

SHRAWAN SINGH, PhD, PE

Education

PhD – Environmental Engineering, University of Florida, 2011

MTech – Environmental Engineering and Management, Indian Institute of Technology, Kanpur, India, 2004

BTech – Agricultural Engineering, G.B.P. University of Agriculture and Technology, Pantnagar, India, 2002



Sharwan Singh

Professional Licenses

Professional Engineer – Texas

Professional Experience

Dr. Singh is a registered professional engineer with over six years of experience as a project/task manager and engineer for various aspects of solid waste management. Dr. Singh has worked on several projects involving design and permitting of municipal solid waste (MSW) landfill liner, gas collection and control system (GCCS), closure design, leachate recirculation system, and leachate treatment system, and developing solid waste management master plan and recycling strategies for counties. Dr. Singh has also worked on groundwater and soil contamination assessment and remediation plans for landfills, technical support for a landfill experiencing a subsurface smoldering event, operational assistance for coal combustion residue (CCR) landfill and surface impoundments, and evaluation of post-closure care (PCC) performance of landfills, beneficial reuse of waste to energy bottom ash, a market analysis of waste materials and waste composition studies. Dr. Singh has provided technical support and engineering services to the Office and Research and Development (ORD) division of the US EPA on several projects and has published several peer-reviewed research articles.

Dr. Singh is currently a Senior Project Professional at the SCS-Atlanta office. His representative project experiences are presented below.

Landfill Bottom Liner Design and Operation

Vega Baja Municipal Landfill, PR (2018-2019)*. Worked as a lead engineer to develop a design layout for the bottom liner of the new cell. Provided guidance to the engineers for developing the design and construction level design drawings, reviewed design drawings and calculation package including settlement calculations, leachate generation, head over the liner, and LCS pipe perforation and strength, LCS pipe sizing, sump and pump sizing, geomembrane leakage rate, and geosynthetic liner equivalency. Communicated with the client about design and its progress.

Kanjur Integrated Waste Management Facility Design, Mumbai, India (2015-2017)*. Lead engineer to perform calculations and design the landfill cells bottom grades and leachate collection and removal system (LCRS). The design consisted of seven contiguous waste cells of one-year waste capacity. Each cell was planned to be mined after every five years of waste degradation. The calculation package included estimation of settlement, leachate generation, head over the liner, and LCS pipe perforation and strength, LCS pipe sizing, sump and pump sizing, geomembrane leakage

*work performed at previous firm

rate, and geosynthetic liner equivalency. Developed permit level drawings in AutoCAD Civil 3D and bill of quantity for the design. Developed filling sequence. Communicated with the client about design and its progress.

Solvi Group, Brazil (2017-2018)*. Lead engineer to performed feasibility evaluation for retrofitting four landfills in Brazil: Belem, Quata, Sao Leopoldo, and Santa Maria into bioreactor landfills. Performed leachate injection design calculations for vertical well and horizontal trench leachate injection system to primarily promote organic substrates and nutrients transportation and cycling throughout the waste mass and not to substantially increase the waste moisture content. Developed and drew conceptual bioreactor design drawings in AutoCAD Civil 3D, calculation packages, material quantity, and the reports for each site.

Kanjur Integrated Waste Management Facility Operation and Maintenance, Mumbai, India (2017)*. Assisted the facility engineers on-site for the operation and maintenance of bioreactor landfills. Identified issues in their existing operational practices and provided design and consulting to improve operational practices. Provided on-site consulting for ongoing liner and GCCS construction.

New River Regional Landfills, Raiford, Florida, Leachate Recirculation System Construction (2006-2007)*. Worked as a Research Assistant on-site during the installation of the leachate recirculation system (LRS) for a 27-acre landfill cell. A hybrid LRS was installed in which leachate was planned to be recirculated through vertical wells completely buried under waste.

Landfill Gas Collection and Control

Semiannual Title V and GHG Reporting (2021-Present). Developed semiannual Title V and GHG reports for multiple landfills (Several private landfills, and DeKalb County Landfill) of Georgia.

