiple ongoing advancements in technology, research, and development currently taking place. The Coalition pursues a multi-pronged approach that includes:

- Investigating viable, year-long (weather resilient) alternatives to land application that look beyond "biosolids to energy" and seek to responsibly recycle back value-added products of biosolids to the environment.
- Educating the public on biosolids management issues in California through public outreach efforts, including the creation of a public website and securing media coverage.
- Serving as a technology incubator - particularly for pre-commercial technologies.
- Supporting land application in the Bay Area by seeking to create more capacity for biosolids in the Bay Area marketplace.
- Advancing the industry and legislative state of knowledge on biosolids as a valuable resource.

To achieve the Coalition objectives (listed above) and address critical challenges identified in the next two years, the Coalition will:

- **Build Relationships** - among members and local governments (e.g., Solano County), academia, legislature, state agencies, public, etc.
- **Achieve Project Maturity** - gaining experiences from the six existing subregional projects
- **Promote Product Development** - continuing to identify/develop technologies and other biosolids end use products that can be replicated by others

Current Coalition members are:

City of Burlingame	Fairfield-Suisun Sewer District
City of Livermore	Ironhouse Sanitary District
City of Millbrae	North San Mateo County Sanitation District
City of Palo Alto	San Francisco Public Utilities Commission
City of Richmond	Sausalito-Marin City Sanitary District
City of San Jose	Silicon Valley Clean Water
City of Santa Rosa	Union Sanitary District
Central Marin Sanitation Agency	Vallejo Sanitation District
Delta Diablo	West County Wastewater District
Dublin San Ramon Services District	

Individual Agency Programs

Individual BACWA agencies are responsible for their own biosolids management programs and each develops its own plan in addition to participating in regional programs. Below are program highlights for many of the participating agencies. Note that while Fairfield Suisun Sewer District does not apply biosolids to agricultural land in the County, they are an active participant in both the BACWA Biosolids Committee and the BAB2E Coalition.

Many agencies that land applied Class B biosolids in Solano County either participated in the BAB2E Coalition and/or diverted a portion of their biosolids to Class A conversion facility (i.e., compost).

Central Marin Sanitation Agency. The Central Marin Sanitation Agency (CMSA) contracted with Synagro for land application of its biosolids during the dry weather season in Solano and Sonoma counties. CMSA also sends its biosolids to Redwood Landfill for landfill beneficial use, to Synagro's Central Valley Compost facility and to Lystek International for further processing to meet Class A biosolids requirements. CMSA continues to be a member of the BAB2E Coalition.

City of Burlingame. The City of Burlingame Wastewater Treatment Facility continues to contract with Synagro to land apply biosolids to farmland in both Sacramento and Solano Counties. The City continues to participate in the BAB2E Coalition.

City of Calistoga. The City of Calistoga produces biosolids according to 40 CFR regulations. At this facility, solids are processed by the treatment methods of thickening and application to drying beds. The material is land applied to various fields in Solano County by Synagro, and a portion of this material is diverted to produce Class A Biosolids at Synagro's Central Valley Compost Site.

City of Millbrae. In 2016, the City of Millbrae contracted with Synagro to land apply, compost biosolids or use as ADC. The City also continues to participate in the BAB2E Coalition and seeks further reuse and disposal options. The City accepts trucked-in restaurant grease trap waste (brown grease) for digestion. Millbrae, through Synagro, land applied approximately 60 dry tons in Solano County in 2016.

City of Pacifica - Calera Creek Water Recycling Plant. The City of Pacifica's Calera Creek Water Recycling Plant contracts with Synagro to land apply biosolids to farm land in Sacramento and Solano counties. In 2016, Synagro has land applied approximately 107.52 dry tons in Solano County. Calera Creek Water Recycling Plant utilizes Autothermal Thermophilic Aerobic Digesters. This type of digester system produces Class A biosolids. All of the biosolids sent to Solano County for 2016 were Class A biosolids.

City of San Mateo. All of the City's biosolids are beneficially used as either ADC, soil amendment, or compost feedstock. The City received a grant from the California Energy Commission in November 2014 to clean and utilize the biogas from the digestion process to produce compressed natural gas (CNG) for the City's vehicle fleet. The City anticipates producing 500 gas gallon equivalents per day.

