2022 GCCS DESIGN PLAN

WOODLAND MEADOWS LANDFILL

WAYNE, MICHIGAN

2022 Gas Collection and Control (GCCS) DESIGN PLAN

PREPARED FOR

WOODLAND MEADOWS LANDFILL
5900 HANNAN ROAD
WAYNE, MI 48184

December 2022

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Signature and P.E. Certification

This NSPS XXX and NESHAP AAAA Gas Collection and Control System (GCCS) Design Plan (Plan) for the Woodland Meadows Landfill (Facility) has been prepared by BEL Environmental Engineering, LLC as authorized by the Facility.

I certify that the GCCS as described in this Plan meets the design requirements specified in 40 CFR §60.769 and §63.1962 and any alternatives pursuant to 40 CFR §60.762(b)(2) and §63.1959(b)(2). I further certify that this report was prepared by me or under my direct supervision, and that I am a duly registered Professional Engineer under the laws of the State of Michigan.

Angela Leonard, P.E. No. 6201052153

Design Plan Implementation Schedule for GCCS Operations

The Facility will initiate GCCS operation compliance with NSPS XXX, including associated monitoring, recordkeeping and reporting, 30-months after the date of the first annual NMOC Emission Rate report which indicates the NMOC emission rate equals or exceeds 34 Mg/yr. Upon this date, compliance with NSPS XXX will satisfy compliance with NESHAPs AAAA and NSPS WWW. In the interim, the Facility will continue to comply with Subpart WWW requirements for GCCS operations, including associated monitoring, recordkeeping, and reporting.

If the Agency requires the Facility to modify this Plan, the modification applies prospectively, not retroactively to the landfill. Changes to the Plan requested by the Agency that affect GCCS operations or monitoring or recordkeeping do not take effect until Agency approves the requested plan modifications.

Woodland Meadows Landfill

Joe Read
District Manager

WOODLAND MEADOWS LANDFILL
2022 GCCS DESIGN PLAN

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1.0 INTRODUCTION

1.1 Purpose

This document serves as a Landfill Gas Collection and Control System (GCCS) Design Plan (Plan) for the Woodland Meadows Landfill (Facility) in accordance with requirements of 40 Code of Federal Regulations (CFR) New Source Performance Standards (NSPS) Part 60, Subpart XXX, for Municipal Solid Waste Landfills (MSW), 40 CFR, Part 63, Subpart AAAA, and the landfill National Emissions Standards for Hazardous Air Pollutants (NESAP). The NSPS XXX were finalized August 29, 2016, took effect on October 28, 2016, and apply to all MSW landfills that commenced construction, reconstruction, or modification after July 17, 2014. The purpose of this document is to provide a design plan that meets the requirements of the NSPS XXX and to provide the Administrator the design standards and calculations used to prepare this Plan. In this Plan, the NESHAP AAAA will collectively be referred to as the Municipal Solid Waste Landfill Standards (MSWLS). The Data Sheet and List of Assumptions used in development of this GCCS Design Plan are located in Appendix F.

1.2 Applicability

In accordance with 40 CFR 60.762(b)(2) and 40 CFR 63.1959(b)(2), a NMOC emission rate report was completed demonstrating the Facility exceeded the 34 Mg/yr threshold. For this reason, a NESHAP AAAA compliant GCCS was installed and operates in accordance with the NSPS stated below:

> §63.1959(b)(2) If the calculated NMOC emission rate is equal to or greater than 50 megagrams per year using Tier 1, 2, or 3 procedures, the owner or operator must either:
>
> §63.1959(b)(2)(i) Submit a collection and control system design plan prepared by a professional engineer to the Administrator within 1 year:
>
> §63.1959(b)(2)(ii) Collection system. Install and start up a collection and control system that captures the gas generated within the landfill as required by paragraphs (b)(2)(ii)(B) or (C) and (b)(2)(iii) of this section within 30 months after:
>
> (A) The first annual report in which the NMOC emission rate equals or exceeds 50 Mg/yr, unless Tier 2 or Tier 3 sampling demonstrates that the NOMC emission rate is less than 50 Mg/yr.

Submittal of this document fulfills the requirement for the Facility to prepare a GCCS Design Plan in accordance 40 CFR 63.1959(b)(2). The Plan outlines the methodologies employed to design a landfill gas collection and control system that will collect, transport, and dispose of the landfill gas (LFG) generated in by the permitted landfill at final grades. In addition, the Facility's proposed alternatives and variances to the standard, including monitoring record keeping, and reporting requirements of the NSPS are discussed in Section 6. Section 7 outlines how the Facility will implement certain monitoring, recordkeeping, and reporting requirements.

The GCCS design outlined in this Plan complies with the specifications for active collection systems as stipulated in §63.1962 of the NESHAP AAAA. If future expansions of the GCCS are necessary, they will be designed to comply with the MSWLS requirements and accommodate existing site conditions, including any approved alternatives.

The MSWLS require the gas collection system be designed in accordance with general conditions that are contained within Subparts AAAA. These regulations will be found throughout this document in addition to the means through which the landfill is meeting or shall meet these requirements.

1.3 Implementation Schedule for GCCS Operations

The site will initiate GCCS compliance with NSPS XXX, including associated monitoring, recordkeeping and reporting, 30-months after the date of the first annual NMOC Emission Rate report which indicates the NMOC emission rate equals or exceeds 34 Mg/yr. Upon this date, compliance with NSPS XXX will satisfy compliance with NESHAPs AAAA and NSPS WWW. In the interim, the site will continue to comply with Subpart WWW requirements for GCCS operations, including associated monitoring, recordkeeping, and reporting. The Facility may elect to conduct additional Tier 2 or Tier 3 testing until the date the site commences operation of the GCCS per this Plan.

If the Agency requires the landfill to modify this Plan, the modification(s) shall apply prospectively, not retroactively to the landfill.

2.0 DESIGN CRITERIA

The GCCS at the Facility has been designed in a manner consistent with MSWLS requirements as outlined below.

2.1 Landfill Gas Collection Design

The following lists NESHAP AAAA regulations which dictate when gas must be collected from areas in which municipal solid waste (MSW) has been deposited in the landfill:

> §63.1959(b)(2)(ii)(B)(2). Collect gas from each area, cell, or group of cells in the landfill in which the initial solid waste has been placed for a period of 5 years or more if active; or 2 years or more if closed or at final grade.
>
> *[This regulatory citation is commonly known as the 5/2 year rule]*

Gas extraction devices and the installation and/or expansion of the pipe network to connect the devices to the gas collection system are designed to be installed in all areas with waste that has reached the age of 5 years or older, if active, and in waste that has reached the age of 2 years or more if closed or at final grade.

Additionally, the GCCS is designed to comply with the following requirements:

> §63.1959(b)(2)(ii)(B)(3) Collect gas at a sufficient extraction rate
>
> §63.1959(b)(2)(ii)(B)(4) Be designed to minimize off-site migration of subsurface gas

The GCCS is designed to extract LFG at a sufficient rate to minimize the subsurface lateral gas migration and surface emissions. This is achieved by sizing, installing, and operating collection elements that sufficiently collect landfill gas. These collection elements include but are not limited to: collection devices, transmission headers and laterals (pipe network) and gas moving equipment, all controlled in a manner to manage the generated LFG. These elements are also installed in a manner as to maintain a negative (gauge) pressure at all wellheads. As defined in NESHAP AAAA §63.1990. a sufficient extraction rate, means "a rate sufficient to maintain a negative pressure at all wellheads in the collection system…."

It is also a requirement of NESHAP AAAA, that, the active collection system must:

> §63.1959(b)(2)(ii)(B)(1) Be designed to handle the maximum expected gas flow rate from the entire area of the landfill that warrants control over the intended use period of the gas control system equipment.

To ensure that the collection system can manage the maximum expected landfill gas flow rate, a series of engineering calculations and models are utilized. For further discussion of these models and calculations see Section 3.1 as well as Appendices A and B.

The GCCS pipe network at final grades is designed to accommodate the anticipated maximum flows however, there may be interim site grades and conditions that require the temporary installation of sacrificial pipe networks sized to convey interim gas flows. The portions of the pipe network that are planned for use as part of the final design will be appropriately sized to handle the maximum anticipated gas flows at final grades.

2.1.1 Gas Collection Density

The MSWLS requires a gas collection system be designed to ensure sufficient density of the LFG extraction points, as stated below:

> §63.1962(a)(2). The sufficient density of gas collection devices determined in paragraph (a)(1) of this section must address landfill gas migration issues and augmentation of the collection system through the use of active or passive systems at the landfill perimeter or exterior.

Per the definition stated in 40 CFR 63.1990, "sufficient density" means "any number, spacing, and combination of collection system components, including vertical wells, horizontal collectors, and surface collectors, necessary to maintain emission and migration control as determined by measures of performance set forth in this part."

The well spacing required to achieve control of LFG is a function of many parameters including liner type, cover type, surrounding geology/hydrogeology, landfill geometry, well depth, waste composition and age, and the presence of liquids within the landfill. Mathematical models can be developed to estimate the zone of influence of a well. However, due to the conditions listed below and the inherent variability of waste properties within a landfill, many parameters such as permeability, channelized flow, saturated zones, and the effect of daily and intermediate cover soil layers are extremely difficult or impossible to define adequately. The error introduced because of the required simplifying assumptions and estimated properties produces results that are often less reliable than the application of extensive industry experience.

The factors and site-specific conditions that are typically used to establish adequate well spacing, which may change as the Facility is constructed and it ages, may include the following:

- SEM Results
- Site-Specific Conditions at the time of installation
- Permeability of soils, waste materials, and/or final cover capping systems
- LFG generation rate
- Moisture
- Past Experience/Engineering Judgment
- LFG temperature
- Waste Age
- Waste composition

Please note that the preceding list is not intended to be comprehensive.

This approach is consistent with spacing criteria used at other landfills and should effectively reduce the potential for surface emissions and subsurface migration. It is estimated that the average well spacing to be utilized at the Facility will vary from approximately 150 to 200 feet depending upon conditions experienced at the site. This spacing may vary in current or interim conditions. In addition, if needed, horizontal collection trenches may be used to temporarily manage LFG. Based on extensive industry experience, the LFG collector spacing shown should be adequate to provide control of the LFG as required at full GCCS build out. If this spacing is not adequate to meet the required operating standards, additional collectors will be installed, as necessary.

Additionally, properly designed, installed, and operated gas collection component density can be demonstrated in the field by use of the Surface Emission Monitoring (SEM) requirements contained in 40 CFR 63.1960. Refer to Appendix E for the Surface Emissions Monitoring Plan.

2.1.2 Landfill Gas Collection System Expandability

§63.1962(a)(1). The collection devices within the interior must be certified to achieve comprehensive control of surface gas emissions by a professional engineer. The following issues must be addressed in the design: Depths of refuse, refuse gas generation rates and flow characteristics, cover properties, gas system expandability, leachate and condensate management, accessibility, compatibility with filling operations, integration with closure end use, air intrusion control, corrosion resistance, fill settlement, and resistance to the refuse decomposition heat, and ability to isolate individual components or sections for repair or troubleshooting without shutting down entire collection system.

§63.1962(b)(1). The landfill gas extraction components must be constructed of polyvinyl chloride (PVC), high density polyethylene (HDPE) pipe, fiberglass, stainless steel, or other non-porous corrosion resistant material of suitable dimensions to: Convey projected amounts of gases; withstand installation, static, and settlement forces; and withstand planned overburden or traffic loads. The collection system must extend as necessary to comply with emission and migration standards. Collection devices such as wells and horizontal collectors must be perforated to allow gas entry without head loss sufficient to impair performance across the intended extent of control. Perforations must be situated with regard to the need to prevent excessive air infiltration.

Expandability of the GCCS is achieved by installing components such as in-line isolation valves, flange adapters with blind flanges, and/or high-density polyethylene (HDPE) butt caps along the header and lateral piping. This allows the GCCS to be modified/expanded as needed in the future.

2.1.3 Fill Settlement

Settlement will occur due to decomposition of the refuse. To accommodate this condition, the GCCS components are designed and installed with several features to account for settlement including:

- Connection of LFG extraction devices to the LFG transmission piping via a flexible pipe or hose connection. This allows the LFG piping to accommodate changes in the orientation of the LFG conveyance piping or LFG extraction well.
- Installation of LFG conveyance piping at sufficient grade so that reasonable amounts of differential and total settlement may occur without causing pipe breakage or disrupting the overall flow gradient.
- Adequate piping used for the construction of the header and lateral transmission system. Piping materials will be determined as needed during each phase of the construction

  Typically, piping that is reasonably flexible and absorbs differential settlement without breaking or cracking will be used.

2.1.4 Extraction Component Connections to Transmission Piping

This section details how the collection devices are connected to the GCCS.

> §63.1962(b)(3), Collection devices may be connected to the collection header pipes below or above the landfill surface. The connector assembly must include a positive closing throttle valve, any necessary seals and couplings, access couplings and at least one sampling port. The collection devices must be constructed of PVC, HDPE, fiberglass, stainless steel, or other nonporous material of suitable thickness.

The collection devices will be connected to lateral piping via a wellhead. Wellheads will be connected to the lateral piping with a flexible membrane hose to accommodate for any changes in well or transmission position or orientation. The lateral piping will be connected to the header either above or below the surface grade, within the limits of waste, or on the exterior of the permitted landfill footprint.

2.1.5 GCCS Materials

GCCS piping materials will be constructed of chlorinated polyvinyl chloride (CPVC), HDPE, fiberglass, stainless steel, or other non-porous corrosion resistant material. These materials will be designed and installed to:

- Withstand installation forces
- Withstand static and settlement loads
- Withstand traffic loads
- Allow for extension to comply with emission and migration control standards
- Resist decomposition heat
- Include sufficient perforation to allow for adequate gas collection

2.1.6 Well, Collection Device, & Pipe Network Loading

The applied loads on GCCS components within the landfill, as well as settlement forces, cannot accurately be predicted due to the non-homogeneous nature of the refuse within the landfill. The GCCS components within the Facility are consistent with those at other landfills, which have been in-place for extended periods of time and verified to be capable of withstanding applied static and settlement forces. Various sections of the header or laterals may lose grade and collect liquids, requiring maintenance. In the event those GCCS component require maintenance, the Facility will repair/replace each component as required to maintain NSPS XXX compliance.

2.1.7 Nonproductive Areas

Nonproductive areas may be excluded from the requirements to have a NSPS compliant control device(s) in the area, as stated below:

> §60.769(a)(3)(ii) Any nonproductive area of the landfill may be excluded from control, provided that the total of all excluded areas can be shown to contribute less than 1

> percent of the total amount of NMOC emissions from the landfill. The amount, location, and age of the material must be documented and provided to the Administrator upon request. A separate NMOC emissions estimate shall be made for each section proposed for exclusion, and the sum of all such sections must be compared to the NMOC emissions estimate for the entire landfill.

As areas of the Facility are determined to be nonproductive, they will be excluded per the requirement stated above. Copies of required documentation, including supporting calculations, will be maintained. The nonproductive areas at the landfill may change over time and therefore, records of these areas will also be part of the Facility's recordkeeping. Nonproductive areas may occur during active, interim, and closed conditions.

2.1.8 Asbestos and Non-Degradable materials

Any area of the landfill that contain only asbestos and/or non-degradable materials are not required to be controlled in accordance with the NSPS XXX, as stated below:

> §60.769(a)(3)(i) Any segregated area of asbestos or nondegradable material may be excluded from collection if documented as provided under §60.768(d). The documentation must provide the nature, date of deposition, location, and amount of asbestos or nondegradable material deposited in the area, must be provided to the Administrator upon request.

If the Facility excludes asbestos or nondegradable material, supporting documentation will be maintained and the Facility will not be required to collect LFG from these segregated areas. Areas or planned areas containing these types of waste are described in the appropriate section of this Design Plan.

2.1.9 Landfill Gas Extraction Design

Landfill gas extraction is normally implemented using gas collection devices that are connected to a vacuum source. Specific MSWLS requirements that apply to the landfill gas collection and extraction components include the following:

> §63.1962(a)(1). The collection devices within the interior must be certified to achieve comprehensive control of surface gas emissions by a professional engineer. The following issues must be addressed in the design: Depths of refuse, refuse gas generation rates and flow characteristics, cover properties, gas system expandability, leachate and condensate management, accessibility, compatibility with filling operations, integration with closure end use, air intrusion control, corrosion resistance, fill settlement, and resistance to the refuse decomposition heat, and ability to isolate individual components or sections for repair or troubleshooting without shutting down entire collection system.

> §63.1962(b)(1). The landfill gas extraction components must be constructed of polyvinyl chloride (PVC), high density polyethylene (HDPE) pipe, fiberglass, stainless steel, or other non-porous corrosion resistant material of suitable dimensions to: Convey projected amounts of gases; withstand installation, static, and settlement forces; and withstand planned overburden or traffic loads. The collection system must extend as necessary to comply with emission and migration standards. Collection devices such as wells and horizontal collectors must be perforated to allow gas entry without head loss sufficient to impair performance across the intended extent of control. Perforations must be situated with regard to the need to prevent excessive air infiltration.

In general, the collection devices are connected to the collection system via header and lateral piping. The lateral piping is connected to the header above or below the surface grade, within the limits of waste or on the exterior of the permitted landfill footprint depending upon the sequencing of the refuse addition to the landfill, and the final GCCS design.

As governed by 40 CFR 63.1962(b)(1) landfill gas extraction components must be constructed of non-porous, corrosion resistant material, such as CPVC, HDPE, fiberglass, stainless steel, or other material approved by the Engineer at the time of installation. In general, materials used should be designed and installed to:

- Withstand installation forces
- Withstand static and settlement loads
- Withstand traffic loads
- Allow for extension to comply with emission and migration control standards
- Resist decomposition heat; and
- Include sufficient perforation to allow for adequate gas collection

Due to the non-homogenous nature of the waste mass, the applied loads on GCCS components, as well as the settlement forces, cannot be accurately predicted. Therefore, in addition to resistance to heat and corrosion, materials should be used which have been in-place for extended periods of time and verified to be capable of withstanding applied static and settlement forces when used for a similar application at other facilities. In the event that elements of the gas collection and control system fail due to these forces, replacement or repair will be conducted to ensure compliance with MSWLS.

2.1.10 Depths of Extraction Wells/Collection Device

Depth of the installed collection device can greatly affect its performance and operation. For vertical wells, the depth of the collection device can greatly affect a well's zone of influence. Zone of influence is the area immediately surrounding a well whereby gas is able to be pulled in for collection and should be maximized when possible.

To a large extent a well's zone of influence is dictated by the amount of vacuum that can be applied without causing an excessive amount of air intrusion into the landfill. This being said, zone of influence will also increase with the depth of the well. Typically, to reduce air intrusion and thereby increase the ZOI, the final well depth will be determined by the site and a professional engineer. In addition to the safety of the base liner system, depth of vertical wells should be designed to maximize the well's zone of influence.

Practical site-specific factors that may change over time will impact the depths of the vertical wells. Some of these factors include the following:

- Availability of accurate liner construction records
- Well locations above or near liner side-slopes or other areas in which the liner elevation changes rapidly; and
- Obstructions or other technical difficulties that may impact the drilling operations

Horizontal gas collectors are typically installed in shallow waste, and therefore can experience issues with air intrusion. However, increasing the depth of refuse atop the collector can help to minimize this issue.

In certain circumstances that allow, some collectors can be designed to utilize bottom-up collection. This style of collector allows for gas collection through the entire waste column by building the collector up from the base leachate collection layer.

2.1.11 LFG Collection Devices

As governed by §63.1962(b)(2), shown in Section 2.1, collection devices must use perforations to allow gas entry into the collection device. These perforations allow gas collection through the application of a negative vacuum. Perforations, may, at times, also allow for the intrusion of liquids into the well casing. In general, pumps may be installed on a well-by-well basis to address any liquids that may inhibit gas collection. See Section 2.1.16 for further discussion of leachate and condensate management.

Collection devices will typically consist of vertical extraction wells or horizonal gas collectors. Vertical extraction wells are drilled into the waste mass and consist of a partially perforated well casing to allow for the collection of landfill gas. The section of piping that is closest to the landfill surface will typically consist of solid casing, to minimize air intrusion. Due to the nature of drilling, precaution must be taken to ensure the underlying base liner system is not endangered. MSWLS says the following about vertical wells and underlying liners:

> §63.1962(b)(2), Vertical wells must be placed so as not to endanger underlying liners and must address the occurrence of water within the landfill. Holes and trenches constructed for piped wells and horizontal collectors must be of sufficient cross-section so as to allow for their proper construction and completion including, for example, centering of pipes and placement of gravel backfill. Collection devices must be designed so as not to allow indirect short circuiting of air into the cover or refuse into the collection system or gas into the air. Any gravel used around pipe perforations should be of a dimension so as not to penetrate or block perforations.

To ensure that the underlying liner system will not be endangered, well depths, locations, and materials (including gravel size), will be designed by the professional engineer in a manner as to maximize gas collection, while minimizing risk of air intrusion and risk to the landfill base liner system.

There may be times when positive drainage to a condensate sump cannot be achieved due to site topography. To allow for adequate collection of gas, it may be determined that a vertical well is still necessary. In these situations, the installation of a “remote wellhead” may be required. These are not intended to be permanent and will primarily be used in areas where filling operations make it impossible for a conventional lateral to transmit the gas.

Horizontal gas collectors are also a commonly used extraction device in locations where the need for controls warrant collection, but shallow waste depths or other circumstances restrict the effectiveness of a conventional vertical well. Horizontals typically consist of a perforated pipe buried in a gravel-filled trench. A negative pressure is introduced to the pipe, and gas is then collected through the perforations. Horizontal gas collectors are not intended as a permanent means of gas collection and are usually designed to function as interim gas collection until a permanent solution can be installed. Therefore, these collectors do not appear on the final gas collection and control system layout in Appendix C. Horizontal gas collectors may include drilled vertical features to enhance gas collection and provide drainage.

There may be times during cell expansion events where bottom-up collectors may be installed or planned for. Some of the most common forms of bottom-up collection include gabion basket wells, rock pad wells, and slope collectors. Gabion basket and rock pad wells involve the installation of a target, gabion cube, or rock pad, during new cell expansion. This rock pad, or gabion cube, is situated directly on the leachate collection layer of the cell and is surveyed upon the completion of cell construction so that once it is determined that the location is suitable for a landfill gas well, the target can be drilled into at the specified coordinates. This form of vertical well allows for the largest zone of influence, most efficient well dewatering, and the deepest collection of landfill gas.