DeKalb County Landfill, GA, GCCS Evaluation and Upgrade, (2021-Present). Assisted engineers at SCS to identify landfill area to install additional gas wells and re-drill other non LFG producing gas wells at the DeKalb County Landfill to increase the LFG generation.

Vega Baja Municipal Landfill, Puerto Rico, GCCS Design (2019)*. Lead engineer to perform calculations and design of the GCCS for Vega Baja Municipal Landfill, Vega Baja, PR. Reviewed and finalized GCCS design prepared by engineers. Developed a report for the GCCS design and installation.

Mayaguez and Guaynabo Landfill, Puerto Rico, Non-methane Organic Compound (NMOC) Evaluation Plan (2018) *. Develop NMOC testing and estimation plan for Mayaguez and Guaynabo landfills located in PR following the 40 CFR 60subpart WWW- Standards of Performance for MSW Landfills. The plans were submitted to PR Environmental Quality Board and the US EPA for approval. Addressed EPA's comments on the plan for Mayaguez Landfill.

Kanjur Integrated Waste Management Facility Design, Mumbai, India, GCCS and LRS Design, (2016-2017)*. Lead engineer to perform calculations and design the hybrid LRS and landfill GCCS for 4,000-metric tons per day solid waste management facility. Horizontal LRS and GCCS trenches were designed such that leachate recirculation and gas collection can be performed through alternate trenches of each level. Developed permit level AutoCAD drawings and bill of quantity for the design.

Pirana Landfill, Ahmadabad, India GCCS Design, (2016)*. Lead engineer to develop design and calculation package of GCCS for closed section of Pirana Landfill. The calculation package included an estimation of the landfill gas generation rate, vacuum required for GCCS operation, the design

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rationale for GCCS devices and their arrangements, a design for the condensate management system. Prepared construction level GCCS design drawings. Communicated with the client for data needs.

Alachua County Southwest Landfill (ACL), Archer, Florida, GCCS Operation and Maintenance (2007-2010)*. Worked as a research assistant to operate GCCS of a landfill operated as bioreactor. GCCS was modulated to generate an overall landfill gas quality with methane concentration greater than 51%. Landfill gas was used to operate the gas-to-energy project. Collected gas measurements from perimeter gas wells, and annual update reports.

Confidential Client, South Carolina, Landfill Gas Odor Issue Evaluation, (2011-2012)*. Evaluated the operational effectiveness of landfill's GCCS for the correctness of odor complaints aroused from landfill neighbors. The project included extensive landfill gas data mining and modeling, evaluation of GCCS design components, and operational records. Provided recommendations for the effectiveness of the existing system.

Landfill Leachate Management and Treatment

Enterprise Florida Class III Landfill, Florida, Impact of Leachate Disposal on Unlined Pond and Design and Permitting of Lined Leachate Treatment Pond, (2020)*. Project manager and lead technical engineer to evaluate the groundwater exceedances observed due to leachate disposal in the unlined leachate treatment pond. Assisted client in addressing and negotiating the consent order issued by the FDEP. Coordinated with FDEP to receive the feedback on proposed corrective action plan (CAP) to address exceedance issues and developed the CAP. Designed a lined leachate treatment aeration pond for removal of iron and manganese from leachate prior to disposal in unlined pond. Obtained permit for leachate treatment, disposal, and monitoring. Managed compliance monitoring associated with leachate treatment permit.

Vega Baja Landfill, PR, Design and Permitting for On-site Landfill Leachate Treatment, (2019)*. Lead engineer to develop research, demonstration, and development (RD&D) permit application for on-site landfill leachate treatment using reverse osmosis (RO) membrane systems. Conducted the evaluation in two phases. The first phase consisted of an evaluation of the effectiveness of existing RO systems used for leachate treatment at five sites in the US. In the second phase, developed an RD&D permit for site's leachate treatment using a low-pressure RO. The permit application was submitted to PR EQB.

Enterprise Florida Class III Landfill, Florida, Leachate Quantity Estimation, (2016)*. Performed HELP model runs to estimate the total quantity of leachate collected at the site. The site was planning to construct a toe drain at the northern toe of the landfill, which would collect leachate from all existing and future cells of the site.