Delta Diablo. Delta Diablo is an active participant in the Bay Area Biosolids to Energy Coalition, working to develop biosolids to energy technology alternatives for the Bay Area. Delta Diablo operates a recently completed FOG receiving facility, which boosts methane gas and energy production from its cogeneration plant. The addition of FOG to the solids treatment process is known to reduce the volume of solids produced through the digestion process. Delta Diablo continues to contract with Synagro for biosolids management.

Ironhouse Sanitary District. The Ironhouse Sanitary District (ISD) produces biosolids according to 40 CFR regulations. ISD's recycling facility is designed to produce Class B biosolids. In 2016, about 16 dry tons of ISD's biosolids were land applied to various fields in Solano County by Synagro.

North San Mateo County Sanitation District. North San Mateo County Sanitation District (Daly City) continues to contract with Synagro to land apply biosolids to farmland in both Sacramento and Solano Counties. Additionally, biosolids were diverted to Merced County for producing a Class A compost material. Daly City continues to actively participate in the BAB2E Coalition.

San Francisco Public Utilities Commission (Southeast and Oceanside). The Wastewater Enterprise (WWE) is one of three enterprises of the SFPUC. WWE marked its sixteenth consecutive season of land application of Class B biosolids in Solano County. Inspectors from the WWE perform bi-weekly land application inspections in Solano County to ensure that the contractors are following local regulations. In addition to Solano County, the WWE also land applies Class B biosolids in Sonoma and Sacramento Counties. WWE also contracts with Synagro to divert biosolids to Synagro's Central Valley Compost Facility in Merced County to produce Class A compost material. During the wet-weather season, biosolids from both plants were beneficially used at Vasco Road, Potrero Hills and Altamont landfills and land applied at Silva Ranch in Sacramento County.

Construction was completed in July 2016 for the upgrade of the digestion process at the Oceanside Water Pollution Control Plant (OSP) to a two-stage thermophilic/mesophilic process known as Temperature-Phased Anaerobic Digestion (TPAD) which will generate Class A Biosolids as defined by the 40CFR503 regulations. Thermophilic digestion in three digesters under flow-through mode was established in September 2016. Transition to a system-wide batch mode operation is expected to take place in early 2017 and the generation of Class A biosolids is expected in January 2017. The WWE is proceeding with its multi-billion dollar Sewer System Improvement Program <http://sfwater.org/index.aspx?page=116>, which includes a keystone project – complete reconstruction of the Southeast Water Pollution Control Plant's (SEP) Biosolids processing facility. WWE Staff and its consultant team (Brown & Caldwell, CH2MHill and Black & Veatch) have decided on Thermal Hydrolysis Pretreatment prior to mesophilic digestion to achieve Class A biosolids from the SEP. Completion of the new facility is expected in 2023.

The WWE continues to actively participate in the BAB2E Coalition.

Silicon Valley Clean Water. Through the end of October 2016, Silicon Valley Clean Water (SVCW) land applied approximately 45 percent of its Class B biosolids in Merced, Solano, and Sacramento Counties via contract with Synagro. SVCW also diverted approximately 13 percent of SVCW biosolids to a compost facility in Merced County. SVCW has also diverted approximately 7 percent to landfill for beneficial use in Solano County, and 35 percent to landfill for beneficial reuse in Alameda County.

In 2016, SVCW completed the Biosolids Drying Bed Improvement Project, in which the drying beds were graded and lined with concrete bottoms and lime stabilized soil on the sloped sides. New concrete decant structures along with a decant pump station were constructed as part of the project. SVCW also installed new Fournier Fan Press units for biosolids dewatering, which replaced an outdated centrifuge unit. Both projects are completed and operational.

Town of Windsor. The Town of Windsor Water Reclamation Facility contracts with Synagro to land apply biosolids to farmland in Solano County. The Town of Windsor is currently diverting a portion of its biosolids to Merced County for composting. The Town of Windsor continues to investigate feasible and cost effective Class A biosolids treatment and process options.

Union Sanitary District. Union Sanitary District (USD) beneficially used 100 percent of its biosolids in 2016 and met all USEPA regulations for the 23rd consecutive year. USD continues to contract with Synagro for its biosolids management, with approximately 70 percent of USD's biosolids land-applied to farmland in Sacramento, Merced and Solano Counties. Nearly 30 percent of biosolids production was delivered to Merced County for producing Class A compost. USD is one of 19 Bay Area wastewater utilities actively participating in the BAB2E Coalition.