Bottom Collectors are a different style of bottom-up collection typically installed in a new cell expansion area and also tie-in to the leachate collection layer. Typically, the Bottom Collector is installed after the new cell is completed and begins by installing perforated pipe along the leachate collection layer. This perforated pipe is covered in drainage stone. As filling operations begin in the cell, the perforated pipe may be extended, typically on a interim waste slope that will later be covered with waste, as fill progresses. If extended, more drainage rock is used to cover the pipe. This form of collector also allows for collection of gas from the base of the landfill to the top of the collector. Other forms of Bottom Collectors may be utilized in the future at the discretion of the professional engineer.

All LFG collection devices will include extraction wellheads (connector assemblies) that are located above grade. These wellheads include a positive closing throttle valve, necessary seals and couplings, access couplings, and sampling ports; all which aid in the prevention of air intrusion, allow for proper operation of the wellheads, and allow the wellheads to be sampled and monitored.

2.1.11.1 Vertical LFG Wells

To a large extent a well's zone of influence (ZOI) is dictated by the amount of vacuum that can be applied without causing an excessive amount of air intrusion into the landfill. Typically, to reduce air intrusion and thereby increase the ZOI, the final well depth will be determined by the site and a professional engineer. Industry experience will be used to determine the depths for the slotted and unslotted portion of the pipe that provides the proper balance between air intrusion control and LFG collection efficiency. Air intrusion is also minimized by using soil backfill in the upper zone of the vertical wells. In addition, a hydrated bentonite or foam plug is used where the pipe penetrates the landfill soil cover.

Further, air intrusion and LFG emissions will be controlled through periodic monitoring and adjustment of the GCCS in coordination with appropriate maintenance of the landfill cover system.

Typical well design and vertical collection wells will be installed in the approximate locations found in Appendix D.

2.1.11.2 Horizontal Gas Collectors

Air infiltration into horizontal gas collectors (HGCs) is primarily limited by initiating operation after sufficient waste has been placed and gas generation has commenced. Vacuum to these collectors is regulated to further limit the potential for air infiltration.

2.1.11.3 Shallow LFG Collectors

Shallow landfill gas collectors refer to any collection device installed at a depth of less than 40 feet from ground surface. Installation of these devices typically will occur in the separatory liner area of the Facility, where depth cannot be reached for a typical vertical extraction well due to base liner system. These could be, but are not limited to:

- Modified vertical extraction well(s)
- Pin well(s)
- Horizontal Collector(s)
- Engineer approved alternatives

2.1.12 Well and Collection Device Perforations/Slots and Backfill

Collectors are perforated to allow LFG entry without excessive head loss, and the surrounding gravel will be sized to prevent blocking of perforations

There are many site-specific factors that will be examined to determine the length of the slotted portion of the gas well. For example, perforated/slotted section of the gas collection device may vary based on the following conditions:

- Depths of perched liquids contained in the landfill
- Mitigation of odors (slots/perforations may be extended for this reason)
- Installation of deeper slots to extend ZOI (may be beneficial in sites with synthetic caps.)

2.1.13 Well/Collection Device Backfill

Gravel, washed aggregate, other acceptable crushed stone (with low carbonate content), and/or other inert non-calcareous material of sufficient size is specified to prevent penetration or blockages of the LFG collector pipe perforations/slots. Note that an acceptable substitute may be used in lieu of the aforementioned materials if it prevents blockage/penetration of the collector pipe perforations/slots.

2.1.14 Accessibility

Facility topography is ever-changing whether from the decomposition of waste over time, through landfill operation, or through construction events. The gas collection and control system will incorporate components to enable, at certain locations, the collection system to be readily accessed. This is typically done through the installation of header access risers, blind flanges for future expansion, monitoring ports, wellheads, valves, etc. The preceding list is not intended to be all-encompassing, and typically these components are installed above the landfill surface, so that they provide an access point without excavation into the landfill. These measures can typically be extended upwards with filling operations to continue to provide access to the gas collection and control system as filling operations continue.

Per NESHAP AAAA rule §63.1962(a)(1), the GCCS is designed with the ability to isolate individual components for repair or troubleshooting without having to shut down the entire collection system. Control valves are typically placed in a way that allows for sections of the gas system to be accessed easily for repairs or troubleshooting without shutting down the entire system.

It should be mentioned that, after each gas collection and control system construction event, the locations of each gas collection and control system component are recorded with survey data. This is done in order to comply with the requirement of §63.1983(d)(1), to keep updated as-built drawings, but also allows for the gas collection and control system to be accessed in certain locations in the future, as needed.

2.1.15 Landfill Gas Well/Collection Device – Installation Requirements

Vertical Gas Extraction Wells (vertical) and Horizontal Gas Collectors (HGCs) that are constructed for LFG collection will have sufficient cross-section to allow for their proper construction and completion, including centering of the pipes and placement of gravel or other approved backfill material. The vertical and HGCs will be constructed under supervision of a construction quality assurance program implemented by the Facility.

2.1.16 Leachate and Condensate Management

In accordance with the leachate and condensate management requirement included in §63.1962(a)(1), leachate management is accomplished by using a leachate collection and condensate management system.

Condensate management will be accomplished by sloping the LFG transmission piping to low points in the GCCS piping for collection of the condensate. Condensate collection sumps/drains are located at these low points, to collect the condensate and remove it from the transmission piping. Condensate collected in drains/sumps is re-introduced into the leachate management system and/or managed in accordance with the landfill's operating plan.

2.1.17 Control Systems

The MSWLS specifically require that LFG collected by a compliant gas collection system be sent to a compliant control device(s). These requirements are listed below:

> §63.1959(b)(2)(iii) Control system. Route all the collected gas to a control system that complies with the requirements in either paragraph (b)(2)(iii)(A), (B) or (C) of this section.

The required operational performance of these components is stipulated by §63.1959(b)(2)(iii)(A), which states:

> §63.1959(b)(2)(iii)(A) A non-enclosed flare designed and operated in accordance with the parameters established in §63.11(b), except as noted in paragraph (e) of this section…

As stated in the previous citation, if the site uses a non-enclosed flare, regulations pertaining to NESHAP Subpart A §63.11(b) apply to their use and monitoring. See below for some of the relevant citations from Subpart A:

> §63.11(b)(1) Owners or operators using flares to comply with provisions of this part shall monitor these control devices to assure that they are operated and maintained in conformance with their designs. Applicable subparts will provide provisions stating how owners or operators using flares shall monitor these control devices.
>
> §63.11(b)(2) Flares shall be steam-assisted, air-assisted, or non-assisted.
>
> §63.11(b)(3) Flares shall be operated at all times when emissions may be vented to them.
>
> §63.11(b)(4) Flares shall be designed for and operated with no visible emissions, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours. Test Method 22 in appendix A of part 60 of this chapter shall be used to determine the compliance of flares with the visible emission provisions of this part. The observation period is 2 hours and shall be used according to Method 22.
>
> §63.11(b)(5) Flares shall be operated with a flame present at all times. The presence of a pilot flame shall be monitored using a thermocouple or any other equivalent device to detect the presence of a flame.

For the Facility's enclosed flares, the following citation dictates operational requirements:

> §63.1959(b)(2)(iii)(B) A control system designed and operated to reduce NMOC by 98 weight-percent, or, when an enclosed combustion device is used for control, to either reduce NMOC by 98 weight percent or reduce the outlet NMOC concentration to less than 20 parts per million by volume, dry basis as hexane at 3-percent oxygen. The reduction efficiency or ppmv must be established by

an initial performance test to be completed no later than 180 days after the initial startup of the approved control system using the test methods specified in paragraph (e) of this section. The performance test is not required for boilers and process heaters with design heat input capacities equal or greater than 44 megawatts that burn landfill gas for compliance with this subpart.

In the event that the landfill gas is collected for a beneficial use, or other use specified in §63.1959(b)(2)(iii)(C), the responsible party must submit a treatment system monitoring plan as detailed in the below citations:

§63.1959(b)(2)(iii)(C) A treatment system that processes the collected gas for subsequent sale or beneficial use such as fuel for combustion, production of vehicle fuel, production of high-British thermal unit (Btu) gas for pipeline injection or use as a raw material in a chemical manufacturing process. Venting of treated landfill gas to the ambient air is not allowed. If the treated landfill gas cannot be routed for subsequent sale or beneficial use, then the treated landfill gas must be controlled according to either paragraph (b)(2)(iii)(A) or (B) of this section.

§63.1959(b)(2)(iii)(D) All emissions from any atmospheric vent from the gas treatment system are subject to the requirements of paragraph (b)(2)(iii)(A) or (B) of this section. For purposes of this subpart, atmospheric vents located on the condensate storage tank are not part of the treatment system and are exempt from the requirements of paragraph (b)(2)(iii)(A) or (B) of this section.

Equivalent citations to §63.1959(b)(2)(iii)(C) and §63.1959(b)(2)(iii)(D).

Requirements of the treatment system monitoring plan are detailed in §63.1983(b)(3)(5) as displayed below:

§63.1958(b)(5) Where an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with §63.1959(b)(2)(iii)(C) through use of a landfill gas treatment system:

(i) *Bypass records.* Records of the flow of landfill gas to, and bypass of, the treatment system.

The capacity of the control system may increase/decrease over time as the volume and quality of LFG produced by the landfill changes. The control system may consist of one or more control devices and/or temporary control devices, and this will be evaluated based on the conditions of the site at that time. All chosen control devices will be designed, installed, and be operated in compliance with the required regulations and proposed changes to the control system will be evaluated to determine if a Permit-to-Install and/or modification to the site's Title V permit is necessary.

Table 1 - List of Current Control Devices

South 1 Open or Enclosed Flare – 2,500 scfm maximum design capacity
South 2 Open or Enclosed Flare – 2,500 scfm maximum design capacity
South 3 Open or Enclosed Flare – 2,500 scfm maximum design capacity
South 4 – Enclosed Flare 2,500 scfm maximum design capacity
North Open Flare – 650 scfm maximum design capacity
Van Buren Enclosed Flare – 2,400 scfm maximum design capacity
Gas-to-Energy Plant – 6,500 scfm maximum design capacity

2.1.18 Open Flare

When in operation, the open flare(s) will be continuously monitored for the presence of a flame. Monitoring for the presence of a flame will be accomplished by an ultraviolet flame scanner, thermocouple, or comparable device. Absence of a flame will cause the monitoring system to automatically turn off the LFG mover(s) and initiate the closure of either an electric or pneumatic valve at the inlet to the mover(s) or open flare(s).

2.1.19 Enclosed Flare

Enclosed flare(s) will operate in accordance with the combustion temperature limits based on the initial performance test and in compliance with any temperature limits resulting from any subsequent performance testing. The low temperature set point will be set above the lower temperature limit set by the most recent performance test to ensure that the enclosed flare(s) will be operated within the appropriate parameters. These operational and testing requirements are contained within the NSPS XXX.

3.0 DESIGN CONSIDERATIONS FOR ACTIVE CONDITIONS

This section of the GCCS Design Plan describes the existing site conditions including description of the current GCCS. This section also identifies and incorporates all previously approved alternatives, variances, and higher operating values for GCCS operations.

3.1 Landfill Description

The Facility is located in Wayne County, Michigan, and began receiving waste in the north area around 1975. The Facility has a total permitted footprint of 490.7 acres, and an approved total permitted design capacity of approximately 113,437,000 CY. The Facility currently has an active GCCS in place.

There is an existing active GCCS at the Facility which will be expanded as waste is placed and new cells are constructed. Future LFG collectors may consist of vertical gas extraction wells, horizontal gas collectors and combination trenches. Combination trenches consist of vertical gas wells installed and buried within areas of the active waste disposal with perforated horizontal gas extraction trenches are extended alongside to induce a vacuum and extract gas to a much deeper depth than would be capable by utilizing a horizontal trench alone. Select locations may be connected to the leachate collection system for odor control and to further improve gas collection efficiency. Vertical wells typically consist of both HDPE and PVC pipe while HGCs are typically constructed of perforated HDPE piping.

HGCs may be installed within the waste mass in locations where the need for controls warrant collection, but shallow waste depths restrict the effectiveness of vertical well. Horizontal gas collectors and combination trenches will be utilized within active areas of the waste disposal where vertical wells would be prone to extensive damage. The use of combination trenches improves the operation of the GCCS by minimizing repeated shutdowns of the system due to air intrusion following damage to vertical wells installed in the active area. The use of combination trenches also enables induction of a vacuum to a deeper portion of the waste mass than is capable through the use of horizontal trenches alone. The vertical wells installed in combination with the horizontal trenches assist with the removal of condensate and leachate from the horizontal trench.

The gas collectors are connected to a network of landfill gas header piping. Where the collector is connected to the header piping, a throttling valve is provided to enable varying the vacuum induced upon the collector. At each collector point, the landfill gas is monitored for methane, carbon dioxide, oxygen, balance gas and temperature. The system vacuum available at the collector and the vacuum induced upon the collector are measured during monitoring to ensure sufficient vacuum is available at the collection device and a negative pressure is maintained at the GCCS collection location. A means to measure flow, typically by utilizing an orifice plate, is provided.

Monitoring information will be recorded and maintained within the site database for the system. The gas monitoring technicians will utilize this information and compare it with historical data collected to determine whether adjustments to the control device throttling valve are warranted to improve gas collection efficiency & whether maintenance of the collection device may be necessary.

Existing control devices combust the gas currently. The required operational performance of these components is stipulated by and compliant with §60.752(b)(2)(iii). The flare exhaust temperatures and LFG flow rates will be continuously monitored in accordance with 40 CFR 60.756 and operated in accordance with the approved air permit for the facility

3.2 Existing Gas Collection Flow

In accordance with the NSPS, the gas collection system must be designed to handle the expected gas flows during the anticipated life of each component of the gas collection system. Portions of the gas collection system that are planned for inclusion in the final design must be appropriately sized to accommodate both current and future gas flows. Certain portions of the gas collection system may be deemed "sacrificial" due to filling operations or other site-specific conditions; these portions need only be sized to accommodate the gas flows that are anticipated during the time they will be in operation.

The following sections of the NSPS discuss the proper sizing of gas collection system.

> §60.769(c) Each owner or operator seeking to comply with §60.762(b)(2)(iii) must convey the landfill gas to a control system in compliance with §60.762(b)(2)(iii) through the collection header pipe(s). The gas mover equipment must be sized to handle the maximum gas generation flow rate expected over the intended use period of the gas moving equipment using the following procedures:
>
> §60.769(c)(1) For existing collection systems, the flow data must be used to project the maximum flow rate. If no flow data exists, the procedures in paragraph (c)(2) of this section must be used.
>
> 60.769(c)(2) For new collection systems, the maximum flow rate must be in accordance with §60.765(a)(1).
>
> §63.1959(b)(2)(ii)(B)(1) An active collection system must be designed to handle the maximum expected gas flow rate from the entire area of the landfill that warrants control over the intended use period of the gas control system equipment

When preparing the LandGEM Model for the Facility, consideration was paid with regards to the quantities of waste which would be capable of producing methanogenic emissions, compared to the fraction of waste received which would be non-methanogenic producing (i.e., inert, non-organic based materials). Historical waste intake was analyzed to determine the typical waste composition of the site and extended to future years and retroactively applied to prior years where applicable.

The LFG generation rates for the landfill were estimated using the U.S. EPA LandGEM. The modeling results reflect the estimated methanogenic waste quantities accepted and to be accepted over the operating life of the site. A detailed explanation of the input, parameters and procedures used during LandGEM modeling and copies of the EPA LandGEM Summary Reports are included in Appendix A.

Once completed, the LandGEM results were compared to the Facility's existing collected flow and methane content data, normalized to 50% methane, from 2017 through 2021. The comparison resulted in a calculated average collection efficiency of greater than 100%. These results are shown in Section 4 of Attachment F. Calculated collection efficiencies greater than 100% can occur for various reasons including, but not limited to, increased collection point density, increased odor control and emissions management, installation of intermediate and final cover, and slower than anticipated declines in LFG generation from older units. To accommodate for these considerations, an adjustment factor (AF) will be applied to the LandGEM maximum flow rate increasing it for GCCS design purposes only. Based on the calculations and assumptions presented in Section 5 of Appendix F, the AF is 1.3. The use of this AF increased the peak maximum flow used for design purposes from the LandGEM rate of 12,772 scfm to 16,604 scfm.

3.3 Control Devices and Initial Performance Test

The first Initial Performance Test (IPT) on each control device at the landfill is conducted when a control device is implemented on the site.

Currently, the Facility operates seven control devices. As new or additional control devices are added, the site will obtain proper air authorizations without revisions to this Design Plan. As new or additional control devices are added, a performance test will be completed and submitted, as required.

3.3.1 Sizing Gas Collection System/Piping Network

The sizing of the headers and laterals are based on the maximum expected LFG generation rate as estimated using the landfill gas generation model as described above.

The final GCCS piping system has been sized to handle this maximum estimated LFG extraction rate while maintaining vacuum throughout the header pipe. Design computations for sizing the LFG transmission piping and determining system vacuum requirements were performed and are included in Appendix A.

3.3.2 Nonproductive Areas

The NSPS allows for nonproductive areas to be excluded from the requirements to collect and control gas in a NSPS compliant manner, as stated below:

> §63.1962(a)(3)(ii) Any nonproductive area of the landfill may be excluded from control, provided that the total of all excluded areas can be shown to contribute less than 1 percent of the total amount of NMOC emissions from the landfill. The amount, location, and age of the material must be documented and provided to the Administrator upon request. A separate NMOC emissions estimate must be made for each section proposed for exclusion, and the sum of all such sections must be compared to the NMOC emissions estimate for the entire landfill.

Currently, there are no known non-producing areas of the landfill. At such time when the landfill identifies non-producing areas, the landfill will submit a revised Design Plan with supporting documentation to exclude such area(s) from NSPS requirements.

As areas of the landfill are determined to be nonproductive in the future, these areas may be requested to be excluded from future monitoring. The agency will be notified of the areas being requested to be excluded from the GCCS Plan and approval will be obtained prior to deactivating GCCS controls and termination of surface emission monitoring. Copies of the area exclusion approval from the agency will be maintained with the GCCS Plan records and maintained on file at the landfill.

3.3.3 Asbestos and Non-Degradable Materials

The NSPS allows for any areas of the landfill that contain only asbestos and/or non-degradable materials are not required to be controlled in accordance with the NSPS, as stated below:

> §60.769(a)(3)(i) Any segregated area of asbestos or non-degradable material may be excluded from collection if documented as provided under §60.768(d). The documentation must provide the nature, date of deposition, location, and amount of asbestos or non-degradable material deposited in the area and must be provided to the

Administrator upon request.

Currently, there are no areas that only contain asbestos and/or non-degradable materials. At such time when the landfill develops additional segregated disposal areas, the landfill will submit a revision to the Design Plan with supporting documentation to exclude such area(s) from NSPS requirements.

As areas of the landfill are determined to be nonproductive in the future, these areas may be requested to be excluded from future monitoring. The agency will be notified of the areas being requested to be excluded from the GCCS Plan and approval will be obtained prior to deactivating GCCS controls and termination of surface emission monitoring. Copies of the area exclusion approval from the agency will be maintained with the GCCS Plan records and maintained on file at the landfill.

3.4 Previously Approved HOVs, Alternatives/Variances

Please see the Facility library for a complete list of approved higher operating values (HOVs), Alternatives, or Variances.

4.0 DESIGN CONSIDERATIONS FOR INTERIM CONDITIONS

This section of the GCCS Design Plan describes the procedures used during interim operating conditions. Interim operating conditions occur when the landfill is still actively accepting waste, and before it is closed or reaches final grades. During these interim conditions, the gas collection system is typically being installed or expanded to comply with NSPS requirements, while the landfill is also balancing the requirements of the day-to-day activities of an active landfill.

According to 40 CFR 60.769(c), the maximum LFG flow rate shall be used to design the size of the GCCS pipe network. To facilitate NSPS XXX compliance during active landfill operations, a flexible design was developed that incorporates the operational difficulties that can occur when installing a GCCS while the facility is actively accepting refuse. Collection device locations will be determined to maintain needed flexibility during daily operations (which may include changes in refuse fill patterns, weather, waste type, and waste volumes), natural disasters, and/or other significant area events.

Interim conditions may warrant gas collection and monitoring from areas where waste has been placed but have not yet reached final grade. Complying with the NSPS XXX under these conditions can be difficult due to several factors, which may include, but are not limited to, the following:

- Components may be inadvertently damaged by heavy equipment collisions during filling operations
- Areas requiring gas collection may not necessarily coincide with filling operations
- Pipe slopes may be altered due to loads from heavy traffic or differential settlement
- Components may be more prone to water accumulation due to shallower waste depths

4.1 Gas Collection System Expansion during Interim Conditions

During interim conditions, compliance with the NSPS XXX requirements that specify additional gas collection devices, and the corresponding expansion of the overall gas collection system will be maintained. These expansions will ensure that LFG will be collected at sufficient rates over the interim timeframe and will be designed and installed properly to minimize off-site migration of gas. Specific NSPS requirements that apply to gas collection during interim conditions include the following:

> §60.761 *Sufficient density* means any number, spacing, and combination of collection system components, including vertical wells, horizontal collectors, and surface collectors, necessary to maintain emission and migration control as determined by measures of performance set forth in this part.
>
> 60.769(a)(1) The collection devices within the interior must be certified to achieve comprehensive control of surface gas emissions by a professional engineer. The following issues must be addressed in the design: Depths of refuse, refuse gas generation rates and flow characteristics, cover properties, gas system expandability, leachate and condensate management, accessibility, compatibility with filling operations, integration with closure end use, air intrusion control, corrosion

resistance, fill settlement, resistance to the refuse decomposition heat, and ability to isolate individual components or sections for repair or troubleshooting without shutting down entire collection system.

§60.769(a)(2) The sufficient density of gas collection devices determined in paragraph (a)(1) of this section must address landfill gas migration issues and augmentation of the collection system through the use of active or passive systems at the landfill perimeter or exterior.

§60.769(a)(3) The placement of gas collection devices determined in paragraph (a)(1) of this section must control all gas producing areas, except as provided by paragraphs (a)(3)(i) and (a)(3)(ii) of this section.

§60.765(b) For purposes of compliance with §60.763(a), each owner or operator of a controlled landfill must place each well or design component as specified in the approved design plan as provided in §60.767(c). Each well shall be installed no later than 60 days after the date on which the initial solid waste has been in place for a period of:

§60.765(b) (1) Five (5) years or more if active; or

§60.765(b) (2) Two (2) years or more if closed or at final grade.

§60.769(c) Each owner or operator seeking to comply with §60.762(b)(2)(iii) must convey the landfill gas to a control system in compliance with §60.762(b)(2)(iii) through the collection header pipe(s). The gas mover equipment must be sized to handle the maximum gas generation flow rate expected over the intended use period of the gas moving equipment using the following procedures:

§60.769(c)(1) For existing collection systems, the flow data must be used to project the maximum flow rate. If no flow data exists, the procedures in paragraph (c)(2) of this section must be used.