Florida International University, Miami (2012)*. Conducted experimental and analytical research on improving the biodegradability of landfill leachate for co-treatment with municipal wastewater. Mentored graduate students in developing experimental plans and conducting various experiments for leachate treatment. Application of the Fenton process was assessed, evaluated, and recommended for biodegradability improvement of landfill leachate. Published three peer-review articles from this research.

Alachua County Southwest landfill (ACL), Florida, Design, Permitting, and Operation and Maintenance of On-site Landfill Leachate Treatment, (2007- 2010)*. Designed, installed, and operated a RO landfill leachate treatment system. Using initial operational and analytical results, prepared an RD&D

*work performed at previous firm

permit to be submitted to the FDEP to operate the RO system at the landfill. Other leachate pretreatment methods air stripping and ion exchange were evaluated for removal of excess ammonia present in the treated leachate after membrane treatment. Treated leachate was beneficially used in irrigating the vegetative cover of the landfill.

The University of Florida, Leachate Characterization Study of the Waste Transfer Station, (2007)*. Collected leachate samples from several transfer stations across the state of Florida and analyzed for leachate quality parameters.

Solid Waste Management Plan

Pinellas County, Florida in association with HDR, Tampa, Organic Waste Management Plan, (2018-2019)*. Lead professional engineer to develop an organic waste management plan for the County's solid waste management master plan. Estimated the amount of organic waste generated at the County, developed different scenarios, strategies, and cost estimates for management of organic waste generated by different sectors within the County. Assisted in other components, including waste to energy ash and construction and demolition debris (CDD) management.

HDR, Australia, State of Practice of Beneficial use of Waste-to-Energy (WTE) Ash (2017)*. Lead engineer to prepare a review of the state of practice of beneficial reuse of WTE ash. The review was to be used in determining WTE ash management practice at the Phoenix Kwinana WTE facility, Perth, Australia.

Pasco County Utilities, FL, Waste to Energy Facility Bottom Ash Reuse (2017)*. Lead Engineer to evaluate the impact of waste to energy facility bottom ash as a base course underneath a 2-inch thick pavement layer as compared to a 4-inch thick pavement layer and their impact on human health and groundwater. Rainwater infiltration rates were estimated using HELP modeling. Groundwater quality data were evaluated to determine the impact of rainwater leaching through the bottom ash base course. No significant difference in infiltration rate between a 4-inch and 2-inch thick pavement layer was observed. Aluminum (Al), antimony (Sb), and molybdenum (Mo) were observed as a constituent of concern (COCs); however, 2-inch and 4-inch thick base course layers showed a similar impact on the groundwater quality.

Clay Cut, Polk County, Florida, Market Analysis of CDD Management, (2016)*. Lead engineer to conduct market analysis for County's CDD management. Evaluated the historical CDD collection and flow to different CDD management facilities in the County. Estimated permitted available CDD management capacity in the County and measured the gap between County's future CDD generation and current management infrastructure. Additionally, presented the project outcomes in the public hearing of the County's Board of County Commissioners.

Clay County, Florida and Polk County, Florida, End of Life Materials Management Plan (2015)*. Lead engineer to develop end of life (EOL) materials management plan for both the counties. Reviewed current state-of-practice of EOL management of materials generated within the County. Developed a list of recycling scenarios for Counties to consider for increasing the materials recycling rate to 75% by 2020. Provided a list of challenges that may occur during the implementation of these scenarios.

Orlando Utilities Commission (OUC) Stanton Energy Center, Orlando, Florida, Environmental Impact of Reuse of Flue-gas Desulfurization Products, (2015)*. Performed a beneficial use assessment for the land application of Flue-gas desulfurization (FGD) byproducts from the OUC Stanton Energy Center in Orlando, FL. Analyzed potential environmental and human health risks due to land application of FGD byproducts.