§60.769(c)(2) For new collection systems, the maximum flow rate must be in accordance with §60.765(a)(1).

In compliance with these regulations, the GCCS has been designed and will be further expanded as necessary over the life of the system, to extract LFG at a sufficient rate to minimize the subsurface lateral migration and surface emissions of LFG. This is achieved, in part by, appropriately sizing and installing sufficient collection elements, transmission piping, gas moving equipment, and control device(s) for the estimated maximum flow rate of LFG.

Since the operation of the landfill changes over time based on filling patterns and the waste intake at the Facility, there is no single design that can be presented at this time to address the location of each gas collection device and the vacuum providing network that accompanies them. Instead, during the interim period, conformance with the above regulations will be maintained and be used as the tool to determine when the system will be expanded and when upgrades to the system will be added.

Based upon the outcome of the system performance metrics contained in the NSPS, such as the SEM and monthly collection device monitoring requirements, the GCCS will be adjusted or modified in accordingly. This information will be used as an additional tool to evaluate the need for future expansion of the GCCS.

In Section 40 CFR 60.761 of the NSPS, "sufficient density" is defined as "any number, spacing, and combination of collection system components . . . necessary to maintain emission and migration control as determined by measures of performance set forth in this part." Well spacing at the landfill is established based on SEM Results, site-specific conditions (waste age, waste density, moisture content, etc.), operational experience, and engineering judgment. This is consistent with spacing criteria used at other landfills and should effectively control surface emissions and subsurface migration of LFG in accordance with NSPS requirements.

In accordance with the requirements, a collection device must be installed in all areas containing waste that is 5 years old or older if active; and 2 years old or older if closed or at final grade. The placement of collection devices will occur in a manner that will maintain compliance with all NSPS requirements. Additionally, collection device locations and density will be determined at the time of installation to support normal operations of the landfill regarding roadways, equipment, and fill sequencing. Actual well placement may vary from the preliminary locations selected for closure conditions (see Section 5) to accommodate actual site conditions at the time of installation.

If the actual landfill gas extraction rate exceeds the capacity of the system, additional GCCS components will be designed and installed in accordance with NSPS requirements. The system flow/ characteristics and installed process equipment will be determined by the actual gas flow trends and site-specific conditions at the time of the modification.

The header and lateral pipeline systems will be sized to accommodate the peak flows depending on the planned life of the pipeline. If the Facility plans to operate the header and lateral pipelines only during interim conditions, and the pipelines will be abandoned/replaced prior to final build out of the system, then the pipelines will be sized for the anticipated gas flows during the period of time they are planned to be operational. The portions of the pipe network that will be incorporated into the final design will be appropriately sized to handle the anticipated gas flows into the pipeline at final build-out.

Many of the design requirements for both collection devices and the expansion of the gas collection system are found in other sections of this GCCS Design Plan.

4.1.1 Compatibility with Refuse Filling Operations

During the operating life of the site, the gas collection system will be designed to be compatible with the waste filling operations of an active landfill. As waste filling operations proceed and portions of the site reach final or near-final grades, additional GCCS components may be installed to comply with the 5-year/2-year requirements of NSPS XXX. Using this method allows GCCS components to be installed in accordance with 40 CFR 60.762(b)(2)(ii)(C)(2) while minimizing interference with ongoing filling operations.

During filling operations, vertical gas extraction wells may be "raised" periodically so that new refuse is not placed over the top of an existing vertical, thereby preventing access to the well. To maintain worker safety, verticals will be raised as needed in advance of waste filling operations.

4.1.2 Landfill Cover Properties

During the normal course of operations, daily, intermediate, and final cover will be installed over the waste. This system limits LFG emissions, as well as water and air infiltration. The thickness and type of cover system will vary depending on when the landfill plans to place additional waste in the affected area.

5.0 DESIGN CONSIDERATIONS FOR CLOSURE CONDITIONS

Closure conditions apply for the closed landfill, or in areas of the active landfill that have a certified cap in place. Final design conditions also apply to the closed landfill or closed portions of an active landfill that achieved final waste grades.

5.1 Landfill Gas Collection

This section addresses the locations of GCCS components after the Facility is no longer operating under interim conditions. The GCCS will be operated in accordance with the requirements of the NSPS XXX for a closed landfill.

> §60.765(b) For purposes of compliance with §60.763(a), each owner or operator of a controlled landfill must place each well or design component as specified in the approved design plan as provided in §60.767(c). Each well must be installed no later than 60 days after the date on which the initial solid waste has been in place for a period of:
>
> §60.765(b) (1) Five (5) years or more if active; or
>
> §60.765(b) (2) Two (2) years or more if closed or at final grade.

In accordance with this requirement, a GCCS must be installed in all areas with waste that is five years old or older if open, and two years old or older if closed or at final grade. The current placements of collectors at the site follow this requirement.

> §60.762(b)(2)(ii)(C)(3) Collect gas at a sufficient extraction rate
>
> §60.762(b)(2)(ii)(C)(4) Be designed to minimize off-site migration of subsurface gas
>
> §60.769(a)(2) The sufficient density of gas collection devices determined in paragraph (a)(1) of this section must address landfill gas migration issues and augmentation of the collection system through the use of active or passive systems at the landfill perimeter or exterior

In compliance with 40 CFR 60.762(b)(2)(ii)(C)(3) and (4), the GCCS is designed to extract LFG at a sufficient rate to minimize the subsurface lateral migration and surface emissions of LFG. This is achieved by sizing and installing sufficient collection elements, transmission piping, blower(s), and control device(s) for the estimated maximum flow rate of LFG.

The GCCS is designed to collect LFG at a sufficient rate, which is defined in 40 CFR 60.761 as maintaining negative gauge pressure at all wellheads. Application of a negative gauge pressure and minimization of air infiltration will be verified by monitoring temperature, pressure, and oxygen concentrations at each LFG wellhead in accordance with applicable NSPS XXX requirements.

“Sufficient density” is defined in 40 CFR 60.761 as “any number, spacing, and combination of collection system components necessary to maintain emission and migration control as determined by measures of performance set forth in this part.” Well spacing at the landfill will be established based on SEM Results, site-specific conditions (waste age, waste density, moisture content, etc.), experience, and engineering judgment. This is consistent with spacing criteria used at other landfills and should effectively control surface emissions and subsurface migration of LFG in accordance with NSPS XXX requirements. The proposed GCCS build-out layout for closure conditions can be found in Appendix D.

The final configuration of wells, collectors, and piping may vary from this proposed design due to modifications required during active and interim conditions. In addition, wells/collectors may have to be replaced, re-drilled, or relocated due site-specific conditions. As-built drawings of the gas collection system will be updated as required and a copy of the as-built drawing will be kept on-site.
The landfill will conduct SEM events as specified in 40 CFR 60.765(b) in all accessible areas that have waste in-place for 5 years if active and 2 years if at or near final grade to ensure that the gas collection system was designed, installed, and is being operated properly. If the GCCS at the landfill does not meet the measures of performance set forth in the NSPS, the GCCS will be adjusted or modified in accordance with the NSPS XXX requirements. Typical adjustments or modifications are described in Section 6.

5.1.1 Landfill Gas Generation Rates and Flow Characteristics

The peak LFG flow rates were used in designing the GCCS for closure conditions, as described in this section.

> §60.762(b)(2)(ii)(C)(1) An active collection system must be designed to handle the maximum expected gas flow rate from the entire area of the landfill that warrants control over the intended use period of the gas control system equipment

In accordance with 40 CFR 60.762(b)(2)(ii)(C), the maximum expected LFG flow rate for the site was used for sizing the GCCS. LFG generation was calculated using the USEPA's LandGEM. The LFG generation rate modeling methods, procedures and assumptions, including the peak generation rate, and the LandGEM Summary Reports are located in Appendix A.

The peak flow value is based on the current permitted design capacity (at time of the design plan submittal), the historical in-place tonnage and the anticipated future waste intake. The actual sizing and configuration of the system may change based on actual gas flows obtained from the landfill as the site nears closure. The final GCCS piping system has been sized to handle the modeled peak LFG extraction rate while maintaining vacuum throughout the LFG piping network. Design computations for sizing the LFG transmission piping and determining system vacuum requirements were performed using the computerized KY Pipe model. A copy of the pipe model printout and its description are included in Appendix A.2.

In addition, radius of influence was analyzed considering waste design capacity, peak flow, and waste density, among others. This radius of influence was used, in conjunction with considerations discussed in Section 2.1.1 of this Plan, to create a well spacing for the final GCCS layout. These calculations can be found in Appendix B.

An estimate of condensate generation rate under normal landfill operating conditions was calculated as a general guideline for future design and can be found in Appendix C.

5.1.2 Landfill Cover Properties

The purpose of the final cover system is to provide a barrier to LFG emissions, as well as water and air infiltration. Michigan EGLE approved final cover system will be installed upon closure.

5.1.3 Integration with Closure End Use

Currently, the closure end-use for the site is unspecified. Any modifications to the closure end use will be reviewed by the landfill to evaluate compatibility with the GCCS. Items of concern will be mitigated by either altering the proposed closure end-use or by adjusting and/or modifying the GCCS in accordance with NSPS XXX requirements.

5.1.4 Operation of GCCS After Closure

The Facility is not required to operate the GCCS indefinitely after closure of the landfill. The requirements that pertain to removal of the GCCS are listed below:

> §60.762(b)(2)(v) The collection and control system may be capped, removed, or decommissioned if the following criteria are met:
>
> §60.762(b)(2)(v)(A) The landfill shall be a closed landfill (as defined in §60.761). A closure report must be submitted to the Administrator as provided in §60.767(e)
>
> §60.762(b)(2)(v)(B) The collection and control system has been in operation a minimum of 15 years, or the landfill owner or operator demonstrates that the GCCS will be unable to operate for 15 years due to declining gas flow
>
> §60.762(b)(2)(v)(C) Following the procedures specified in §60.764(b), the calculated NMOC emission rate at the landfill is less than 34 megagrams per year on three successive test dates. The test dates must be no less than 90 days apart, and no more than 180 days apart

The GCCS will be operated in accordance with applicable sections of the NSPS XXX. After the GCCS meets the above-referenced requirements for removal under the NSPS XXX, the GCCS may remain in place and functional, but it will no longer be required to comply with the NSPS XXX operational requirements.

6.0 NESHAP AAAA AND NSPS XXX PROPOSED ALTERNATIVES AND CLARIFICATIONS

The following NESHAP AAAA citation allows for alternatives to the operational standards, test methods, procedures, compliance requirements, monitoring, record keeping, and reporting provisions to be requested in the design plan:

> §63.1981(d)(2) The collection and control system design plan must include any alternatives to the operational standards, test methods, procedures, compliance measures, monitoring, recordkeeping or reporting provisions of (§63.1957) through (§63.1983) proposed by the owner or operator.

The following sections describe proposed alternatives to the MSWLS.

6.1 Monthly Monitoring Methods

Under MSWLS, the site is required to monitor all gas wells within the landfill once per month using a field monitoring device that measures oxygen, temperature, and pressure. Unless an alternative test method has been established, 40 CFR §63.1961(a)(2)(i-ii), allow for the use of EPA Method 3C to measure the nitrogen levels and the use of either EPA Method 3A, 3C, or ASTM D6522-11 to establish the oxygen content. In accordance with general practice procedures, the landfill utilizes a portable monitoring instrument (e.g., Landtec GEM, LMS, Envision, or equivalent instrument) to perform this monitoring. The monitoring equipment is calibrated in accordance with manufacturer's recommendations prior to use.

6.2 Positive Pressure under a Synthetic Cover

In areas of a landfill where a geomembrane or synthetic cover is being used, Section 40 CFR §63.1958(b)(2) allows the owner or operator to develop acceptable pressure limits in the design plan. Based on the experience at similar landfills, 5 inches of water column (W.C.) of pressure is acceptable in all areas where a geomembrane or synthetic cover is being used as part of the final cover system. For this reason, incidents of positive pressure less than 5" W.C. in areas where a geomembrane or synthetic cover is installed will not be recorded as exceedances.

6.3 Collection Device Abandonment

If a collection device is no longer functioning effectively, the landfill may elect to abandon the device. To document this action, the landfill will provide information to Michigan EGLE stating that the landfill will still maintain sufficient well field density in compliance with the NSPS XXX without the well. Once abandoned, the well will no longer be monitored monthly per NSPS XXX. If the Facility has not been given a response by the Michigan EGLE within 90 days of submittal, the Facility will assume that the Michigan EGLE could not find any faults with the request, and it will be assumed to be approved.

If a collection device is replaced or redrilled, the existing collection device may be abandoned/removed by the Facility without notification or prior approval to the Michigan EGLE. The replacement well will be renamed for ease of data evaluation and noted in the NSPS XXX Report.

6.4 Early Installation of Collection Devices

The requirements of 40 CFR 63.1960(b) state that each collection device shall be installed no later than 60 days after the date on which the initial solid waste has been in place for a period of five years or more in active areas, or two years or more if closed or at final grade. However, there may be occasions when the Facility will install collection devices prior to the onset of NESHAP AAAA requirements.

Any collection device installed prior to the requirements of NSPS XXX will not be subject to the operational, monitoring, and/or recordkeeping requirements of the NSPS XXX until the age of the initial waste placed in the affected area reaches five years old if active, or two years if closed or at final grade.

6.5 Monitoring During Collection Device Extension

During filling operations, vertical gas extraction wells (verticals) may be extended (raised) periodically so that new refuse is not placed over the top of an existing vertical, thereby preventing access to the well. To maintain worker safety, verticals will be raised as needed in advance of waste filling operations. This may require the well to be raised more than 30 days before refuse is placed around the well. During this period, the well may be inaccessible for monitoring.

Due to the dangers associated with well raising, the Facility is requesting that raised collection devices be exempt from the monthly monitoring for a period not greater than 60 days to eliminate potentially dangerous situations for monitoring personnel. Any times that a collection device is not monitored due to raising activities will be noted on the semi-annual NESHAP and NSPS reports.

6.6 Monitoring of Leachate Risers

During the operating life of the Facility, it may connect the leachate collection system for the purpose of expanding the GCCS or to enhance it for improved control of odors, increase the quantity of LFG available for beneficial use, or meet other landfill operating needs beyond regulatory compliance with the rule. This GCCS Design Plan has been prepared to meet the required level of LFG control without the use of these connections. For this reason, unless done for the specific purpose of expanding the GCCS, the Facility does not believe that the operating requirements of the rule should be applied to voluntarily added collectors because these collectors only act to enhance the performance of the system beyond that required by the rule. Further, when these devices are installed for purposes other than to meet the requirements of the rule, their design may preclude their ability to meet the stipulated operational requirements.

Leachate collection and cleanout risers often operate with positive pressure because they are sometimes closed off for operational purposes due to the pumping action of the leachate pumps. Therefore, if the leachate collection system (LCS) features are connected to the GCCS for any reason other than to correct a surface emission monitoring exceedance, the LCS feature riser will not be a NESHAP or NSPS compliance point. These LCS features can be connected to the GCCS when need and can be disconnected at any time the Facility deems it necessary.

6.7 Operation of Near Surface Collectors (Pin Wells) for Odor Control

The Facility is requesting to install and utilize non-traditional near surface landfill gas extraction/odor control devices referred to in this plan as “pin wells” in areas of the landfill subject to the MSWLS.

These near surface collectors are not installed with the same design as a true vertical collector, instead pin wells are created by driving or impacting an approximately six-inch diameter solid impact “nail” or probe vertically approximately twenty feet into the surface of the landfill. Once the probe is removed, a PVC pipe (the well casing) is fitted into the hole. A gravel pack fills the annulus between the well casing and the sidewalls of the hole to a depth approximately five feet below the surface. The remainder is sealed with an acceptable sealant such as bentonite. The pipe is perforated in the lower section for gas extraction. The well is fitted with a well head and connected to the nearest vacuum source. The wells would generally be developed in clusters and construction may vary slightly.

Pin wells are near-surface gas collectors intended for operation on a temporary basis only. The intent of the well is to provide a “blanket” of gas collection in higher waste zones near the surface of the landfill. The well is not intended to replace traditional vertical gas collection wells that are generally semi-permanent and drilled much deeper, but rather to supplement them when warranted. Accordingly, the primary objective of the wells is for odor control in landfill areas that do not have final cover. These wells can be installed, and removed, much quicker and for far less expense than traditional wells. Accordingly, the landfill is not seeking approval to use the wells to demonstrate adequate collection coverage per the operational standards found in MSWLS. Rather, the landfill seeks approval and flexibility to augment existing system by installing and removing these wells as necessary to control odors on a temporary basis.

The Facility does not currently use near surface collectors, but to allow for the most effective use of this technology in the future, we are requesting the following alternate procedures concerning the utilization of these wells in areas of the landfill that are subject to the requirements of the MSWLS:

1. We request site wide approval to both install, and remove, pin wells as necessary without the requirements for further approvals from the Agency, these wells will not be used to demonstrate adequate coverage per 40 CFR 63.1958(a) or (d) or otherwise meet the operational requirements found in MSWLS.
2. In accordance with 40 CFR 63.1958(b)(3), the landfill will be allowed to temporarily or permanently decommission each pin well, and hence allow positive pressure, at any time. Because the pin wells are discretionary, will be installed in areas that may not generate gas consistently, and will only be used to aid in odor control, the landfill needs the ability to install, remove, open, and close the well at our discretion.

6.8 Operation of Bottom Collectors for Odor Control

The Facility is requesting to install and utilize non-traditional near surface landfill gas extraction/odor control devices referred to in this plan as Bottom Collectors in areas of the landfill subject to the MSWLS.

These near surface collectors are not installed with the same design as a true vertical or horizontal collector, instead Bottom Collectors are usually installed during cell construction events, and prior to any waste placement. During the installation of leachate collection drainage layer within a newly constructed waste disposal cell, lengths of perforated pipe are embedded within the collection material . At a future date, when waste has been placed atop these perforated pipe locations, the facility may elect to connect the perforated pipe lengths to the active landfill gas extraction system to assist in the control of odors and the prevention of landfill gas migration.

While not as common, Bottom Collectors may also be installed after waste placement as a means to mitigate fugitive emissions or help control liquids. This requires digging down to cell leachate collection layer, placing a length of perforated piping and/or collection stone, and promoting communication between the collector and the leachate collection layer. The collector can then be connected to the existing vacuum system to contain surface emissions and liquids in the area.

Bottom Collectors are intended for operation on a temporary basis only. These collectors are not intended to replace traditional vertical gas collection wells that are generally semi-permanent and drilled much deeper, but rather to supplement them when warranted. Accordingly, the primary objective of these collectors is for odor and liquid control in landfill areas that do not have final cover. These can be connected to an active extraction system much quicker than traditional wells. Accordingly, the Facility is not seeking approval to use the wells to demonstrate adequate collection coverage per the operational standards found in MSWLS. Rather, the landfill seeks approval and flexibility to augment existing system by installing and removing these collectors as necessary to control odors and liquid on a temporary basis.

The Facility does not currently use Bottom Collectors, but to allow for the most effective use of this technology in the future, we are requesting the following alternate procedures concerning the utilization of these wells in areas of the landfill that are subject to the requirements of the MSWLS:

1. We request site wide approval to both install, and remove, Bottom Collectors as necessary without the requirements for further approvals from the Agency, these wells will not be used to demonstrate adequate coverage per 40 CFR 63.1958(a) or (d) or otherwise meet the operational requirements found in MSWLS.
2. In accordance with 40 CFR 63.1958(b)(3), the landfill will be allowed to decommission each Bottom Collector temporarily or permanently, and hence allow positive pressure, at any time. Because the Bottom Collectors are discretionary, will be installed in areas that may not generate gas consistently, and will only be used to aid in odor control, the landfill needs the ability to install, remove, open, and close the well at our discretion.

6.9 Operation of Near Surface Collectors for Cap Stability

The buildup of excessive LFG pressure below the geomembrane in the final cover system can cause or contribute to cover system stability failure. Excessive pressure reduces the effective normal stress on the lower geomembrane interface and can cause veneer instability and/or cap system failure resulting in environmental impacts. Therefore, to protect the cover system, surface collectors/vents may be installed underneath the final cap. Given that near surface collectors/vents will not be installed in waste they are not considered part of the required GCCS and as such not subject to the monitoring and operating requirements of the MSWLS. Furthermore, given these collectors/vents are not installed in the waste they are not penetrations.

6.10 Surface Emission Monitoring (SEM)

6.10.1 Exclusion of Dangerous Areas from SEM requirements

Areas with steep slopes or other dangerous areas are excluded from the SEM requirements under the NSPS:

§63.1958(d)(1) Operational Standards for Collection and Control Systems:
"...A surface monitoring design plan shall be developed...Areas with steep slopes or other dangerous areas may be excluded from surface testing.

The Facility is proposing to exclude the following dangerous areas from SEM:

a. Roads

b. Working areas and/or the working face

c. Truck traffic areas

d. steep and dangerous slopes

e. Icy, snow covered, and/or extremely muddy side slopes

f. Areas where the landfill cover material has been exposed for the express purpose of installing, expanding, replacing, or repairing components of the LFG, leachate, or gas condensate collection and removal systems.

This list is not exhaustive, and there could be other circumstances in which monitoring cannot be safely executed. If such a situation arises, it will be documented in the reports.

6.10.2 Alternative Remedy for SEM events

Section 40 CFR 63.1960(c)(4) of the MSWLS requires the Facility owner or operator to take corrective action to remedy any incidents of methane concentrations more than 500 ppm above background that are detected during SEM. The Facility will perform the initial SEM event and 10-day/1-month remonitoring events in accordance with the MSWLS. For SEM exceedances, corrective measures may include modifications to the GCCS other than the installation of additional LFG collection devices to meet the 120-day timeline unless an alternative timeline has been established. The following alternative remedies will be implemented to correct SEM exceedances within the 120-day timeline. These corrective actions may include, but are not limited to, one or more of the following measures:

a. Installation of, or upgrades to, conveyance and/or control equipment (e.g., larger flare, additional blowers, etc.)

b. Installation of a liquid management system in the extraction wells or sumps

c. Installation/modification of other ancillary equipment (e.g., larger air compressor, additional air, and condensate force main lines, etc.)

d. Installation of additional or replacement LFG collection devices

e. Repair ofthe landfill cap to minimize LFG migration and/or air infiltration

f. Repair or replace header valves

Please note that this list is not intended to be exhaustive. Other actions that result in the remediation of an exceedance within the 120-day timeframe would also be covered under this alternative. Any enhancements made to the existing GCCS will be documented in the Semi-Annual Reports prepared for compliance with MSWLS/Title V requirements. Please note that the landfill will be proactively implementing this variance to ensure that exceedances are addressed as expeditiously as possible. If the GCCS cannot be brought back into compliance during the 120-day assessment period, the landfill will prepare an alternative compliance schedule for review and approval by the Administrator.