*work performed at previous firm

Indiantown Cogeneration Facility in Indiantown, Florida, Safety Data Sheet Development (2015)*. Developed Safety Data Sheets (SDS) for coal bottom ash, fly ash, and lime grit residuals generated at the facility. Collected lime grit samples at the site for its chemical analysis.

Polk County, Florida, Waste Quantity Reports (2011)*. Assisted the County in submitting the waste quantity online report to FDEP. Developed a template for the County for their waste quantity reporting.

Bill Hinkley Center for Solid and Hazardous Waste Management, Gainesville, FL, Florida Class-I Landfill Capacity Estimation (2012-2013)*. Managed the project for estimating the cumulative capacity of Florida class-I landfills (municipal solid waste landfill). Collected and analyzed statewide landfill capacity data, created an excel database that can be easily managed and updated in the future; developed web GIS maps showing statewide remaining capacity, and prepared a report.

The University of Florida, Gainesville, Florida, Waste Characterization Studies (2007 and 2010)*. Involved in two waste characterization studies as a research assistant. The first study was conducted at the Orange County landfill, Florida, to determine the amount and type of pharmaceutical waste generated in Orange County. The second study was conducted at the Alachua County Transfer Station, Gainesville, Florida, to determine the amount of recyclable and biodegradable waste generated in Alachua County.

Soil and Groundwater Contamination Assessment and Remediation

Enterprise Class-III Landfill and Recycling Center, Dade City, Florida, Evaluation of Iron and Manganese Groundwater Exceedances in a Florida Class III landfill (2020)*. Lead engineer to evaluate the observed exceedances of iron and manganese in the compliance wells surrounding an unlined leachate pond. Prepared a memo on behalf of the site owner explaining FDEP that the observed exceedances are primarily due to the reductive dissolution of natural site soil iron. Listed the corrective actions to be implemented to address the observed exceedances.

Central County Solid Waste Disposal Complex, Sarasota County, Florida, Soil Remediation for Landfill Liner Construction, (2018-2019)*. Lead engineer for analyzing groundwater and soil characterization data, estimating potential arsenic and iron release into the groundwater due to changes in biogeochemistry caused by the development of planned landfill liner, recommending soil remediation strategies and bottom liner design options to reduce the amount of arsenic and iron release.

Gainesville Regional Utilities (GRU) Coal Combustion Residue (CCR) Landfill, Gainesville, Florida, Contaminated Soil Remediation (2018-2019)*. Lead engineer to estimate the extent of the presence of contaminated soil with coal combustion residue (CCR) surrounding the CCR landfill. Developed a plan and drawings for contaminated soil excavation, disposal, and clean fill at the excavation area.

Gainesville Regional Utilities, Gainesville, Florida, Characterization and Disposal Option Evaluation for GRU Biomass Facility Ash, (2018)*. Provided engineering services in characterizing the ash produced at the GRU's biomass burn facility. Evaluated disposal alternatives for the ash including soil amendment and disposal at existing CCR landfill. Due to radioactive contamination present in the ash, landfill disposal was recommended.

Enterprise Class-III Landfill and Recycling Center, Dade City, Florida, Groundwater Quality Evaluation (2011)*. Reviewed, organized, and analyzed all available historical groundwater monitoring data of

*work performed at previous firm

the landfill to assess the impact of the landfill on the surrounding groundwater quality. Evaluated temporal impact on the groundwater quality at each monitoring well. Identified the constituents of concerns (COC) based on their temporal changes and exceedances to the Florida Groundwater Cleanup Target Levels. Identified the potential reasons for these exceedances.

US EPA Office of Research and Development (ORD) Projects

HELP Model v4.0 Testing and Recommending Features to update in Future Version (2019-2020)*.

US EPA has released an updated excel based HELP model v 4.0. As project engineer responsibilities were to test the HELP model during the model development and provide recommendations to model developers for model analytical and user interface improvement. Following the v4.0 release, the US EPA has also planned to add features related to leachate recirculation and extreme weather events. Developed a memo for US EPA to consider the potential features that can be added in the upcoming updated versions.

State of Practice of On-site Leachate Treatment (2019-2020)*. Lead engineer to develop a report on the state of practice of onsite leachate treatment in the US landfills. Case studies for the most common onsite leachate treatment processes including evaporation, biological treatment, membrane process, phytoremediation, and a combination of physico-chemical and biological processes were evaluated.

Data Compilation of the Landfill Facilities in Southeast USA (2019-2020)*. As the Project manager responsibilities were to collect all the publicly available data related to non-hazardous waste disposal across the southeast USA. Provided guidance to staff engineers and contacted state agencies for the effort. The compiled data are expected to be used to understand the state of practice of solid waste disposal in this region.

Support for the Subsurface Heating Event at a Closed Municipal Solid Waste Landfill, Missouri (2015-2020)*. Project engineer to analyze the monitoring data collected at a closed landfill experiencing the subsurface heating event. A variety of data such as subsurface waste temperature, gas temperature and quality, settlement, leachate removal systems, and waste heat extraction systems are being collected at the site. Conducted extensive data analysis and prepared monthly and annual reports consisting of critical evaluation of monitoring data for the EPA. The EPA uses the reports to provide further guidance to the site to manage existing SSE.

Approaches to Evaluate the Impact of Subtitle D Landfills beyond the 30-year Post-Closure Care Period (2016-2019)*. One of the lead engineers to identify the approaches for evaluating subtitle-D landfill performance after closure. Collected and analyzed a variety of data collected at nine landfills across the US closed for over 10 years. The data analyzed included leachate and gas quantity and quality, groundwater quality, PCC cost, settlement, subsurface methane monitoring, surface emission monitoring, etc. Prepared a comprehensive report and recommendations for the ORD for PCC performance evaluation approaches.

Performance of Double Lined MSW Landfills (2016-2019)*. Project engineer to collect and analyze the performance of double-lined MSW landfills across the US. Leachate quantity and quality data were collected from a total of 54 double-lined landfills across the US. Data analysis was performed to determine the liner efficiencies and the size of the defects in the liner. Evaluated the effectiveness of the HELP model in estimating leakage rate as compared to site measured data.

Hydraulic Properties of Landfill Liner Geosynthetic Material, US EPA (2019)*. Provided guidance to staff engineers to develop a database with the most updated information on the hydraulic properties

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of landfill liner geosynthetic materials. Conducted quality analysis and control for the database. The database is planned to be used by the US EPA in updating the existing HELP model default values.

Hydraulic Properties of Waste Material, (2019)*. Provided guidance to staff engineers to develop a database with the most updated information on the hydraulic properties of various waste materials. The EPA plans to add and/or update the existing HELP model default values. Conducted quality analysis and control for the databases.

Hydrologic Evaluation of Landfill Performance (HELP) Model Testing (2018, 2020)*. Lead engineer to test the excel-based HELP model that EPA is developing. Provided critical recommendations to the EPA for adding the missing features on the model that will greatly improve the usability and quality of excel based model.

Wasted Food Generation in the US: Sources, Amounts, and Estimation Methodologies, Cincinnati, Ohio (2016-2015)*. Lead engineer to review the existing methodologies to determine the amount of wasted food generation rate from individual industrial, commercial, and institutional entities across the US. Improved the existing methodologies as needed and developed extensive database listing names, locations, contact details, and an estimate of the wasted food generation rate from each of the 685,000 entities. The database was used by the ORD to develop an excess food opportunity mapping tool (<https://www.epa.gov/sustainable-management-food/excess-food-opportunities-map>) to locate the amount of wasted food generation across the US by each entity.