6.10.3 SEM for Closed Portions of the Landfill

The landfill is requesting that any portions of the landfill that have been certified closed or have been closed and capped in accordance with the cover conditions contained according to the MSWLS or Subtitle D be treated as a closed landfill for SEM events. These closed portions of the landfill will be monitored in accordance with the following section of the MSWLS:

> §63.1961(f) …Any closed landfill that has no monitored exceedances of the operational standard in three consecutive quarterly monitoring periods may skip to annual monitoring. Any reading of 500 ppm or more above background detected during the annual monitoring returns the frequency for the landfill to quarterly monitoring.

Closure criteria in Subtitle D are stipulated by §258.60 and §258.61.

In accordance with this requirement, the landfill is requesting that SEM be performed on all closed areas of the landfill in accordance with the requirements listed above.

7.0 NESHAP AAAA OPERATING CLARIFICATIONS

This section clarifies how the Facility will implement certain monitoring, recordkeeping, and reporting obligations under MSWLS.

7.1 Alternative Timeline Request

According to MSWLS, the Facility must request an alternative timeline if the site requires more than 120 days from the initial exceedance to correct a well exceedance.

> 63.1960(a)(3) For the purpose of demonstrating whether the gas collection system flow rate is sufficient to determine compliance with § 63.1959(b)(2)(ii)(B)(2), the owner or operator must measure gauge pressure in the gas collection header applied to each individual well, monthly. If a positive pressure exists, action must be initiated to correct the exceedance within 5 calendar days, except for the three conditions allowed under § 60.763(b). Any attempted corrective measure must not cause exceedances of other operational or performance standards.

. (i) Beginning no later than September 27, 2021, if a positive pressure exists, action must be initiated to correct the exceedance within 5 days, except for the three conditions allowed under § 63.1958(b).

(A) If negative pressure cannot be achieved without excess air infiltration within 15 days of the first measurement of positive pressure, the owner or operator must conduct a root cause analysis and correct the exceedance as soon as practicable, but no later than 60 days after positive pressure was first measured § 63.1983(e)(3).

(B) If corrective actions cannot be fully implemented within 60 days following the positive pressure measurement for which the root cause analysis was required, the owner or operator must also conduct a corrective action analysis and develop an implementation schedule to complete the corrective action(s) as soon as practicable, but no more than 120 days following the positive pressure measurement. The owner or operator must submit the items listed in § 63.1981(h)(7) as part of the next semi-annual report. The owner or operator must keep records according to § 63.1983(e)(4).

(C) If corrective action is expected to take longer than 120 days to complete after the initial exceedance, the owner or operator must submit the root cause analysis, corrective action analysis, and corresponding implementation timeline to the Administrator, according to § 63.1981(j). The owner or operator must keep records according to § 63.1983(e)(5).

§63.1960(a)(4) Where an owner of operator subject to the provisions of this subpart seeks to demonstrate compliance with the temperature and nitrogen or oxygen operational standards in introductory paragraph § 63.1958(c), for the purpose of identifying whether excess air infiltration into the landfill is occurring, the owner or operator must follow the procedures as specified in § 60.755(a)(5) of this chapter, except:

(i) Once an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with the temperature and nitrogen or oxygen operational standards in introductory paragraph § 63.1958(c)(1), action must be initiated to correct the exceedance within 5 days. Any attempted corrective measure must not cause exceedances of other operational or performance standards.

(A) If a landfill gas temperature less than or equal to 62.8 degrees Celsius (145 degrees Fahrenheit) cannot be achieved within 15 days of the first measurement of landfill gas temperature greater than 62.8 degrees Celsius (145 degrees Fahrenheit), the owner or operator must conduct a root cause analysis and correct the exceedance as soon as practicable, but no later than 60 days after a landfill gas temperature greater than 62.8 degrees Celsius (145 degrees Fahrenheit) was first measured. The owner or operator must keep records according to § 63.1983(e)(3).

(B) If corrective actions cannot be fully implemented within 60 days following the temperature measurement for which the root cause analysis was required, the owner or operator must also conduct a corrective action analysis and develop an implementation schedule to complete the corrective action(s) as soon as practicable, but no more than 120 days following the measurement of landfill gas temperature greater than 62.8 degrees Celsius (145 degrees Fahrenheit). The owner or operator must submit the items listed in § 63.1983(e)(4).

(C) If corrective action is expected to take longer than 120 days to complete after the initial exceedance, the owner or operator must submit the root cause analysis, corrective action analysis, and corresponding implementation timeline to the Administrator, according to § 63.1981(h)(7) and (j). The owner or operator must keep records according to § 63.1983(e)(5).

(D) If a landfill gas temperature measured at either the wellhead or at any point in the well is greater than or equal to 76.7 degrees Celsius (170 degrees Fahrenheit) and the carbon monoxide concentration measured, according to the procedures in § 63.1961(a)(5)(vi) is greater than or equal to 1,000 ppmv the corrective action(s) for the wellhead temperature standard (62.8 degrees Celsius or 145 degrees Fahrenheit) must be completed within 15 days.

§63.1960(a)(3)(i)(B) and §63.1960(a)(4)(i)(C) the site is required to conduct a <u>root cause analysis</u> if an exceedance takes more than 15 days to correct from the initial reading. The owner or operator must also conduct a <u>corrective action analysis</u> and develop an implementation schedule to submit to the Administrator for corrective actions that may take longer than 60 days from the initial exceedance date. Records for the <u>corrective action analysis</u> must include the date for the corrective action, the date for corrective actions already completed following the positive pressure reading or high temperature reading, and, for actions not already completed, a schedule for implementation, including proposed commencement and completion dates. If corrective actions are expected to take longer than 120 days to complete, the root cause analysis, corrective action analysis, and corresponding implementation timeline must be submitted to the Administrator in the NSPS/NESHAP reports. However, in accordance with 63.1981(h)(7) for the semi-annual reports, if the exceedance takes more than 60 days to correct, the <u>corrective action analysis</u> should be included in the annual NSPS report, even though it will not be sent directly to the Administrator. For landfill gas collection components that are remediated after 15 days but before 60 days of the initial exceedance, the <u>root cause analysis</u> will not be submitted to the Administrator.

If the site receives no agency response within 40-days of submittal of an alternative timeline request to the Agency, the site will assume the alternative timeline is approved and the exceedance and corresponding alternative timeline will not be considered a reportable deviation in subsequent Title V reports.

7.2 Establishment of a Higher Operating Value (HOV) for Temperature

To establish a HOV, the landfill will retain supporting data that the proposed standard will not cause an environment conducive to subsurface oxidation, nor inhibit anaerobic decomposition by killing methanogens. If a collection device is observed to have a normal operating temperature that is stable above what is currently approved, a higher operating temperature threshold will be established for the collection device. The landfill will provide at least three (3) months of operational data to support the establishment of a higher operating temperature range for any the landfill gas collection device. The following information will be included in the request to prove that the elevated temperature neither causes fires nor significantly inhibits anaerobic decomposition by killing methanogens:

- The monthly and average oxygen content of the LFG
- The monthly and average carbon dioxide of the LFG
- The monthly and average methane content of the LFG
- Well logs provided by drilling contractors during initial installation, if available
- The monthly and average temperature of the LFG

A discussion of any conditions that might suggest subsurface oxidation (e.g., smoke, excessive settlement, etc.). If the site receives no agency response within 30 days of submittal to the Agency, the site will assume the alternative timeline is approved.

Copies of the written approved and deemed approved HOVs will be listed in the MSWLS reports.

7.3 Frequency of Updates to As-built Drawings

The landfill is required to keep an up-to-date readily accessible plot map showing each existing and planned collectors (see 40 CFR 63.1983(d) below). An up-to-date plot map is more commonly called an as-built.

> §63.1983(d) Except as provided in §63.1983(d)(2), each owner or operator subject to the provisions of this subpart must keep for the life of the collection system an up-to-date, readily accessible plot map showing each existing and planned collector in the system and providing a unique identification location label for each collector.
>
> (1) Each owner or operator subject to the provisions of this subpart must keep up-to-date, readily accessible records of the installation date and location of all newly installed collectors as specified under §63.1960(b).
>
> (2) Each owner or operator subject to the provisions of this subpart must keep readily accessible documentation of the nature, date of deposition, amount, and location of asbestos-containing or nondegradable waste excluded from collection as provided in §63.1962(a)(3)(ii).

The as-built can only be generated/updated for a landfill after construction projects that include upgrades and additions to the gas collection system are completed. After construction has taken place, the survey crew will document the completion of the construction. Since there is no defined frequency for preparing/updating an as-built of the gas collection system, the landfill will update the as-built on an annual basis in years that changes, or construction of the gas collection system are performed.

7.4 Definitions of Penetration and Openings

40 CFR §63.1958(d) added a new Surface Emission Monitoring (SEM) requirement not previously required. As part of SEM, the landfill must now also include the monitoring of all cover penetrations and. A cover penetration is now defined in 40 CFR §63.1990.

In 63.1990 of NESHAP AAAA, a cover penetration:

> *"means a wellhead, a part of a landfill gas collection or operations system, and/or any other object that completely passes through the landfill cover. The landfill cover includes that portion which covers the waste, as well as the portion which borders the waste extended to the point where it is sealed with the landfill liner or the surrounding land mass. Examples of what is not a penetration for purposes of this subpart include but are not limited to: Survey stakes, fencing including litter fences, flags, signs, utility posts, and trees so long as these items do not pass through the landfill cover."*

Monitoring will be conducted in accordance with this definition.

Appendix A

LFG Generation Rate Modeling & KY Gas Models

An estimate of the landfill gas (LFG) generation rates at the Facility was prepared under conditions described in the following sections. If actual extraction rates exceed the design extraction rates, appropriate modifications to the gas collection and control system will be prepared and implemented, as necessary, to manage LFG within as required by the Regulations.

LandGEM Model Name/Period, Input Parameters and Acceptance Rates:

	WML LandGEM(s)						
LandGEM Model Name/Period:				1975 - 2006	2007-2027	2028-2041	
Began Receiving Waste (modeled):				1975	2007	2028	
Stop Receiving Waste (modeled):				2006	2027	2052	
LandGEM Model to Calculate Closure Year:				Yes	Yes	Yes	
Methane Generation Rate Constant (k):				0.04	0.04	0.04	$year^{-1}$
Methane Generation Potential (Lo):				100	100	100	m^3/Mg
NMOC Concentration:	238.9	238.9	238.9	238.9	238.9	238.9	ppmv as hexane
Methane Content:	50	50	50	50	50	50	% by volume
Waste Acceptance Rates (Actual Revied & Proposed Future Tons to be Received):	0	0	0	24,296,443	20,322,048	17,888,248	short tons

LandGEM Parameters k, $L_{0,}$ NMOC and Methane Content:

Default Inventory Conventional Air Pollutant Emissions Factors (AP42) for k=0.04 years-1, Lo=100 m3/Mg and 50% by volume Methane Concentration, to comply with the Clean Air Act (CAA), were used to model waste received at the Facility. These values are representative of Type II landfills within the climate of the Midwest, Northeast and Central United States. In addition, a site specific NMOC concentration of 238.9 ppmv as hexane was provided by the Facility and used in this analysis.

Waste Acceptance Rates (short tons per year):

The waste acceptance rates entered into the LandGEM model were determined based on the following information, data and assumptions.

The total annual waste receipts from 1975 through 1999 were provided by the Facility and reduced by 23% to account for the estimated percentage of non-methanogenic waste received during that time period. This percentage was determined using the waste material descriptions and summary tonnage reports from 2002 through 2004, where 23% of the total tonnage was determined to be non-methanogenic. Based on discussions with the Facility, this time period would be representative of the previous years. Tonnages used for 2000 through 2021 were obtained from the air emissions reporting system and were not reduced because only wastes characterized as methanogenic are reported to that system. The annual methanogenic tonnages were entered as "short tons per year" in the respective LandGEM models.

The annual short-tons from 2021 were projected for all future years. The Facility provided 2041 as the final year the site would receive waste. This year is based on internal methods the Facility uses for determining the remaining site life which included, but are not limited to, operational density and fillable airspace.

During LandGEM modeling, or when State annual air emissions reporting is completed, total annual waste tons received at the Facility are reviewed to determine what portion of the waste stream was methanogenic. This is typically completed by review of the Facility's annual material activity reports, where available, which provides a material description with the associated tonnage received. Non-methanogenic waste is removed from the total and the remaining tonnage, or methanogenic tonnage, is entered into the LandGEM model as "short tons per year". Where a material descriptions are not sufficient to determine methanogenic potential, it is assumed to be methanogenic unless the Facility provides more detailed information otherwise. The categories shown below are examples of waste descriptions found within material activity reports and how they are categorized during the review process. Every landfill may use different waste descriptions, therefore the separation by material description is reviewed with the Facility prior to be used for the purpose of LandGEM modeling.

Methanogenic	Non-Methanogenic
Municipal Solid Waste (MSW)	Ash & Asbestos
Sludges	Soils & C&D
	Misc. Special Waste & RGC Waste

In addition, where waste activity reports are not available, total historic waste intake data, or estimated future total anticipated tonnages, may be adjusted based on current data or information. The adjustment, if applicable, is based on the ratio of non-methanogenic to methanogenic waste received over the years where data is available, or where new materials are anticipated. When done, this is also reviewed with the Facility for concurrence that it is representative of waste received, or waste anticipated to be received, prior to being entered into the LandGEM model.

LandGEM Model Results:

The results from the LandGEM modeling showed the peak rate of LFG generation for the Facility to be: 12,772 scfm in 2041. This peak LFG rate was developed by combining the results of the LandGEMs, representing the periods modeled, at the Facility.

BEL ENVIRONMENTAL ENGINEERING

Waste Acceptance Rates and Total LFG Generation Rate:

Year			1975-2006		2007-2027		2028-2041		Total LFG Rate (scfm)
	Waste (s-tons/yr)	Total LFG (scfm)	Waste (s-tons/yr)	Total LFG (scfm)	Waste (s-tons/yr)	Total LFG (scfm)	Waste (s-tons/yr)	Total LFG (scfm)	
1975	-	-	174,906	0	-	-	-	-	0
1976	-	-	185,917	84	-	-	-	-	84
1977	-	-	208,786	170	-	-	-	-	170
1978	-	-	265,323	263	-	-	-	-	263
1979	-	-	333,718	380	-	-	-	-	380
1980	-	-	570,243	526	-	-	-	-	526
1981	-	-	239,066	779	-	-	-	-	779
1982	-	-	231,866	863	-	-	-	-	863
1983	-	-	256,006	940	-	-	-	-	940
1984	-	-	344,504	1,026	-	-	-	-	1,026
1985	-	-	379,073	1,152	-	-	-	-	1,152
1986	-	-	380,716	1,288	-	-	-	-	1,288
1987	-	-	387,545	1,421	-	-	-	-	1,421
1988	-	-	387,523	1,551	-	-	-	-	1,551
1989	-	-	417,134	1,676	-	-	-	-	1,676
1990	-	-	457,770	1,811	-	-	-	-	1,811
1991	-	-	493,009	1,959	-	-	-	-	1,959
1992	-	-	579,956	2,119	-	-	-	-	2,119
1993	-	-	630,053	2,314	-	-	-	-	2,314
1994	-	-	915,436	2,526	-	-	-	-	2,526
1995	-	-	1,058,318	2,866	-	-	-	-	2,866
1996	-	-	1,103,104	3,262	-	-	-	-	3,262
1997	-	-	990,161	3,663	-	-	-	-	3,663
1998	-	-	1,150,656	3,995	-	-	-	-	3,995
1999	-	-	1,458,727	4,391	-	-	-	-	4,391
2000	-	-	1,584,767	4,919	-	-	-	-	4,919
2001	-	-	1,578,871	5,486	-	-	-	-	5,486
2002	-	-	1,757,658	6,029	-	-	-	-	6,029
2003	-	-	1,461,434	6,636	-	-	-	-	6,636
2004	-	-	1,600,802	7,078	-	-	-	-	7,078
2005	-	-	1,603,082	7,568	-	-	-	-	7,568
2006	-	-	1,110,318	8,041	-	-	-	-	8,041
2007	-	-	0	8,259	1,114,117	-	-	-	8,259
2008	-	-	0	7,935	795,691	535	-	-	8,470

BEL ENVIRONMENTAL ENGINEERING

Waste Acceptance Rates and Total LFG Generation Rate:

Year			1975-2006		2007-2027		2028-2041		Total LFG Rate (scfm)
	Waste (s-tons/yr)	Total LFG (scfm)	Waste (s-tons/yr)	Total LFG (scfm)	Waste (s-tons/yr)	Total LFG (scfm)	Waste (s-tons/yr)	Total LFG (scfm)	
2009	-	-	0	7,624	787,897	896	-	-	8,519
2010	-	-	0	7,325	819,945	1,239	-	-	8,564
2011	-	-	0	7,038	715,416	1,584	-	-	8,621
2012	-	-	0	6,762	739,131	1,865	-	-	8,627
2013	-	-	0	6,497	708,613	2,147	-	-	8,643
2014	-	-	0	6,242	694,482	2,403	-	-	8,644
2015	-	-	0	5,997	678,482	2,642	-	-	8,639
2016	-	-	0	5,762	707,634	2,864	-	-	8,626
2017	-	-	0	5,536	811,616	3,091	-	-	8,627
2018	-	-	0	5,319	777,574	3,359	-	-	8,678
2019	-	-	0	5,110	988,521	3,601	-	-	10,454
2020	-	-	0	4,910	1,038,805	3,934	-	-	8,844
2021	-	-	0	4,717	1,277,732	4,279	-	-	8,996
2022	-	-	0	4,532	1,277,732	4,724	-	-	9,256
2023	-	-	0	4,355	1,277,732	5,152	-	-	9,507
2024	-	-	0	4,184	1,277,732	5,563	-	-	9,747
2025	-	-	0	4,020	1,277,732	5,958	-	-	9,978
2026	-	-	0	3,862	1,277,732	6,338	-	-	10,200
2027	-	-	0	3,711	1,277,732	6,703	-	-	10,414
2028	-	-	0	3,565	0	7,053	1,277,732	0	10,619
2029	-	-	0	3,426	0	6,777	1,277,732	613	10,816
2030	-	-	0	3,291	0	6,511	1,277,732	1,202	11,005
2031	-	-	0	3,162	0	6,256	1,277,732	1,769	11,187
2032	-	-	0	3,038	0	6,010	1,277,732	2,313	11,361
2033	-	-	0	2,919	0	5,775	1,277,732	2,835	11,529
2034	-	-	0	2,805	0	5,548	1,277,732	3,337	11,690
2035	-	-	0	2,695	0	5,331	1,277,732	3,820	11,845
2036	-	-	0	2,589	0	5,122	1,277,732	4,283	11,994
2037	-	-	0	2,487	0	4,921	1,277,732	4,728	12,137
2038	-	-	0	2,390	0	4,728	1,277,732	5,156	12,274
2039	-	-	0	2,296	0	4,543	1,277,732	5,567	12,406
2040	-	-	0	2,206	0	4,364	1,277,732	5,962	12,533
2041	-	-	0	2,120	0	4,193	1,277,732	6,342	12,655
2042	-	-	0	2,037	0	4,029	0	6,706	12,772

	Subject:	LFG Generation Rate Modeling Methods, Procedures and Assumptions		
BEL ENVIRONMENTAL ENGINEERING	Project:	Woodland Meadows Landfill (WML) GCCS Plan		
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	Made By:	AML	Date:	12/16/2022
	Checked By:	PS	Date:	12/16/2022

Waste Acceptance Rates and Total LFG Generation Rate:

Year			1975-2006		2007-2027		2028-2041		Total LFG Rate (scfm)
	Waste (s-tons/yr)	Total LFG (scfm)	Waste (s-tons/yr)	Total LFG (scfm)	Waste (s-tons/yr)	Total LFG (scfm)	Waste (s-tons/yr)	Total LFG (scfm)	
2043	-	-	0	1,957	0	3,871	0	6,444	12,271
2044	-	-	0	1,880	0	3,719	0	6,191	11,790
2045	-	-	0	1,806	0	3,573	0	5,948	11,328
2046	-	-	0	1,735	0	3,433	0	5,715	10,884
2047	-	-	0	1,667	0	3,299	0	5,491	10,457
2048	-	-	0	1,602	0	3,169	0	5,276	10,047
2049	-	-	0	1,539	0	3,045	0	5,069	9,653
2050	-	-	0	1,479	0	2,926	0	4,870	9,274
2051	-	-	0	1,421	0	2,811	0	4,679	8,911
2052	-	-	0	1,365	0	2,701	0	4,495	8,561
2053	-	-	0	1,312	0	2,595	0	4,319	8,226
2054	-	-	0	1,260	0	2,493	0	4,150	7,903
2055	-	-	0	1,211	0	2,395	0	3,987	7,593
2056	-	-	0	1,163	0	2,301	0	3,831	7,295
2057	-	-	0	1,118	0	2,211	0	3,681	7,009
2058	-	-	0	1,074	0	2,124	0	3,536	6,735
2059	-	-	0	1,032	0	2,041	0	3,398	6,470
2060	-	-	0	991	0	1,961	0	3,264	6,217
2061	-	-	0	952	0	1,884	0	3,136	5,973
2062	-	-	0	915	0	1,810	0	3,013	5,739
2063	-	-	0	879	0	1,739	0	2,895	5,514
2064	-	-	0	845	0	1,671	0	2,782	5,298
2065	-	-	0	812	0	1,606	0	2,673	5,090
2066	-	-	0	780	0	1,543	0	2,568	4,890
2067	-	-	0	749	0	1,482	0	2,467	4,699
2068	-	-	0	720	0	1,424	0	2,370	4,514
2069	-	-	0	692	0	1,368	0	2,277	4,337
2070	-	-	0	664	0	1,315	0	2,188	4,167
2071	-	-	0	638	0	1,263	0	2,102	4,004
2072	-	-	0	613	0	1,213	0	2,020	3,847
2073	-	-	0	589	0	1,166	0	1,941	3,696
2074	-	-	0	566	0	1,120	0	1,865	3,551
2075	-	-	0	544	0	1,076	0	1,792	3,412
2076	-	-	0	523	0	1,034	0	1,721	3,278

Summary Report

Landfill Name or Identifier: Woodland Meadows 1975 - 2006

Date: Friday, December 16, 2022

Description/Comments:

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} kL_o \left(\frac{M_i}{10} \right) e^{-kt_{ij}}$$

Where,
Q_{CH4} = annual methane generation in the year of the calculation (*m^3/year*)
i = 1-year time increment
n = (year of the calculation) - (initial year of waste acceptance)
j = 0.1-year time increment
k = methane generation rate (*$year^{-1}$*)
L_o = potential methane generation capacity (*m^3/Mg*)

M_i = mass of waste accepted in the i^{th} year (*Mg*)
t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**1975**	
Landfill Closure Year (with 80-year limit)	**2006**	
Actual Closure Year (without limit)	***2006***	
Have Model Calculate Closure Year?	**Yes**	
Waste Design Capacity	**24,296,443**	*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.040**	*year^{-1}*
Potential Methane Generation Capacity, L_o	**100**	*m^3/Mg*
NMOC Concentration	**239**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**Total landfill gas**
Gas / Pollutant #2:	**Methane**
Gas / Pollutant #3:	**Carbon dioxide**
Gas / Pollutant #4:	**NMOC**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
1975	159,005	174,906	0	0
1976	169,015	185,917	159,005	174,906
1977	189,805	208,786	328,020	360,822
1978	241,203	265,323	517,825	569,608
1979	303,380	333,718	759,028	834,930
1980	518,403	570,243	1,062,408	1,168,648
1981	217,333	239,066	1,580,810	1,738,891
1982	210,788	231,866	1,798,143	1,977,957
1983	232,733	256,006	2,008,930	2,209,823
1984	313,186	344,504	2,241,663	2,465,829
1985	344,611	379,073	2,554,848	2,810,333
1986	346,105	380,716	2,899,460	3,189,405
1987	352,314	387,545	3,245,565	3,570,121
1988	352,293	387,523	3,597,878	3,957,666
1989	379,212	417,134	3,950,171	4,345,189
1990	416,155	457,770	4,329,384	4,762,322
1991	448,190	493,009	4,745,539	5,220,093
1992	527,232	579,956	5,193,728	5,713,101
1993	572,775	630,053	5,720,961	6,293,057
1994	832,215	915,436	6,293,736	6,923,109
1995	962,107	1,058,318	7,125,950	7,838,545
1996	1,002,821	1,103,104	8,088,058	8,896,863
1997	900,147	990,161	9,090,879	9,999,967
1998	1,046,051	1,150,656	9,991,026	10,990,128
1999	1,326,115	1,458,727	11,037,077	12,140,785
2000	1,440,697	1,584,767	12,363,192	13,599,511
2001	1,435,337	1,578,871	13,803,889	15,184,278
2002	1,597,871	1,757,658	15,239,227	16,763,149
2003	1,328,576	1,461,434	16,837,098	18,520,807
2004	1,455,275	1,600,802	18,165,674	19,982,241
2005	1,457,347	1,603,082	19,620,948	21,583,043
2006	1,009,380	1,110,318	21,078,296	23,186,125
2007	0	0	22,087,676	24,296,443
2008	0	0	22,087,676	24,296,443
2009	0	0	22,087,676	24,296,443
2010	0	0	22,087,676	24,296,443
2011	0	0	22,087,676	24,296,443
2012	0	0	22,087,676	24,296,443
2013	0	0	22,087,676	24,296,443
2014	0	0	22,087,676	24,296,443

WASTE ACCEPTANCE RATES (Continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg)	(short tons)
2015	0	0	22,087,676	24,296,443
2016	0	0	22,087,676	24,296,443
2017	0	0	22,087,676	24,296,443
2018	0	0	22,087,676	24,296,443
2019	0	0	22,087,676	24,296,443
2020	0	0	22,087,676	24,296,443
2021	0	0	22,087,676	24,296,443
2022	0	0	22,087,676	24,296,443
2023	0	0	22,087,676	24,296,443
2024	0	0	22,087,676	24,296,443
2025	0	0	22,087,676	24,296,443
2026	0	0	22,087,676	24,296,443
2027	0	0	22,087,676	24,296,443
2028	0	0	22,087,676	24,296,443
2029	0	0	22,087,676	24,296,443
2030	0	0	22,087,676	24,296,443
2031	0	0	22,087,676	24,296,443
2032	0	0	22,087,676	24,296,443
2033	0	0	22,087,676	24,296,443
2034	0	0	22,087,676	24,296,443
2035	0	0	22,087,676	24,296,443
2036	0	0	22,087,676	24,296,443
2037	0	0	22,087,676	24,296,443
2038	0	0	22,087,676	24,296,443
2039	0	0	22,087,676	24,296,443
2040	0	0	22,087,676	24,296,443
2041	0	0	22,087,676	24,296,443
2042	0	0	22,087,676	24,296,443
2043	0	0	22,087,676	24,296,443
2044	0	0	22,087,676	24,296,443
2045	0	0	22,087,676	24,296,443
2046	0	0	22,087,676	24,296,443
2047	0	0	22,087,676	24,296,443
2048	0	0	22,087,676	24,296,443
2049	0	0	22,087,676	24,296,443
2050	0	0	22,087,676	24,296,443
2051	0	0	22,087,676	24,296,443
2052	0	0	22,087,676	24,296,443
2053	0	0	22,087,676	24,296,443
2054	0	0	22,087,676	24,296,443

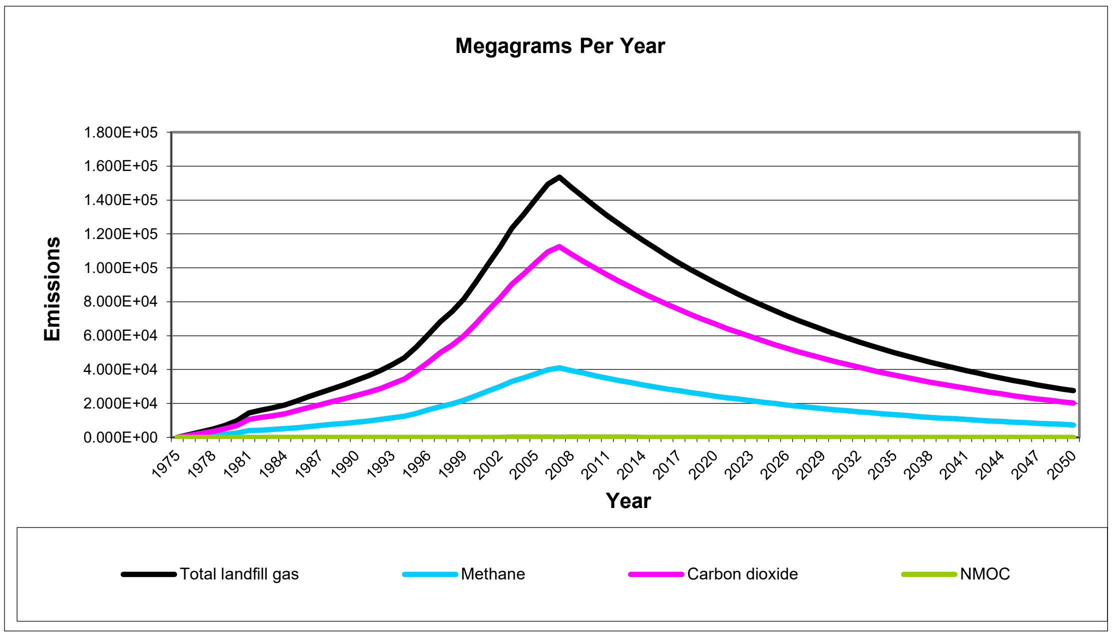
Pollutant Parameters

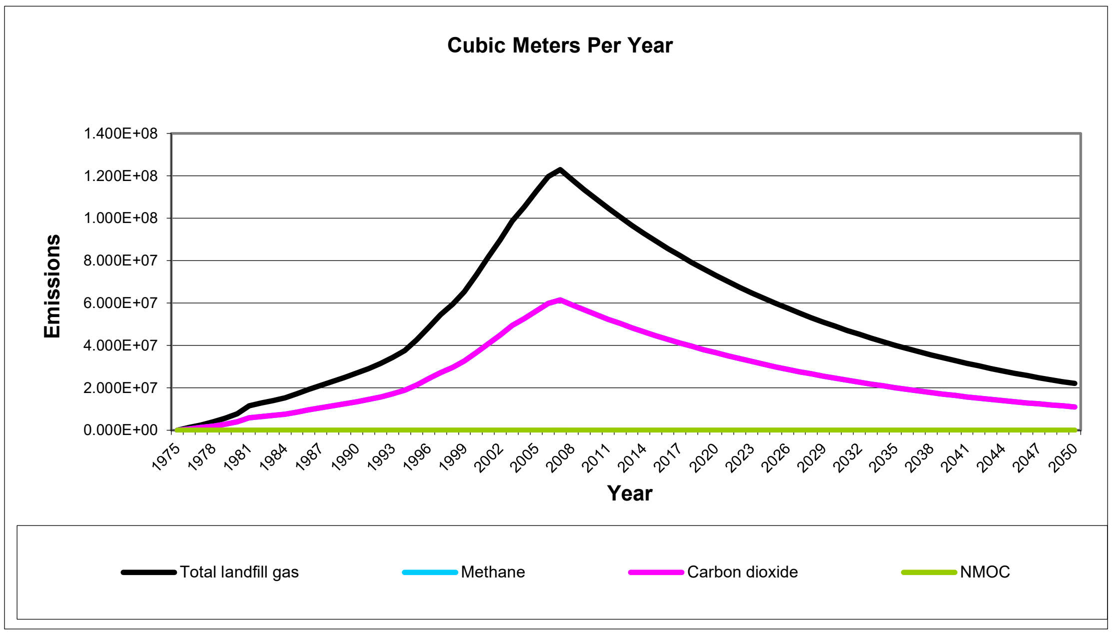
	Compound	Gas / Pollutant Default Parameters: Concentration (*ppmv*)	Molecular Weight	User-specified Pollutant Parameters: Concentration (*ppmv*)	Molecular Weight
Gases	Total landfill gas		0.00		
	Methane		16.04		
	Carbon dioxide		44.01		
	NMOC	4,000	86.18		
Pollutants	1,1,1-Trichloroethane (methyl chloroform) - HAP	0.48	133.41		
	1,1,2,2-Tetrachloroethane - HAP/VOC	1.1	167.85		
	1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	2.4	98.97		
	1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.20	96.94		
	1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.41	98.96		
	1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.18	112.99		
	2-Propanol (isopropyl alcohol) - VOC	50	60.11		
	Acetone	7.0	58.08		
	Acrylonitrile - HAP/VOC	6.3	53.06		
	Benzene - No or Unknown Co-disposal - HAP/VOC	1.9	78.11		
	Benzene - Co-disposal - HAP/VOC	11	78.11		
	Bromodichloromethane - VOC	3.1	163.83		
	Butane - VOC	5.0	58.12		
	Carbon disulfide - HAP/VOC	0.58	76.13		
	Carbon monoxide	140	28.01		
	Carbon tetrachloride - HAP/VOC	4.0E-03	153.84		
	Carbonyl sulfide - HAP/VOC	0.49	60.07		
	Chlorobenzene - HAP/VOC	0.25	112.56		
	Chlorodifluoromethane	1.3	86.47		
	Chloroethane (ethyl chloride) - HAP/VOC	1.3	64.52		
	Chloroform - HAP/VOC	0.03	119.39		
	Chloromethane - VOC	1.2	50.49		
	Dichlorobenzene - (HAP for para isomer/VOC)	0.21	147		
	Dichlorodifluoromethane	16	120.91		
	Dichlorofluoromethane - VOC	2.6	102.92		
	Dichloromethane (methylene chloride) - HAP	14	84.94		
	Dimethyl sulfide (methyl sulfide) - VOC	7.8	62.13		
	Ethane	890	30.07		
	Ethanol - VOC	27	46.08		

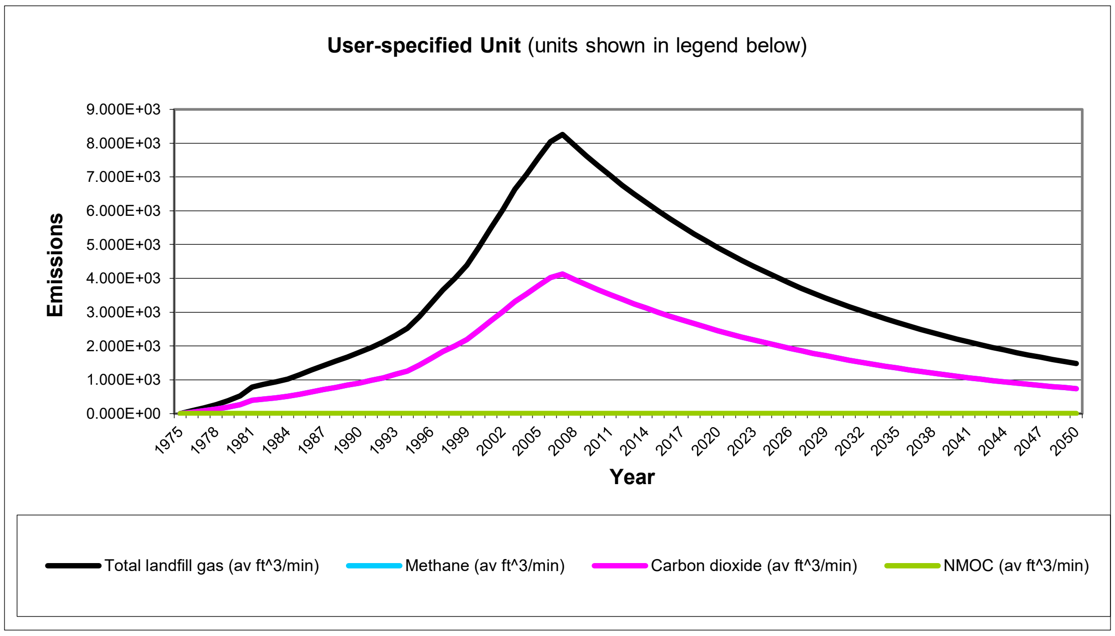
Pollutant Parameters (Continued)

	Gas / Pollutant Default Parameters:			User-specified Pollutant Parameters:	
	Compound	Concentration (*ppmv*)	Molecular Weight	Concentration (*ppmv*)	Molecular Weight
Pollutants	Ethyl mercaptan (ethanethiol) - VOC	2.3	62.13		
	Ethylbenzene - HAP/VOC	4.6	106.16		
	Ethylene dibromide - HAP/VOC	1.0E-03	187.88		
	Fluorotrichloromethane - VOC	0.76	137.38		
	Hexane - HAP/VOC	6.6	86.18		
	Hydrogen sulfide	36	34.08		
	Mercury (total) - HAP	2.9E-04	200.61		
	Methyl ethyl ketone - HAP/VOC	7.1	72.11		
	Methyl isobutyl ketone - HAP/VOC	1.9	100.16		
	Methyl mercaptan - VOC	2.5	48.11		
	Pentane - VOC	3.3	72.15		
	Perchloroethylene (tetrachloroethylene) - HAP	3.7	165.83		
	Propane - VOC	11	44.09		
	t-1,2-Dichloroethene - VOC	2.8	96.94		
	Toluene - No or Unknown Co-disposal - HAP/VOC	39	92.13		
	Toluene - Co-disposal - HAP/VOC	170	92.13		
	Trichloroethylene (trichloroethene) - HAP/VOC	2.8	131.40		
	Vinyl chloride - HAP/VOC	7.3	62.50		
	Xylenes - HAP/VOC	12	106.16		

Graphs


Megagrams Per Year
Emissions
Year
Total landfill gas
Methane
Carbon dioxide
NMOC


Cubic Meters Per Year
Emissions
Year
Total landfill gas
Methane
Carbon dioxide
NMOC


User-specified Unit (units shown in legend below)
Emissions
Year
Total landfill gas (av ft^3/min)
Methane (av ft^3/min)
Carbon dioxide (av ft^3/min)
NMOC (av ft^3/min)

Results

Year	Total landfill gas			Methane		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
1975	0	0	0	0	0	0
1976	1.560E+03	1.249E+06	8.395E+01	4.168E+02	6.247E+05	4.197E+01
1977	3.158E+03	2.529E+06	1.699E+02	8.435E+02	1.264E+06	8.495E+01
1978	4.896E+03	3.921E+06	2.634E+02	1.308E+03	1.960E+06	1.317E+02
1979	7.071E+03	5.662E+06	3.805E+02	1.889E+03	2.831E+06	1.902E+02
1980	9.771E+03	7.824E+06	5.257E+02	2.610E+03	3.912E+06	2.629E+02
1981	1.448E+04	1.159E+07	7.788E+02	3.866E+03	5.796E+06	3.894E+02
1982	1.604E+04	1.284E+07	8.630E+02	4.285E+03	6.422E+06	4.315E+02
1983	1.748E+04	1.400E+07	9.405E+02	4.669E+03	6.998E+06	4.702E+02
1984	1.908E+04	1.528E+07	1.026E+03	5.096E+03	7.638E+06	5.132E+02
1985	2.140E+04	1.714E+07	1.152E+03	5.717E+03	8.569E+06	5.758E+02
1986	2.395E+04	1.917E+07	1.288E+03	6.396E+03	9.587E+06	6.442E+02
1987	2.640E+04	2.114E+07	1.421E+03	7.053E+03	1.057E+07	7.103E+02
1988	2.883E+04	2.308E+07	1.551E+03	7.700E+03	1.154E+07	7.754E+02
1989	3.115E+04	2.495E+07	1.676E+03	8.321E+03	1.247E+07	8.380E+02
1990	3.365E+04	2.695E+07	1.811E+03	8.989E+03	1.347E+07	9.053E+02
1991	3.642E+04	2.916E+07	1.959E+03	9.727E+03	1.458E+07	9.796E+02
1992	3.939E+04	3.154E+07	2.119E+03	1.052E+04	1.577E+07	1.060E+03
1993	4.302E+04	3.444E+07	2.314E+03	1.149E+04	1.722E+07	1.157E+03
1994	4.695E+04	3.760E+07	2.526E+03	1.254E+04	1.880E+07	1.263E+03
1995	5.328E+04	4.266E+07	2.866E+03	1.423E+04	2.133E+07	1.433E+03
1996	6.063E+04	4.855E+07	3.262E+03	1.619E+04	2.427E+07	1.631E+03
1997	6.809E+04	5.452E+07	3.663E+03	1.819E+04	2.726E+07	1.832E+03
1998	7.425E+04	5.946E+07	3.995E+03	1.983E+04	2.973E+07	1.998E+03
1999	8.161E+04	6.535E+07	4.391E+03	2.180E+04	3.267E+07	2.195E+03
2000	9.142E+04	7.321E+07	4.919E+03	2.442E+04	3.660E+07	2.459E+03
2001	1.020E+05	8.166E+07	5.486E+03	2.724E+04	4.083E+07	2.743E+03
2002	1.121E+05	8.973E+07	6.029E+03	2.993E+04	4.487E+07	3.015E+03
2003	1.233E+05	9.877E+07	6.636E+03	3.295E+04	4.938E+07	3.318E+03
2004	1.315E+05	1.053E+08	7.078E+03	3.514E+04	5.267E+07	3.539E+03
2005	1.407E+05	1.126E+08	7.568E+03	3.757E+04	5.632E+07	3.784E+03
2006	1.495E+05	1.197E+08	8.041E+03	3.992E+04	5.984E+07	4.021E+03
2007	1.535E+05	1.229E+08	8.259E+03	4.100E+04	6.146E+07	4.129E+03
2008	1.475E+05	1.181E+08	7.935E+03	3.939E+04	5.905E+07	3.967E+03
2009	1.417E+05	1.135E+08	7.624E+03	3.785E+04	5.673E+07	3.812E+03
2010	1.361E+05	1.090E+08	7.325E+03	3.637E+04	5.451E+07	3.662E+03
2011	1.308E+05	1.047E+08	7.038E+03	3.494E+04	5.237E+07	3.519E+03
2012	1.257E+05	1.006E+08	6.762E+03	3.357E+04	5.032E+07	3.381E+03
2013	1.207E+05	9.669E+07	6.497E+03	3.225E+04	4.834E+07	3.248E+03
2014	1.160E+05	9.290E+07	6.242E+03	3.099E+04	4.645E+07	3.121E+03
2015	1.115E+05	8.925E+07	5.997E+03	2.977E+04	4.463E+07	2.999E+03
2016	1.071E+05	8.576E+07	5.762E+03	2.861E+04	4.288E+07	2.881E+03
2017	1.029E+05	8.239E+07	5.536E+03	2.748E+04	4.120E+07	2.768E+03
2018	9.886E+04	7.916E+07	5.319E+03	2.641E+04	3.958E+07	2.659E+03
2019	9.498E+04	7.606E+07	5.110E+03	2.537E+04	3.803E+07	2.555E+03
2020	9.126E+04	7.308E+07	4.910E+03	2.438E+04	3.654E+07	2.455E+03
2021	8.768E+04	7.021E+07	4.717E+03	2.342E+04	3.511E+07	2.359E+03
2022	8.424E+04	6.746E+07	4.532E+03	2.250E+04	3.373E+07	2.266E+03
2023	8.094E+04	6.481E+07	4.355E+03	2.162E+04	3.241E+07	2.177E+03
2024	7.777E+04	6.227E+07	4.184E+03	2.077E+04	3.114E+07	2.092E+03