Publications and Presentations

Singh, S., Moody, C., Townsend, T., 2014. Ozonation as a pretreatment for stabilized landfill leachate treatment using high pressure membranes. Desalination 344,163-170. doi: 10.1016/j.desal.2014.03.011

Bernardo-Brisker, A.R., Singh, S., Trovo, A.G., Tang, W.Z., Tachiev, G., 2014. Biodegradability enhancement of mature landfill leachate using fenton process under different COD loading factors. Environmental Processes, 1-13. doi: 10.1007/s40710-014-0016-8

Singh, S., Tang, W.Z., Tachiev, G., 2013. Fenton treatment of landfill leachate under different COD loading factors. Waste Management 33, 2116-2122. doi: 10.1016/j.wasman.2013.06.019

Singh, S., Tang, W.Z. 2013. Statistical analysis of optimum fenton oxidation conditions for landfill leachate treatment. Waste Management 33, 81-88. doi: 10.1016/j.wasman.2012.08.005

Singh, S., Townsend, T., Mazyck, D., Boyer, T., 2012. Equilibrium and intra-particle diffusion of stabilized landfill leachate onto micro and meso-porous activated carbon. Water Research 46 491-499. doi:10.1016/j.watres.2011.11.007

Singh, S., Townsend, T., Boyer, T., 2012. Effect of coagulation and anion exchange resin (MIEX) as a pretreatment method for treating stabilized landfill leachate using membrane systems. Separation and Purification Technology 96, 98-106. doi: <http://dx.doi.org/10.1016/j.seppur.2012.05.014>

Agarwal, D., Singh, S., Agarwal, A.K., 2011. Effect of exhaust gas recirculation (EGR) on performance, emissions, deposits and durability of a constant speed compression ignition engine. Applied Energy 88 (8), 2900-2907. doi:10.1016/j.apenergy.2011.01.066

*work performed at previous firm

Jang, Y., Jain, P., Tolaymat, T., Dubey, B., Singh, S., Townsend, T., 2010. Characterization of roadway stormwater system residuals for reuse and disposal options. Science of the Total Environment, 408, 1878-1887. doi:[10.1016/j.scitotenv.2010.01.036](https://doi.org/10.1016/j.scitotenv.2010.01.036)

Tang, Z. and Singh, S., 2012. Biodegradability enhancement of landfill leachate using Fenton processes. Submitted to Hinkley Center for Solid and Hazardous Waste Management, Gainesville, Florida.

Link to Google scholar: <http://scholar.google.com/citations?user=jbZpXLcAAAAJ&hl=en>

Conference Publications and Posters

Singh, S., Townsend, T., 2010. Evaluation of coagulation and MIEX as a pretreatment option for treating stabilized landfill leachate using membrane systems. Poster presentation, 47th Florida Air and Waste Management Conference, Crystal River, Florida.

Singh, S., Townsend, T., 2010. Treatment of stabilized bioreactor landfill leachate using membrane system: Pretreatment Evaluation (Activated Carbon). Poster presentation, 12th Annual EES poster symposium, University of Florida, Gainesville, Florida.

Singh, S., Townsend, T., 2009. Treatment of stabilized bioreactor landfill leachate using membrane system: Pretreatment Evaluation. Poster presentation, 46th Florida AWMA Conference, Captiva Island, Florida.

Singh, S., Townsend, T., 2009. Comparison of pretreatment methods for treatment of stabilized bioreactor landfill leachate using membrane systems. Poster symposium 11th Annual EES poster symposium, University of Florida, Gainesville, Florida.

Singh S., Bishop, R., Wood, D., Townsend, T., 2008. Evaluation of use of reverse osmosis system for treatment of stabilized bioreactor landfill leachate. Poster presentation: SWANA-FL, St. Augustine, Florida.

Professional Services and Affiliations

Reviewer: Water Science and Technology; Science of the Total Environment; Society of Automotive Engineers; Chemosphere, Environmental Biology

Affiliations: Chi Epsilon (An honor society of Civil Engineers) (2009); Order of the Engineers (2010)

Achievements and Awards

- Second prize in poster presentation competition at 12th Annual EES poster symposium, University of Florida, Gainesville, Florida (2010).
- First prize in poster presentation competition at 46th Florida Air and Waste Management Conference, Captiva Island, Florida (2009).
- Florida Air and Waste Management Association Scholarship (2008).
- Norm Casey Scholarship presented by Florida Water Works Association (2006).
- National Student Design Competition at WEFTEC (2006). Winning team.
- FWEA Student Design Competition at Florida Water Resource Conference (2006). Winning team.

*work performed at previous firm