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2025	7.472E+04	5.983E+07	4.020E+03	1.996E+04	2.991E+07	2.010E+03
2026	7.179E+04	5.748E+07	3.862E+03	1.917E+04	2.874E+07	1.931E+03
2027	6.897E+04	5.523E+07	3.711E+03	1.842E+04	2.761E+07	1.855E+03
2028	6.627E+04	5.306E+07	3.565E+03	1.770E+04	2.653E+07	1.783E+03
2029	6.367E+04	5.098E+07	3.426E+03	1.701E+04	2.549E+07	1.713E+03
2030	6.117E+04	4.898E+07	3.291E+03	1.634E+04	2.449E+07	1.646E+03
2031	5.877E+04	4.706E+07	3.162E+03	1.570E+04	2.353E+07	1.581E+03
2032	5.647E+04	4.522E+07	3.038E+03	1.508E+04	2.261E+07	1.519E+03
2033	5.426E+04	4.345E+07	2.919E+03	1.449E+04	2.172E+07	1.460E+03
2034	5.213E+04	4.174E+07	2.805E+03	1.392E+04	2.087E+07	1.402E+03
2035	5.008E+04	4.010E+07	2.695E+03	1.338E+04	2.005E+07	1.347E+03
2036	4.812E+04	3.853E+07	2.589E+03	1.285E+04	1.927E+07	1.294E+03
2037	4.623E+04	3.702E+07	2.487E+03	1.235E+04	1.851E+07	1.244E+03
2038	4.442E+04	3.557E+07	2.390E+03	1.187E+04	1.778E+07	1.195E+03
2039	4.268E+04	3.418E+07	2.296E+03	1.140E+04	1.709E+07	1.148E+03
2040	4.101E+04	3.284E+07	2.206E+03	1.095E+04	1.642E+07	1.103E+03
2041	3.940E+04	3.155E+07	2.120E+03	1.052E+04	1.577E+07	1.060E+03
2042	3.785E+04	3.031E+07	2.037E+03	1.011E+04	1.516E+07	1.018E+03
2043	3.637E+04	2.912E+07	1.957E+03	9.714E+03	1.456E+07	9.784E+02
2044	3.494E+04	2.798E+07	1.880E+03	9.333E+03	1.399E+07	9.400E+02
2045	3.357E+04	2.688E+07	1.806E+03	8.968E+03	1.344E+07	9.031E+02
2046	3.226E+04	2.583E+07	1.735E+03	8.616E+03	1.291E+07	8.677E+02
2047	3.099E+04	2.482E+07	1.667E+03	8.278E+03	1.241E+07	8.337E+02
2048	2.978E+04	2.384E+07	1.602E+03	7.953E+03	1.192E+07	8.010E+02
2049	2.861E+04	2.291E+07	1.539E+03	7.642E+03	1.145E+07	7.696E+02
2050	2.749E+04	2.201E+07	1.479E+03	7.342E+03	1.101E+07	7.394E+02
2051	2.641E+04	2.115E+07	1.421E+03	7.054E+03	1.057E+07	7.104E+02
2052	2.537E+04	2.032E+07	1.365E+03	6.777E+03	1.016E+07	6.826E+02
2053	2.438E+04	1.952E+07	1.312E+03	6.512E+03	9.761E+06	6.558E+02
2054	2.342E+04	1.876E+07	1.260E+03	6.256E+03	9.378E+06	6.301E+02
2055	2.250E+04	1.802E+07	1.211E+03	6.011E+03	9.010E+06	6.054E+02
2056	2.162E+04	1.731E+07	1.163E+03	5.775E+03	8.657E+06	5.817E+02
2057	2.077E+04	1.663E+07	1.118E+03	5.549E+03	8.317E+06	5.588E+02
2058	1.996E+04	1.598E+07	1.074E+03	5.331E+03	7.991E+06	5.369E+02
2059	1.918E+04	1.536E+07	1.032E+03	5.122E+03	7.678E+06	5.159E+02
2060	1.842E+04	1.475E+07	9.913E+02	4.921E+03	7.377E+06	4.957E+02
2061	1.770E+04	1.418E+07	9.524E+02	4.728E+03	7.088E+06	4.762E+02
2062	1.701E+04	1.362E+07	9.151E+02	4.543E+03	6.810E+06	4.575E+02
2063	1.634E+04	1.309E+07	8.792E+02	4.365E+03	6.543E+06	4.396E+02
2064	1.570E+04	1.257E+07	8.447E+02	4.194E+03	6.286E+06	4.224E+02
2065	1.508E+04	1.208E+07	8.116E+02	4.029E+03	6.040E+06	4.058E+02
2066	1.449E+04	1.161E+07	7.798E+02	3.871E+03	5.803E+06	3.899E+02
2067	1.393E+04	1.115E+07	7.492E+02	3.720E+03	5.575E+06	3.746E+02
2068	1.338E+04	1.071E+07	7.198E+02	3.574E+03	5.357E+06	3.599E+02
2069	1.285E+04	1.029E+07	6.916E+02	3.434E+03	5.147E+06	3.458E+02
2070	1.235E+04	9.890E+06	6.645E+02	3.299E+03	4.945E+06	3.322E+02
2071	1.187E+04	9.502E+06	6.384E+02	3.170E+03	4.751E+06	3.192E+02
2072	1.140E+04	9.129E+06	6.134E+02	3.045E+03	4.565E+06	3.067E+02
2073	1.095E+04	8.771E+06	5.893E+02	2.926E+03	4.386E+06	2.947E+02
2074	1.052E+04	8.427E+06	5.662E+02	2.811E+03	4.214E+06	2.831E+02
2075	1.011E+04	8.097E+06	5.440E+02	2.701E+03	4.049E+06	2.720E+02

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2076	9.715E+03	7.780E+06	5.227E+02	2.595E+03	3.890E+06	2.614E+02
2077	9.334E+03	7.474E+06	5.022E+02	2.493E+03	3.737E+06	2.511E+02
2078	8.968E+03	7.181E+06	4.825E+02	2.396E+03	3.591E+06	2.413E+02
2079	8.617E+03	6.900E+06	4.636E+02	2.302E+03	3.450E+06	2.318E+02
2080	8.279E+03	6.629E+06	4.454E+02	2.211E+03	3.315E+06	2.227E+02
2081	7.954E+03	6.369E+06	4.280E+02	2.125E+03	3.185E+06	2.140E+02
2082	7.642E+03	6.120E+06	4.112E+02	2.041E+03	3.060E+06	2.056E+02
2083	7.343E+03	5.880E+06	3.951E+02	1.961E+03	2.940E+06	1.975E+02
2084	7.055E+03	5.649E+06	3.796E+02	1.884E+03	2.825E+06	1.898E+02
2085	6.778E+03	5.428E+06	3.647E+02	1.811E+03	2.714E+06	1.823E+02
2086	6.512E+03	5.215E+06	3.504E+02	1.740E+03	2.607E+06	1.752E+02
2087	6.257E+03	5.010E+06	3.366E+02	1.671E+03	2.505E+06	1.683E+02
2088	6.012E+03	4.814E+06	3.234E+02	1.606E+03	2.407E+06	1.617E+02
2089	5.776E+03	4.625E+06	3.108E+02	1.543E+03	2.313E+06	1.554E+02
2090	5.549E+03	4.444E+06	2.986E+02	1.482E+03	2.222E+06	1.493E+02
2091	5.332E+03	4.270E+06	2.869E+02	1.424E+03	2.135E+06	1.434E+02
2092	5.123E+03	4.102E+06	2.756E+02	1.368E+03	2.051E+06	1.378E+02
2093	4.922E+03	3.941E+06	2.648E+02	1.315E+03	1.971E+06	1.324E+02
2094	4.729E+03	3.787E+06	2.544E+02	1.263E+03	1.893E+06	1.272E+02
2095	4.544E+03	3.638E+06	2.445E+02	1.214E+03	1.819E+06	1.222E+02
2096	4.365E+03	3.496E+06	2.349E+02	1.166E+03	1.748E+06	1.174E+02
2097	4.194E+03	3.359E+06	2.257E+02	1.120E+03	1.679E+06	1.128E+02
2098	4.030E+03	3.227E+06	2.168E+02	1.076E+03	1.613E+06	1.084E+02
2099	3.872E+03	3.100E+06	2.083E+02	1.034E+03	1.550E+06	1.042E+02
2100	3.720E+03	2.979E+06	2.001E+02	9.936E+02	1.489E+06	1.001E+02
2101	3.574E+03	2.862E+06	1.923E+02	9.547E+02	1.431E+06	9.615E+01
2102	3.434E+03	2.750E+06	1.848E+02	9.172E+02	1.375E+06	9.238E+01
2103	3.299E+03	2.642E+06	1.775E+02	8.813E+02	1.321E+06	8.875E+01
2104	3.170E+03	2.538E+06	1.705E+02	8.467E+02	1.269E+06	8.527E+01
2105	3.046E+03	2.439E+06	1.639E+02	8.135E+02	1.219E+06	8.193E+01
2106	2.926E+03	2.343E+06	1.574E+02	7.816E+02	1.172E+06	7.872E+01
2107	2.811E+03	2.251E+06	1.513E+02	7.510E+02	1.126E+06	7.563E+01
2108	2.701E+03	2.163E+06	1.453E+02	7.215E+02	1.082E+06	7.267E+01
2109	2.595E+03	2.078E+06	1.396E+02	6.932E+02	1.039E+06	6.982E+01
2110	2.494E+03	1.997E+06	1.342E+02	6.660E+02	9.984E+05	6.708E+01
2111	2.396E+03	1.918E+06	1.289E+02	6.399E+02	9.592E+05	6.445E+01
2112	2.302E+03	1.843E+06	1.238E+02	6.148E+02	9.216E+05	6.192E+01
2113	2.212E+03	1.771E+06	1.190E+02	5.907E+02	8.855E+05	5.949E+01
2114	2.125E+03	1.701E+06	1.143E+02	5.676E+02	8.507E+05	5.716E+01
2115	2.042E+03	1.635E+06	1.098E+02	5.453E+02	8.174E+05	5.492E+01

Results (Continued)

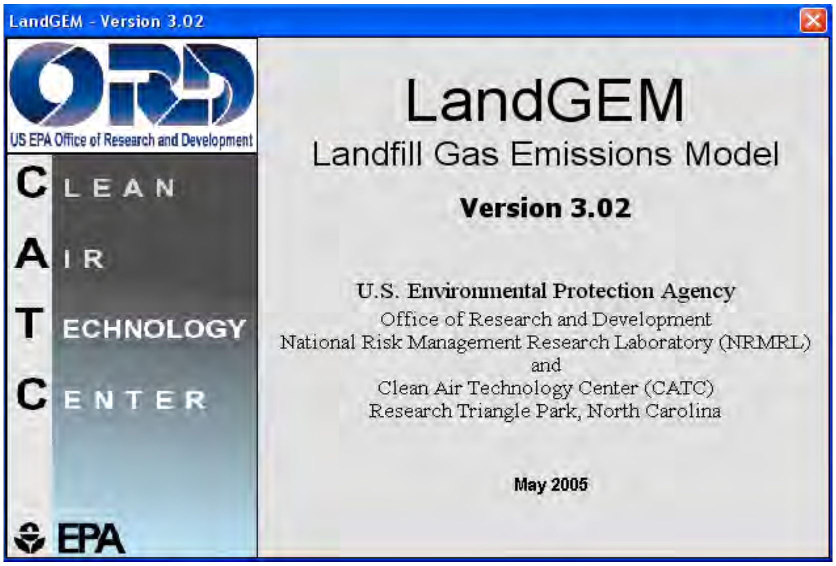
Year	Carbon dioxide			NMOC		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
1975	0	0	0	0	0	0
1976	1.144E+03	6.247E+05	4.197E+01	1.070E+00	2.985E+02	2.006E-02
1977	2.314E+03	1.264E+06	8.495E+01	2.165E+00	6.041E+02	4.059E-02
1978	3.589E+03	1.960E+06	1.317E+02	3.358E+00	9.367E+02	6.294E-02
1979	5.183E+03	2.831E+06	1.902E+02	4.849E+00	1.353E+03	9.089E-02
1980	7.161E+03	3.912E+06	2.629E+02	6.700E+00	1.869E+03	1.256E-01
1981	1.061E+04	5.796E+06	3.894E+02	9.926E+00	2.769E+03	1.861E-01
1982	1.176E+04	6.422E+06	4.315E+02	1.100E+01	3.068E+03	2.062E-01
1983	1.281E+04	6.998E+06	4.702E+02	1.199E+01	3.344E+03	2.247E-01
1984	1.398E+04	7.638E+06	5.132E+02	1.308E+01	3.650E+03	2.452E-01
1985	1.569E+04	8.569E+06	5.758E+02	1.468E+01	4.094E+03	2.751E-01
1986	1.755E+04	9.587E+06	6.442E+02	1.642E+01	4.581E+03	3.078E-01
1987	1.935E+04	1.057E+07	7.103E+02	1.810E+01	5.051E+03	3.394E-01
1988	2.113E+04	1.154E+07	7.754E+02	1.977E+01	5.514E+03	3.705E-01
1989	2.283E+04	1.247E+07	8.380E+02	2.136E+01	5.959E+03	4.004E-01
1990	2.466E+04	1.347E+07	9.053E+02	2.308E+01	6.438E+03	4.325E-01
1991	2.669E+04	1.458E+07	9.796E+02	2.497E+01	6.966E+03	4.681E-01
1992	2.887E+04	1.577E+07	1.060E+03	2.701E+01	7.535E+03	5.062E-01
1993	3.153E+04	1.722E+07	1.157E+03	2.950E+01	8.229E+03	5.529E-01
1994	3.441E+04	1.880E+07	1.263E+03	3.219E+01	8.981E+03	6.035E-01
1995	3.904E+04	2.133E+07	1.433E+03	3.653E+01	1.019E+04	6.848E-01
1996	4.443E+04	2.427E+07	1.631E+03	4.157E+01	1.160E+04	7.793E-01
1997	4.990E+04	2.726E+07	1.832E+03	4.669E+01	1.303E+04	8.752E-01
1998	5.442E+04	2.973E+07	1.998E+03	5.092E+01	1.420E+04	9.544E-01
1999	5.981E+04	3.267E+07	2.195E+03	5.596E+01	1.561E+04	1.049E+00
2000	6.700E+04	3.660E+07	2.459E+03	6.269E+01	1.749E+04	1.175E+00
2001	7.474E+04	4.083E+07	2.743E+03	6.992E+01	1.951E+04	1.311E+00
2002	8.213E+04	4.487E+07	3.015E+03	7.684E+01	2.144E+04	1.440E+00
2003	9.040E+04	4.938E+07	3.318E+03	8.458E+01	2.360E+04	1.585E+00
2004	9.641E+04	5.267E+07	3.539E+03	9.020E+01	2.516E+04	1.691E+00
2005	1.031E+05	5.632E+07	3.784E+03	9.646E+01	2.691E+04	1.808E+00
2006	1.095E+05	5.984E+07	4.021E+03	1.025E+02	2.859E+04	1.921E+00
2007	1.125E+05	6.146E+07	4.129E+03	1.053E+02	2.936E+04	1.973E+00
2008	1.081E+05	5.905E+07	3.967E+03	1.011E+02	2.821E+04	1.896E+00
2009	1.038E+05	5.673E+07	3.812E+03	9.716E+01	2.711E+04	1.821E+00
2010	9.978E+04	5.451E+07	3.662E+03	9.335E+01	2.604E+04	1.750E+00
2011	9.586E+04	5.237E+07	3.519E+03	8.969E+01	2.502E+04	1.681E+00
2012	9.211E+04	5.032E+07	3.381E+03	8.618E+01	2.404E+04	1.615E+00
2013	8.849E+04	4.834E+07	3.248E+03	8.280E+01	2.310E+04	1.552E+00
2014	8.502E+04	4.645E+07	3.121E+03	7.955E+01	2.219E+04	1.491E+00
2015	8.169E+04	4.463E+07	2.999E+03	7.643E+01	2.132E+04	1.433E+00
2016	7.849E+04	4.288E+07	2.881E+03	7.343E+01	2.049E+04	1.377E+00
2017	7.541E+04	4.120E+07	2.768E+03	7.056E+01	1.968E+04	1.323E+00
2018	7.245E+04	3.958E+07	2.659E+03	6.779E+01	1.891E+04	1.271E+00
2019	6.961E+04	3.803E+07	2.555E+03	6.513E+01	1.817E+04	1.221E+00
2020	6.688E+04	3.654E+07	2.455E+03	6.258E+01	1.746E+04	1.173E+00
2021	6.426E+04	3.511E+07	2.359E+03	6.012E+01	1.677E+04	1.127E+00
2022	6.174E+04	3.373E+07	2.266E+03	5.777E+01	1.612E+04	1.083E+00
2023	5.932E+04	3.241E+07	2.177E+03	5.550E+01	1.548E+04	1.040E+00
2024	5.699E+04	3.114E+07	2.092E+03	5.332E+01	1.488E+04	9.996E-01

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2025	5.476E+04	2.991E+07	2.010E+03	5.123E+01	1.429E+04	9.604E-01
2026	5.261E+04	2.874E+07	1.931E+03	4.922E+01	1.373E+04	9.227E-01
2027	5.055E+04	2.761E+07	1.855E+03	4.729E+01	1.319E+04	8.865E-01
2028	4.857E+04	2.653E+07	1.783E+03	4.544E+01	1.268E+04	8.518E-01
2029	4.666E+04	2.549E+07	1.713E+03	4.366E+01	1.218E+04	8.184E-01
2030	4.483E+04	2.449E+07	1.646E+03	4.195E+01	1.170E+04	7.863E-01
2031	4.307E+04	2.353E+07	1.581E+03	4.030E+01	1.124E+04	7.554E-01
2032	4.139E+04	2.261E+07	1.519E+03	3.872E+01	1.080E+04	7.258E-01
2033	3.976E+04	2.172E+07	1.460E+03	3.720E+01	1.038E+04	6.974E-01
2034	3.820E+04	2.087E+07	1.402E+03	3.574E+01	9.972E+03	6.700E-01
2035	3.671E+04	2.005E+07	1.347E+03	3.434E+01	9.581E+03	6.437E-01
2036	3.527E+04	1.927E+07	1.294E+03	3.300E+01	9.205E+03	6.185E-01
2037	3.388E+04	1.851E+07	1.244E+03	3.170E+01	8.844E+03	5.943E-01
2038	3.256E+04	1.778E+07	1.195E+03	3.046E+01	8.498E+03	5.710E-01
2039	3.128E+04	1.709E+07	1.148E+03	2.927E+01	8.164E+03	5.486E-01
2040	3.005E+04	1.642E+07	1.103E+03	2.812E+01	7.844E+03	5.271E-01
2041	2.887E+04	1.577E+07	1.060E+03	2.702E+01	7.537E+03	5.064E-01
2042	2.774E+04	1.516E+07	1.018E+03	2.596E+01	7.241E+03	4.865E-01
2043	2.665E+04	1.456E+07	9.784E+02	2.494E+01	6.957E+03	4.675E-01
2044	2.561E+04	1.399E+07	9.400E+02	2.396E+01	6.684E+03	4.491E-01
2045	2.460E+04	1.344E+07	9.031E+02	2.302E+01	6.422E+03	4.315E-01
2046	2.364E+04	1.291E+07	8.677E+02	2.212E+01	6.171E+03	4.146E-01
2047	2.271E+04	1.241E+07	8.337E+02	2.125E+01	5.929E+03	3.983E-01
2048	2.182E+04	1.192E+07	8.010E+02	2.042E+01	5.696E+03	3.827E-01
2049	2.097E+04	1.145E+07	7.696E+02	1.962E+01	5.473E+03	3.677E-01
2050	2.014E+04	1.101E+07	7.394E+02	1.885E+01	5.258E+03	3.533E-01
2051	1.935E+04	1.057E+07	7.104E+02	1.811E+01	5.052E+03	3.394E-01
2052	1.860E+04	1.016E+07	6.826E+02	1.740E+01	4.854E+03	3.261E-01
2053	1.787E+04	9.761E+06	6.558E+02	1.672E+01	4.664E+03	3.133E-01
2054	1.717E+04	9.378E+06	6.301E+02	1.606E+01	4.481E+03	3.011E-01
2055	1.649E+04	9.010E+06	6.054E+02	1.543E+01	4.305E+03	2.893E-01
2056	1.585E+04	8.657E+06	5.817E+02	1.483E+01	4.136E+03	2.779E-01
2057	1.522E+04	8.317E+06	5.588E+02	1.424E+01	3.974E+03	2.670E-01
2058	1.463E+04	7.991E+06	5.369E+02	1.369E+01	3.818E+03	2.565E-01
2059	1.405E+04	7.678E+06	5.159E+02	1.315E+01	3.669E+03	2.465E-01
2060	1.350E+04	7.377E+06	4.957E+02	1.263E+01	3.525E+03	2.368E-01
2061	1.297E+04	7.088E+06	4.762E+02	1.214E+01	3.386E+03	2.275E-01
2062	1.247E+04	6.810E+06	4.575E+02	1.166E+01	3.254E+03	2.186E-01
2063	1.198E+04	6.543E+06	4.396E+02	1.121E+01	3.126E+03	2.100E-01
2064	1.151E+04	6.286E+06	4.224E+02	1.077E+01	3.004E+03	2.018E-01
2065	1.106E+04	6.040E+06	4.058E+02	1.034E+01	2.886E+03	1.939E-01
2066	1.062E+04	5.803E+06	3.899E+02	9.938E+00	2.773E+03	1.863E-01
2067	1.021E+04	5.575E+06	3.746E+02	9.549E+00	2.664E+03	1.790E-01
2068	9.805E+03	5.357E+06	3.599E+02	9.174E+00	2.559E+03	1.720E-01
2069	9.421E+03	5.147E+06	3.458E+02	8.814E+00	2.459E+03	1.652E-01
2070	9.052E+03	4.945E+06	3.322E+02	8.469E+00	2.363E+03	1.587E-01
2071	8.697E+03	4.751E+06	3.192E+02	8.137E+00	2.270E+03	1.525E-01
2072	8.356E+03	4.565E+06	3.067E+02	7.818E+00	2.181E+03	1.465E-01
2073	8.028E+03	4.386E+06	2.947E+02	7.511E+00	2.095E+03	1.408E-01
2074	7.713E+03	4.214E+06	2.831E+02	7.217E+00	2.013E+03	1.353E-01
2075	7.411E+03	4.049E+06	2.720E+02	6.934E+00	1.934E+03	1.300E-01

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2076	7.120E+03	3.890E+06	2.614E+02	6.662E+00	1.859E+03	1.249E-01
2077	6.841E+03	3.737E+06	2.511E+02	6.401E+00	1.786E+03	1.200E-01
2078	6.573E+03	3.591E+06	2.413E+02	6.150E+00	1.716E+03	1.153E-01
2079	6.315E+03	3.450E+06	2.318E+02	5.909E+00	1.648E+03	1.108E-01
2080	6.067E+03	3.315E+06	2.227E+02	5.677E+00	1.584E+03	1.064E-01
2081	5.830E+03	3.185E+06	2.140E+02	5.454E+00	1.522E+03	1.022E-01
2082	5.601E+03	3.060E+06	2.056E+02	5.240E+00	1.462E+03	9.823E-02
2083	5.381E+03	2.940E+06	1.975E+02	5.035E+00	1.405E+03	9.438E-02
2084	5.170E+03	2.825E+06	1.898E+02	4.837E+00	1.350E+03	9.068E-02
2085	4.968E+03	2.714E+06	1.823E+02	4.648E+00	1.297E+03	8.712E-02
2086	4.773E+03	2.607E+06	1.752E+02	4.466E+00	1.246E+03	8.371E-02
2087	4.586E+03	2.505E+06	1.683E+02	4.290E+00	1.197E+03	8.042E-02
2088	4.406E+03	2.407E+06	1.617E+02	4.122E+00	1.150E+03	7.727E-02
2089	4.233E+03	2.313E+06	1.554E+02	3.961E+00	1.105E+03	7.424E-02
2090	4.067E+03	2.222E+06	1.493E+02	3.805E+00	1.062E+03	7.133E-02
2091	3.908E+03	2.135E+06	1.434E+02	3.656E+00	1.020E+03	6.853E-02
2092	3.754E+03	2.051E+06	1.378E+02	3.513E+00	9.800E+02	6.585E-02
2093	3.607E+03	1.971E+06	1.324E+02	3.375E+00	9.416E+02	6.326E-02
2094	3.466E+03	1.893E+06	1.272E+02	3.243E+00	9.046E+02	6.078E-02
2095	3.330E+03	1.819E+06	1.222E+02	3.116E+00	8.692E+02	5.840E-02
2096	3.199E+03	1.748E+06	1.174E+02	2.993E+00	8.351E+02	5.611E-02
2097	3.074E+03	1.679E+06	1.128E+02	2.876E+00	8.023E+02	5.391E-02
2098	2.953E+03	1.613E+06	1.084E+02	2.763E+00	7.709E+02	5.180E-02
2099	2.838E+03	1.550E+06	1.042E+02	2.655E+00	7.407E+02	4.976E-02
2100	2.726E+03	1.489E+06	1.001E+02	2.551E+00	7.116E+02	4.781E-02
2101	2.619E+03	1.431E+06	9.615E+01	2.451E+00	6.837E+02	4.594E-02
2102	2.517E+03	1.375E+06	9.238E+01	2.355E+00	6.569E+02	4.414E-02
2103	2.418E+03	1.321E+06	8.875E+01	2.262E+00	6.311E+02	4.241E-02
2104	2.323E+03	1.269E+06	8.527E+01	2.174E+00	6.064E+02	4.074E-02
2105	2.232E+03	1.219E+06	8.193E+01	2.088E+00	5.826E+02	3.915E-02
2106	2.145E+03	1.172E+06	7.872E+01	2.007E+00	5.598E+02	3.761E-02
2107	2.060E+03	1.126E+06	7.563E+01	1.928E+00	5.378E+02	3.614E-02
2108	1.980E+03	1.082E+06	7.267E+01	1.852E+00	5.167E+02	3.472E-02
2109	1.902E+03	1.039E+06	6.982E+01	1.780E+00	4.965E+02	3.336E-02
2110	1.827E+03	9.984E+05	6.708E+01	1.710E+00	4.770E+02	3.205E-02
2111	1.756E+03	9.592E+05	6.445E+01	1.643E+00	4.583E+02	3.079E-02
2112	1.687E+03	9.216E+05	6.192E+01	1.578E+00	4.403E+02	2.959E-02
2113	1.621E+03	8.855E+05	5.949E+01	1.516E+00	4.231E+02	2.843E-02
2114	1.557E+03	8.507E+05	5.716E+01	1.457E+00	4.065E+02	2.731E-02
2115	1.496E+03	8.174E+05	5.492E+01	1.400E+00	3.905E+02	2.624E-02



Summary Report

Landfill Name or Identifier: Woodland Meadows Landfill 2007 - 2027

Date: Friday, December 16, 2022

Description/Comments:

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} k L_o \left(\frac{M_i}{10} \right) e^{-k t_{ij}}$$

Where,
Q_{CH4} = annual methane generation in the year of the calculation (*m^3/year*)
i = 1-year time increment
n = (year of the calculation) - (initial year of waste acceptance)
j = 0.1-year time increment
k = methane generation rate (*$year^{-1}$*)
L_o = potential methane generation capacity (*m^3/Mg*)

M_i = mass of waste accepted in the i^{th} year (*Mg*)
t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**2007**	
Landfill Closure Year (with 80-year limit)	**2027**	
Actual Closure Year (without limit)	***2027***	
Have Model Calculate Closure Year?	**Yes**	
Waste Design Capacity	**20,322,048**	*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.040**	*$year^{-1}$*
Potential Methane Generation Capacity, L_o	**100**	*m^3/Mg*
NMOC Concentration	**239**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**Total landfill gas**
Gas / Pollutant #2:	**Methane**
Gas / Pollutant #3:	**Carbon dioxide**
Gas / Pollutant #4:	**NMOC**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2007	1,012,834	1,114,117	0	0
2008	723,355	795,691	1,012,834	1,114,117
2009	716,270	787,897	1,736,189	1,909,808
2010	745,405	819,945	2,452,459	2,697,705
2011	650,378	715,416	3,197,864	3,517,650
2012	671,937	739,131	3,848,242	4,233,066
2013	644,194	708,613	4,520,179	4,972,197
2014	631,347	694,482	5,164,373	5,680,810
2015	616,802	678,482	5,795,720	6,375,292
2016	643,304	707,634	6,412,522	7,053,774
2017	737,833	811,616	7,055,825	7,761,408
2018	706,885	777,574	7,793,658	8,573,024
2019	898,655	988,521	8,500,544	9,350,598
2020	944,368	1,038,805	9,399,199	10,339,119
2021	1,161,575	1,277,732	10,343,567	11,377,924
2022	1,161,575	1,277,732	11,505,142	12,655,656
2023	1,161,575	1,277,732	12,666,716	13,933,388
2024	1,161,575	1,277,732	13,828,291	15,211,120
2025	1,161,575	1,277,732	14,989,865	16,488,852
2026	1,161,575	1,277,732	16,151,440	17,766,584
2027	1,161,575	1,277,732	17,313,015	19,044,316
2028	0	0	18,474,589	20,322,048
2029	0	0	18,474,589	20,322,048
2030	0	0	18,474,589	20,322,048
2031	0	0	18,474,589	20,322,048
2032	0	0	18,474,589	20,322,048
2033	0	0	18,474,589	20,322,048
2034	0	0	18,474,589	20,322,048
2035	0	0	18,474,589	20,322,048
2036	0	0	18,474,589	20,322,048
2037	0	0	18,474,589	20,322,048
2038	0	0	18,474,589	20,322,048
2039	0	0	18,474,589	20,322,048
2040	0	0	18,474,589	20,322,048
2041	0	0	18,474,589	20,322,048
2042	0	0	18,474,589	20,322,048
2043	0	0	18,474,589	20,322,048
2044	0	0	18,474,589	20,322,048
2045	0	0	18,474,589	20,322,048
2046	0	0	18,474,589	20,322,048

WASTE ACCEPTANCE RATES (Continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2047	0	0	18,474,589	20,322,048
2048	0	0	18,474,589	20,322,048
2049	0	0	18,474,589	20,322,048
2050	0	0	18,474,589	20,322,048
2051	0	0	18,474,589	20,322,048
2052	0	0	18,474,589	20,322,048
2053	0	0	18,474,589	20,322,048
2054	0	0	18,474,589	20,322,048
2055	0	0	18,474,589	20,322,048
2056	0	0	18,474,589	20,322,048
2057	0	0	18,474,589	20,322,048
2058	0	0	18,474,589	20,322,048
2059	0	0	18,474,589	20,322,048
2060	0	0	18,474,589	20,322,048
2061	0	0	18,474,589	20,322,048
2062	0	0	18,474,589	20,322,048
2063	0	0	18,474,589	20,322,048
2064	0	0	18,474,589	20,322,048
2065	0	0	18,474,589	20,322,048
2066	0	0	18,474,589	20,322,048
2067	0	0	18,474,589	20,322,048
2068	0	0	18,474,589	20,322,048
2069	0	0	18,474,589	20,322,048
2070	0	0	18,474,589	20,322,048
2071	0	0	18,474,589	20,322,048
2072	0	0	18,474,589	20,322,048
2073	0	0	18,474,589	20,322,048
2074	0	0	18,474,589	20,322,048
2075	0	0	18,474,589	20,322,048
2076	0	0	18,474,589	20,322,048
2077	0	0	18,474,589	20,322,048
2078	0	0	18,474,589	20,322,048
2079	0	0	18,474,589	20,322,048
2080	0	0	18,474,589	20,322,048
2081	0	0	18,474,589	20,322,048
2082	0	0	18,474,589	20,322,048
2083	0	0	18,474,589	20,322,048
2084	0	0	18,474,589	20,322,048
2085	0	0	18,474,589	20,322,048
2086	0	0	18,474,589	20,322,048

Pollutant Parameters

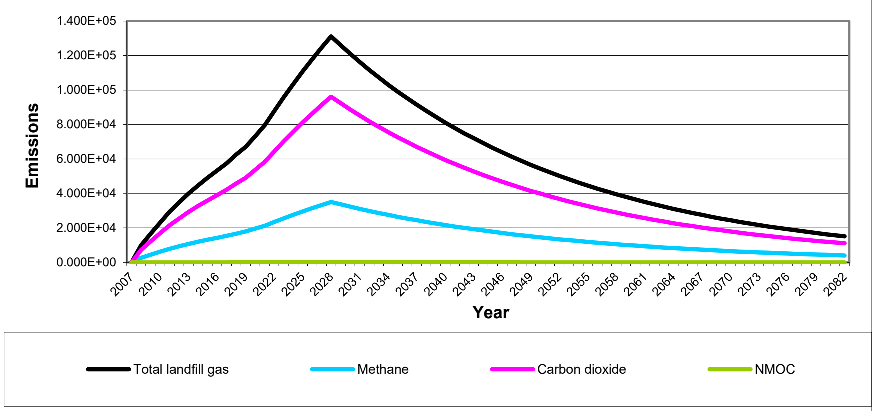
		Gas / Pollutant Default Parameters:		User-specified Pollutant Parameters:	
	Compound	Concentration (*ppmv*)	Molecular Weight	Concentration (*ppmv*)	Molecular Weight
Gases	Total landfill gas		0.00		
	Methane		16.04		
	Carbon dioxide		44.01		
	NMOC	4,000	86.18		
Pollutants	1,1,1-Trichloroethane (methyl chloroform) - HAP	0.48	133.41		
	1,1,2,2-Tetrachloroethane - HAP/VOC	1.1	167.85		
	1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	2.4	98.97		
	1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.20	96.94		
	1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.41	98.96		
	1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.18	112.99		
	2-Propanol (isopropyl alcohol) - VOC	50	60.11		
	Acetone	7.0	58.08		
	Acrylonitrile - HAP/VOC	6.3	53.06		
	Benzene - No or Unknown Co-disposal - HAP/VOC	1.9	78.11		
	Benzene - Co-disposal - HAP/VOC	11	78.11		
	Bromodichloromethane - VOC	3.1	163.83		
	Butane - VOC	5.0	58.12		
	Carbon disulfide - HAP/VOC	0.58	76.13		
	Carbon monoxide	140	28.01		
	Carbon tetrachloride - HAP/VOC	4.0E-03	153.84		
	Carbonyl sulfide - HAP/VOC	0.49	60.07		
	Chlorobenzene - HAP/VOC	0.25	112.56		
	Chlorodifluoromethane	1.3	86.47		
	Chloroethane (ethyl chloride) - HAP/VOC	1.3	64.52		
	Chloroform - HAP/VOC	0.03	119.39		
	Chloromethane - VOC	1.2	50.49		
	Dichlorobenzene - (HAP for para isomer/VOC)	0.21	147		
	Dichlorodifluoromethane	16	120.91		
	Dichlorofluoromethane - VOC	2.6	102.92		
	Dichloromethane (methylene chloride) - HAP	14	84.94		
	Dimethyl sulfide (methyl sulfide) - VOC	7.8	62.13		
	Ethane	890	30.07		
	Ethanol - VOC	27	46.08		

Pollutant Parameters (Continued)

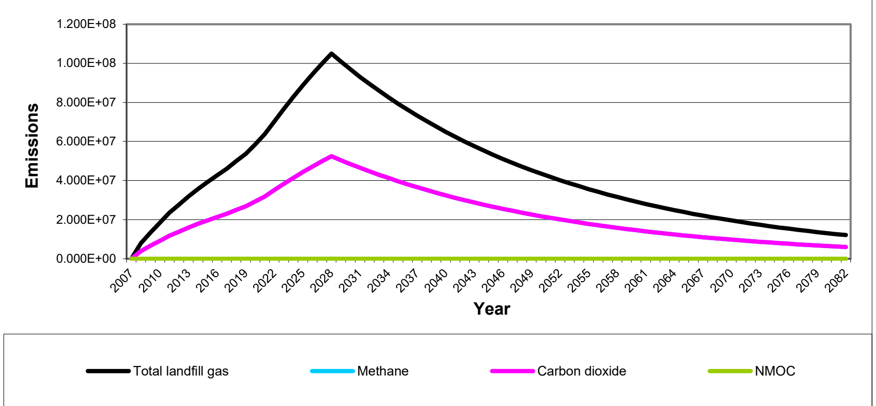
	Gas / Pollutant Default Parameters:			User-specified Pollutant Parameters:	
	Compound	Concentration (*ppmv*)	Molecular Weight	Concentration (*ppmv*)	Molecular Weight
Pollutants	Ethyl mercaptan (ethanethiol) - VOC	2.3	62.13		
	Ethylbenzene - HAP/VOC	4.6	106.16		
	Ethylene dibromide - HAP/VOC	1.0E-03	187.88		
	Fluorotrichloromethane - VOC	0.76	137.38		
	Hexane - HAP/VOC	6.6	86.18		
	Hydrogen sulfide	36	34.08		
	Mercury (total) - HAP	2.9E-04	200.61		
	Methyl ethyl ketone - HAP/VOC	7.1	72.11		
	Methyl isobutyl ketone - HAP/VOC	1.9	100.16		
	Methyl mercaptan - VOC	2.5	48.11		
	Pentane - VOC	3.3	72.15		
	Perchloroethylene (tetrachloroethylene) - HAP	3.7	165.83		
	Propane - VOC	11	44.09		
	t-1,2-Dichloroethene - VOC	2.8	96.94		
	Toluene - No or Unknown Co-disposal - HAP/VOC	39	92.13		
	Toluene - Co-disposal - HAP/VOC	170	92.13		
	Trichloroethylene (trichloroethene) - HAP/VOC	2.8	131.40		
	Vinyl chloride - HAP/VOC	7.3	62.50		
	Xylenes - HAP/VOC	12	106.16		

Graphs

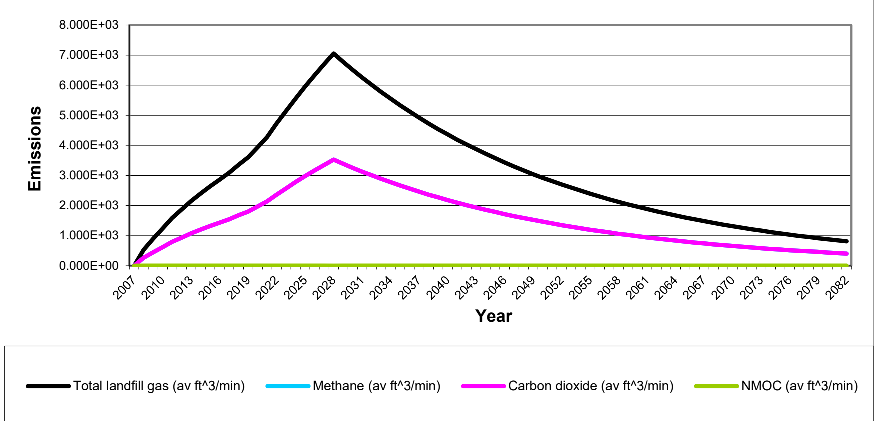
Megagrams Per Year



Cubic Meters Per Year



User-specified Unit (units shown in legend below)



Results

Year	Total landfill gas			Methane		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2007	0	0	0	0	0	0
2008	9.939E+03	7.959E+06	5.347E+02	2.655E+03	3.979E+06	2.674E+02
2009	1.665E+04	1.333E+07	8.957E+02	4.447E+03	6.665E+06	4.478E+02
2010	2.302E+04	1.844E+07	1.239E+03	6.150E+03	9.218E+06	6.194E+02
2011	2.944E+04	2.357E+07	1.584E+03	7.863E+03	1.179E+07	7.919E+02
2012	3.466E+04	2.776E+07	1.865E+03	9.259E+03	1.388E+07	9.325E+02
2013	3.990E+04	3.195E+07	2.147E+03	1.066E+04	1.597E+07	1.073E+03
2014	4.466E+04	3.576E+07	2.403E+03	1.193E+04	1.788E+07	1.201E+03
2015	4.910E+04	3.932E+07	2.642E+03	1.312E+04	1.966E+07	1.321E+03
2016	5.323E+04	4.262E+07	2.864E+03	1.422E+04	2.131E+07	1.432E+03
2017	5.745E+04	4.601E+07	3.091E+03	1.535E+04	2.300E+07	1.546E+03
2018	6.244E+04	5.000E+07	3.359E+03	1.668E+04	2.500E+07	1.680E+03
2019	6.693E+04	5.359E+07	3.601E+03	1.788E+04	2.680E+07	1.800E+03
2020	7.312E+04	5.855E+07	3.934E+03	1.953E+04	2.928E+07	1.967E+03
2021	7.952E+04	6.368E+07	4.279E+03	2.124E+04	3.184E+07	2.139E+03
2022	8.780E+04	7.031E+07	4.724E+03	2.345E+04	3.515E+07	2.362E+03
2023	9.576E+04	7.668E+07	5.152E+03	2.558E+04	3.834E+07	2.576E+03
2024	1.034E+05	8.280E+07	5.563E+03	2.762E+04	4.140E+07	2.782E+03
2025	1.107E+05	8.868E+07	5.958E+03	2.958E+04	4.434E+07	2.979E+03
2026	1.178E+05	9.433E+07	6.338E+03	3.147E+04	4.717E+07	3.169E+03
2027	1.246E+05	9.976E+07	6.703E+03	3.328E+04	4.988E+07	3.351E+03
2028	1.311E+05	1.050E+08	7.053E+03	3.502E+04	5.249E+07	3.527E+03
2029	1.260E+05	1.009E+08	6.777E+03	3.364E+04	5.043E+07	3.388E+03
2030	1.210E+05	9.690E+07	6.511E+03	3.232E+04	4.845E+07	3.256E+03
2031	1.163E+05	9.310E+07	6.256E+03	3.106E+04	4.655E+07	3.128E+03
2032	1.117E+05	8.945E+07	6.010E+03	2.984E+04	4.473E+07	3.005E+03
2033	1.073E+05	8.595E+07	5.775E+03	2.867E+04	4.297E+07	2.887E+03
2034	1.031E+05	8.258E+07	5.548E+03	2.755E+04	4.129E+07	2.774E+03
2035	9.908E+04	7.934E+07	5.331E+03	2.647E+04	3.967E+07	2.665E+03
2036	9.520E+04	7.623E+07	5.122E+03	2.543E+04	3.811E+07	2.561E+03
2037	9.146E+04	7.324E+07	4.921E+03	2.443E+04	3.662E+07	2.460E+03
2038	8.788E+04	7.037E+07	4.728E+03	2.347E+04	3.518E+07	2.364E+03
2039	8.443E+04	6.761E+07	4.543E+03	2.255E+04	3.380E+07	2.271E+03
2040	8.112E+04	6.496E+07	4.364E+03	2.167E+04	3.248E+07	2.182E+03
2041	7.794E+04	6.241E+07	4.193E+03	2.082E+04	3.121E+07	2.097E+03
2042	7.488E+04	5.996E+07	4.029E+03	2.000E+04	2.998E+07	2.014E+03
2043	7.195E+04	5.761E+07	3.871E+03	1.922E+04	2.881E+07	1.935E+03
2044	6.913E+04	5.535E+07	3.719E+03	1.846E+04	2.768E+07	1.860E+03
2045	6.642E+04	5.318E+07	3.573E+03	1.774E+04	2.659E+07	1.787E+03
2046	6.381E+04	5.110E+07	3.433E+03	1.704E+04	2.555E+07	1.717E+03
2047	6.131E+04	4.909E+07	3.299E+03	1.638E+04	2.455E+07	1.649E+03
2048	5.891E+04	4.717E+07	3.169E+03	1.573E+04	2.358E+07	1.585E+03
2049	5.660E+04	4.532E+07	3.045E+03	1.512E+04	2.266E+07	1.522E+03
2050	5.438E+04	4.354E+07	2.926E+03	1.452E+04	2.177E+07	1.463E+03
2051	5.224E+04	4.183E+07	2.811E+03	1.395E+04	2.092E+07	1.405E+03
2052	5.020E+04	4.019E+07	2.701E+03	1.341E+04	2.010E+07	1.350E+03
2053	4.823E+04	3.862E+07	2.595E+03	1.288E+04	1.931E+07	1.297E+03
2054	4.634E+04	3.710E+07	2.493E+03	1.238E+04	1.855E+07	1.247E+03
2055	4.452E+04	3.565E+07	2.395E+03	1.189E+04	1.782E+07	1.198E+03
2056	4.277E+04	3.425E+07	2.301E+03	1.143E+04	1.713E+07	1.151E+03

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2057	4.110E+04	3.291E+07	2.211E+03	1.098E+04	1.645E+07	1.106E+03
2058	3.949E+04	3.162E+07	2.124E+03	1.055E+04	1.581E+07	1.062E+03
2059	3.794E+04	3.038E+07	2.041E+03	1.013E+04	1.519E+07	1.021E+03
2060	3.645E+04	2.919E+07	1.961E+03	9.736E+03	1.459E+07	9.805E+02
2061	3.502E+04	2.804E+07	1.884E+03	9.354E+03	1.402E+07	9.421E+02
2062	3.365E+04	2.694E+07	1.810E+03	8.988E+03	1.347E+07	9.052E+02
2063	3.233E+04	2.589E+07	1.739E+03	8.635E+03	1.294E+07	8.697E+02
2064	3.106E+04	2.487E+07	1.671E+03	8.297E+03	1.244E+07	8.356E+02
2065	2.984E+04	2.390E+07	1.606E+03	7.971E+03	1.195E+07	8.028E+02
2066	2.867E+04	2.296E+07	1.543E+03	7.659E+03	1.148E+07	7.713E+02
2067	2.755E+04	2.206E+07	1.482E+03	7.358E+03	1.103E+07	7.411E+02
2068	2.647E+04	2.119E+07	1.424E+03	7.070E+03	1.060E+07	7.120E+02
2069	2.543E+04	2.036E+07	1.368E+03	6.793E+03	1.018E+07	6.841E+02
2070	2.443E+04	1.956E+07	1.315E+03	6.526E+03	9.782E+06	6.573E+02
2071	2.347E+04	1.880E+07	1.263E+03	6.270E+03	9.399E+06	6.315E+02
2072	2.255E+04	1.806E+07	1.213E+03	6.025E+03	9.030E+06	6.067E+02
2073	2.167E+04	1.735E+07	1.166E+03	5.788E+03	8.676E+06	5.830E+02
2074	2.082E+04	1.667E+07	1.120E+03	5.561E+03	8.336E+06	5.601E+02
2075	2.000E+04	1.602E+07	1.076E+03	5.343E+03	8.009E+06	5.381E+02
2076	1.922E+04	1.539E+07	1.034E+03	5.134E+03	7.695E+06	5.170E+02
2077	1.847E+04	1.479E+07	9.935E+02	4.932E+03	7.393E+06	4.968E+02
2078	1.774E+04	1.421E+07	9.546E+02	4.739E+03	7.103E+06	4.773E+02
2079	1.705E+04	1.365E+07	9.171E+02	4.553E+03	6.825E+06	4.586E+02
2080	1.638E+04	1.311E+07	8.812E+02	4.375E+03	6.557E+06	4.406E+02
2081	1.574E+04	1.260E+07	8.466E+02	4.203E+03	6.300E+06	4.233E+02
2082	1.512E+04	1.211E+07	8.134E+02	4.038E+03	6.053E+06	4.067E+02
2083	1.453E+04	1.163E+07	7.815E+02	3.880E+03	5.816E+06	3.908E+02
2084	1.396E+04	1.118E+07	7.509E+02	3.728E+03	5.588E+06	3.754E+02
2085	1.341E+04	1.074E+07	7.214E+02	3.582E+03	5.369E+06	3.607E+02
2086	1.288E+04	1.032E+07	6.932E+02	3.441E+03	5.158E+06	3.466E+02
2087	1.238E+04	9.912E+06	6.660E+02	3.306E+03	4.956E+06	3.330E+02
2088	1.189E+04	9.523E+06	6.399E+02	3.177E+03	4.762E+06	3.199E+02
2089	1.143E+04	9.150E+06	6.148E+02	3.052E+03	4.575E+06	3.074E+02
2090	1.098E+04	8.791E+06	5.907E+02	2.932E+03	4.395E+06	2.953E+02
2091	1.055E+04	8.446E+06	5.675E+02	2.817E+03	4.223E+06	2.838E+02
2092	1.013E+04	8.115E+06	5.453E+02	2.707E+03	4.058E+06	2.726E+02
2093	9.737E+03	7.797E+06	5.239E+02	2.601E+03	3.898E+06	2.619E+02
2094	9.355E+03	7.491E+06	5.033E+02	2.499E+03	3.746E+06	2.517E+02
2095	8.988E+03	7.197E+06	4.836E+02	2.401E+03	3.599E+06	2.418E+02
2096	8.636E+03	6.915E+06	4.646E+02	2.307E+03	3.458E+06	2.323E+02
2097	8.297E+03	6.644E+06	4.464E+02	2.216E+03	3.322E+06	2.232E+02
2098	7.972E+03	6.384E+06	4.289E+02	2.129E+03	3.192E+06	2.145E+02
2099	7.659E+03	6.133E+06	4.121E+02	2.046E+03	3.067E+06	2.060E+02
2100	7.359E+03	5.893E+06	3.959E+02	1.966E+03	2.946E+06	1.980E+02
2101	7.070E+03	5.662E+06	3.804E+02	1.889E+03	2.831E+06	1.902E+02
2102	6.793E+03	5.440E+06	3.655E+02	1.815E+03	2.720E+06	1.827E+02
2103	6.527E+03	5.226E+06	3.512E+02	1.743E+03	2.613E+06	1.756E+02
2104	6.271E+03	5.021E+06	3.374E+02	1.675E+03	2.511E+06	1.687E+02
2105	6.025E+03	4.825E+06	3.242E+02	1.609E+03	2.412E+06	1.621E+02
2106	5.789E+03	4.635E+06	3.115E+02	1.546E+03	2.318E+06	1.557E+02
2107	5.562E+03	4.454E+06	2.992E+02	1.486E+03	2.227E+06	1.496E+02

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2108	5.344E+03	4.279E+06	2.875E+02	1.427E+03	2.140E+06	1.438E+02
2109	5.134E+03	4.111E+06	2.762E+02	1.371E+03	2.056E+06	1.381E+02
2110	4.933E+03	3.950E+06	2.654E+02	1.318E+03	1.975E+06	1.327E+02
2111	4.739E+03	3.795E+06	2.550E+02	1.266E+03	1.898E+06	1.275E+02
2112	4.554E+03	3.646E+06	2.450E+02	1.216E+03	1.823E+06	1.225E+02
2113	4.375E+03	3.503E+06	2.354E+02	1.169E+03	1.752E+06	1.177E+02
2114	4.204E+03	3.366E+06	2.262E+02	1.123E+03	1.683E+06	1.131E+02
2115	4.039E+03	3.234E+06	2.173E+02	1.079E+03	1.617E+06	1.086E+02
2116	3.880E+03	3.107E+06	2.088E+02	1.036E+03	1.554E+06	1.044E+02
2117	3.728E+03	2.985E+06	2.006E+02	9.958E+02	1.493E+06	1.003E+02
2118	3.582E+03	2.868E+06	1.927E+02	9.568E+02	1.434E+06	9.636E+01
2119	3.442E+03	2.756E+06	1.852E+02	9.193E+02	1.378E+06	9.258E+01
2120	3.307E+03	2.648E+06	1.779E+02	8.832E+02	1.324E+06	8.895E+01
2121	3.177E+03	2.544E+06	1.709E+02	8.486E+02	1.272E+06	8.546E+01
2122	3.052E+03	2.444E+06	1.642E+02	8.153E+02	1.222E+06	8.211E+01
2123	2.933E+03	2.348E+06	1.578E+02	7.834E+02	1.174E+06	7.889E+01
2124	2.818E+03	2.256E+06	1.516E+02	7.526E+02	1.128E+06	7.580E+01
2125	2.707E+03	2.168E+06	1.457E+02	7.231E+02	1.084E+06	7.283E+01
2126	2.601E+03	2.083E+06	1.399E+02	6.948E+02	1.041E+06	6.997E+01
2127	2.499E+03	2.001E+06	1.345E+02	6.675E+02	1.001E+06	6.723E+01
2128	2.401E+03	1.923E+06	1.292E+02	6.414E+02	9.613E+05	6.459E+01
2129	2.307E+03	1.847E+06	1.241E+02	6.162E+02	9.237E+05	6.206E+01
2130	2.216E+03	1.775E+06	1.193E+02	5.921E+02	8.874E+05	5.963E+01
2131	2.130E+03	1.705E+06	1.146E+02	5.688E+02	8.526E+05	5.729E+01
2132	2.046E+03	1.638E+06	1.101E+02	5.465E+02	8.192E+05	5.504E+01
2133	1.966E+03	1.574E+06	1.058E+02	5.251E+02	7.871E+05	5.288E+01
2134	1.889E+03	1.512E+06	1.016E+02	5.045E+02	7.562E+05	5.081E+01
2135	1.815E+03	1.453E+06	9.764E+01	4.847E+02	7.266E+05	4.882E+01
2136	1.744E+03	1.396E+06	9.381E+01	4.657E+02	6.981E+05	4.690E+01
2137	1.675E+03	1.341E+06	9.013E+01	4.475E+02	6.707E+05	4.506E+01
2138	1.610E+03	1.289E+06	8.660E+01	4.299E+02	6.444E+05	4.330E+01
2139	1.546E+03	1.238E+06	8.320E+01	4.131E+02	6.191E+05	4.160E+01
2140	1.486E+03	1.190E+06	7.994E+01	3.969E+02	5.949E+05	3.997E+01
2141	1.428E+03	1.143E+06	7.680E+01	3.813E+02	5.715E+05	3.840E+01
2142	1.372E+03	1.098E+06	7.379E+01	3.664E+02	5.491E+05	3.690E+01
2143	1.318E+03	1.055E+06	7.090E+01	3.520E+02	5.276E+05	3.545E+01
2144	1.266E+03	1.014E+06	6.812E+01	3.382E+02	5.069E+05	3.406E+01
2145	1.216E+03	9.741E+05	6.545E+01	3.249E+02	4.870E+05	3.272E+01
2146	1.169E+03	9.359E+05	6.288E+01	3.122E+02	4.679E+05	3.144E+01
2147	1.123E+03	8.992E+05	6.042E+01	2.999E+02	4.496E+05	3.021E+01

Results (Continued)

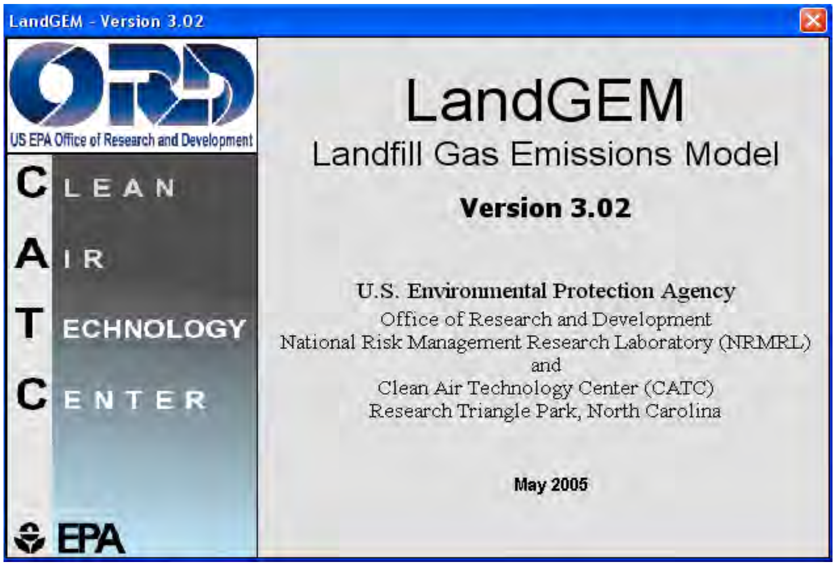
Year	Carbon dioxide			NMOC		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2007	0	0	0	0	0	0
2008	7.284E+03	3.979E+06	2.674E+02	6.815E+00	1.901E+03	1.277E-01
2009	1.220E+04	6.665E+06	4.478E+02	1.142E+01	3.185E+03	2.140E-01
2010	1.687E+04	9.218E+06	6.194E+02	1.579E+01	4.404E+03	2.959E-01
2011	2.157E+04	1.179E+07	7.919E+02	2.018E+01	5.631E+03	3.783E-01
2012	2.540E+04	1.388E+07	9.325E+02	2.377E+01	6.631E+03	4.455E-01
2013	2.924E+04	1.597E+07	1.073E+03	2.736E+01	7.632E+03	5.128E-01
2014	3.273E+04	1.788E+07	1.201E+03	3.062E+01	8.543E+03	5.740E-01
2015	3.598E+04	1.966E+07	1.321E+03	3.367E+01	9.393E+03	6.311E-01
2016	3.901E+04	2.131E+07	1.432E+03	3.650E+01	1.018E+04	6.841E-01
2017	4.211E+04	2.300E+07	1.546E+03	3.940E+01	1.099E+04	7.385E-01
2018	4.576E+04	2.500E+07	1.680E+03	4.282E+01	1.194E+04	8.026E-01
2019	4.905E+04	2.680E+07	1.800E+03	4.589E+01	1.280E+04	8.603E-01
2020	5.359E+04	2.928E+07	1.967E+03	5.014E+01	1.399E+04	9.399E-01
2021	5.828E+04	3.184E+07	2.139E+03	5.453E+01	1.521E+04	1.022E+00
2022	6.435E+04	3.515E+07	2.362E+03	6.021E+01	1.680E+04	1.129E+00
2023	7.018E+04	3.834E+07	2.576E+03	6.566E+01	1.832E+04	1.231E+00
2024	7.578E+04	4.140E+07	2.782E+03	7.090E+01	1.978E+04	1.329E+00
2025	8.117E+04	4.434E+07	2.979E+03	7.594E+01	2.119E+04	1.423E+00
2026	8.634E+04	4.717E+07	3.169E+03	8.078E+01	2.254E+04	1.514E+00
2027	9.131E+04	4.988E+07	3.351E+03	8.543E+01	2.383E+04	1.601E+00
2028	9.608E+04	5.249E+07	3.527E+03	8.989E+01	2.508E+04	1.685E+00
2029	9.231E+04	5.043E+07	3.388E+03	8.637E+01	2.410E+04	1.619E+00
2030	8.869E+04	4.845E+07	3.256E+03	8.298E+01	2.315E+04	1.555E+00
2031	8.521E+04	4.655E+07	3.128E+03	7.973E+01	2.224E+04	1.494E+00
2032	8.187E+04	4.473E+07	3.005E+03	7.660E+01	2.137E+04	1.436E+00
2033	7.866E+04	4.297E+07	2.887E+03	7.360E+01	2.053E+04	1.380E+00
2034	7.558E+04	4.129E+07	2.774E+03	7.071E+01	1.973E+04	1.325E+00
2035	7.261E+04	3.967E+07	2.665E+03	6.794E+01	1.895E+04	1.274E+00
2036	6.977E+04	3.811E+07	2.561E+03	6.528E+01	1.821E+04	1.224E+00
2037	6.703E+04	3.662E+07	2.460E+03	6.272E+01	1.750E+04	1.176E+00
2038	6.440E+04	3.518E+07	2.364E+03	6.026E+01	1.681E+04	1.130E+00
2039	6.188E+04	3.380E+07	2.271E+03	5.789E+01	1.615E+04	1.085E+00
2040	5.945E+04	3.248E+07	2.182E+03	5.562E+01	1.552E+04	1.043E+00
2041	5.712E+04	3.121E+07	2.097E+03	5.344E+01	1.491E+04	1.002E+00
2042	5.488E+04	2.998E+07	2.014E+03	5.135E+01	1.433E+04	9.625E-01
2043	5.273E+04	2.881E+07	1.935E+03	4.933E+01	1.376E+04	9.248E-01
2044	5.066E+04	2.768E+07	1.860E+03	4.740E+01	1.322E+04	8.885E-01
2045	4.868E+04	2.659E+07	1.787E+03	4.554E+01	1.271E+04	8.537E-01
2046	4.677E+04	2.555E+07	1.717E+03	4.376E+01	1.221E+04	8.202E-01
2047	4.493E+04	2.455E+07	1.649E+03	4.204E+01	1.173E+04	7.880E-01
2048	4.317E+04	2.358E+07	1.585E+03	4.039E+01	1.127E+04	7.571E-01
2049	4.148E+04	2.266E+07	1.522E+03	3.881E+01	1.083E+04	7.274E-01
2050	3.985E+04	2.177E+07	1.463E+03	3.729E+01	1.040E+04	6.989E-01
2051	3.829E+04	2.092E+07	1.405E+03	3.582E+01	9.994E+03	6.715E-01
2052	3.679E+04	2.010E+07	1.350E+03	3.442E+01	9.602E+03	6.452E-01
2053	3.535E+04	1.931E+07	1.297E+03	3.307E+01	9.226E+03	6.199E-01
2054	3.396E+04	1.855E+07	1.247E+03	3.177E+01	8.864E+03	5.956E-01
2055	3.263E+04	1.782E+07	1.198E+03	3.053E+01	8.517E+03	5.722E-01
2056	3.135E+04	1.713E+07	1.151E+03	2.933E+01	8.183E+03	5.498E-01

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2057	3.012E+04	1.645E+07	1.106E+03	2.818E+01	7.862E+03	5.282E-01
2058	2.894E+04	1.581E+07	1.062E+03	2.708E+01	7.554E+03	5.075E-01
2059	2.780E+04	1.519E+07	1.021E+03	2.601E+01	7.257E+03	4.876E-01
2060	2.671E+04	1.459E+07	9.805E+02	2.499E+01	6.973E+03	4.685E-01
2061	2.567E+04	1.402E+07	9.421E+02	2.401E+01	6.699E+03	4.501E-01
2062	2.466E+04	1.347E+07	9.052E+02	2.307E+01	6.437E+03	4.325E-01
2063	2.369E+04	1.294E+07	8.697E+02	2.217E+01	6.184E+03	4.155E-01
2064	2.276E+04	1.244E+07	8.356E+02	2.130E+01	5.942E+03	3.992E-01
2065	2.187E+04	1.195E+07	8.028E+02	2.046E+01	5.709E+03	3.836E-01
2066	2.101E+04	1.148E+07	7.713E+02	1.966E+01	5.485E+03	3.685E-01
2067	2.019E+04	1.103E+07	7.411E+02	1.889E+01	5.270E+03	3.541E-01
2068	1.940E+04	1.060E+07	7.120E+02	1.815E+01	5.063E+03	3.402E-01
2069	1.864E+04	1.018E+07	6.841E+02	1.744E+01	4.865E+03	3.269E-01
2070	1.791E+04	9.782E+06	6.573E+02	1.675E+01	4.674E+03	3.140E-01
2071	1.720E+04	9.399E+06	6.315E+02	1.610E+01	4.491E+03	3.017E-01
2072	1.653E+04	9.030E+06	6.067E+02	1.547E+01	4.315E+03	2.899E-01
2073	1.588E+04	8.676E+06	5.830E+02	1.486E+01	4.145E+03	2.785E-01
2074	1.526E+04	8.336E+06	5.601E+02	1.428E+01	3.983E+03	2.676E-01
2075	1.466E+04	8.009E+06	5.381E+02	1.372E+01	3.827E+03	2.571E-01
2076	1.409E+04	7.695E+06	5.170E+02	1.318E+01	3.677E+03	2.470E-01
2077	1.353E+04	7.393E+06	4.968E+02	1.266E+01	3.533E+03	2.374E-01
2078	1.300E+04	7.103E+06	4.773E+02	1.217E+01	3.394E+03	2.280E-01
2079	1.249E+04	6.825E+06	4.586E+02	1.169E+01	3.261E+03	2.191E-01
2080	1.200E+04	6.557E+06	4.406E+02	1.123E+01	3.133E+03	2.105E-01
2081	1.153E+04	6.300E+06	4.233E+02	1.079E+01	3.010E+03	2.023E-01
2082	1.108E+04	6.053E+06	4.067E+02	1.037E+01	2.892E+03	1.943E-01
2083	1.065E+04	5.816E+06	3.908E+02	9.960E+00	2.779E+03	1.867E-01
2084	1.023E+04	5.588E+06	3.754E+02	9.570E+00	2.670E+03	1.794E-01
2085	9.827E+03	5.369E+06	3.607E+02	9.195E+00	2.565E+03	1.724E-01
2086	9.442E+03	5.158E+06	3.466E+02	8.834E+00	2.465E+03	1.656E-01
2087	9.072E+03	4.956E+06	3.330E+02	8.488E+00	2.368E+03	1.591E-01
2088	8.716E+03	4.762E+06	3.199E+02	8.155E+00	2.275E+03	1.529E-01
2089	8.374E+03	4.575E+06	3.074E+02	7.835E+00	2.186E+03	1.469E-01
2090	8.046E+03	4.395E+06	2.953E+02	7.528E+00	2.100E+03	1.411E-01
2091	7.730E+03	4.223E+06	2.838E+02	7.233E+00	2.018E+03	1.356E-01
2092	7.427E+03	4.058E+06	2.726E+02	6.949E+00	1.939E+03	1.303E-01
2093	7.136E+03	3.898E+06	2.619E+02	6.677E+00	1.863E+03	1.252E-01
2094	6.856E+03	3.746E+06	2.517E+02	6.415E+00	1.790E+03	1.202E-01
2095	6.587E+03	3.599E+06	2.418E+02	6.163E+00	1.719E+03	1.155E-01
2096	6.329E+03	3.458E+06	2.323E+02	5.922E+00	1.652E+03	1.110E-01
2097	6.081E+03	3.322E+06	2.232E+02	5.690E+00	1.587E+03	1.066E-01
2098	5.843E+03	3.192E+06	2.145E+02	5.466E+00	1.525E+03	1.025E-01
2099	5.613E+03	3.067E+06	2.060E+02	5.252E+00	1.465E+03	9.845E-02
2100	5.393E+03	2.946E+06	1.980E+02	5.046E+00	1.408E+03	9.459E-02
2101	5.182E+03	2.831E+06	1.902E+02	4.848E+00	1.353E+03	9.088E-02
2102	4.979E+03	2.720E+06	1.827E+02	4.658E+00	1.300E+03	8.732E-02
2103	4.783E+03	2.613E+06	1.756E+02	4.476E+00	1.249E+03	8.389E-02
2104	4.596E+03	2.511E+06	1.687E+02	4.300E+00	1.200E+03	8.060E-02
2105	4.416E+03	2.412E+06	1.621E+02	4.131E+00	1.153E+03	7.744E-02
2106	4.243E+03	2.318E+06	1.557E+02	3.969E+00	1.107E+03	7.441E-02
2107	4.076E+03	2.227E+06	1.496E+02	3.814E+00	1.064E+03	7.149E-02

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2108	3.916E+03	2.140E+06	1.438E+02	3.664E+00	1.022E+03	6.869E-02
2109	3.763E+03	2.056E+06	1.381E+02	3.521E+00	9.822E+02	6.599E-02
2110	3.615E+03	1.975E+06	1.327E+02	3.383E+00	9.437E+02	6.340E-02
2111	3.474E+03	1.898E+06	1.275E+02	3.250E+00	9.067E+02	6.092E-02
2112	3.337E+03	1.823E+06	1.225E+02	3.122E+00	8.711E+02	5.853E-02
2113	3.206E+03	1.752E+06	1.177E+02	3.000E+00	8.370E+02	5.624E-02
2114	3.081E+03	1.683E+06	1.131E+02	2.882E+00	8.041E+02	5.403E-02
2115	2.960E+03	1.617E+06	1.086E+02	2.769E+00	7.726E+02	5.191E-02
2116	2.844E+03	1.554E+06	1.044E+02	2.661E+00	7.423E+02	4.988E-02
2117	2.732E+03	1.493E+06	1.003E+02	2.556E+00	7.132E+02	4.792E-02
2118	2.625E+03	1.434E+06	9.636E+01	2.456E+00	6.852E+02	4.604E-02
2119	2.522E+03	1.378E+06	9.258E+01	2.360E+00	6.584E+02	4.424E-02
2120	2.423E+03	1.324E+06	8.895E+01	2.267E+00	6.326E+02	4.250E-02
2121	2.328E+03	1.272E+06	8.546E+01	2.178E+00	6.078E+02	4.084E-02
2122	2.237E+03	1.222E+06	8.211E+01	2.093E+00	5.839E+02	3.923E-02
2123	2.149E+03	1.174E+06	7.889E+01	2.011E+00	5.610E+02	3.770E-02
2124	2.065E+03	1.128E+06	7.580E+01	1.932E+00	5.390E+02	3.622E-02
2125	1.984E+03	1.084E+06	7.283E+01	1.856E+00	5.179E+02	3.480E-02
2126	1.906E+03	1.041E+06	6.997E+01	1.784E+00	4.976E+02	3.343E-02
2127	1.832E+03	1.001E+06	6.723E+01	1.714E+00	4.781E+02	3.212E-02
2128	1.760E+03	9.613E+05	6.459E+01	1.646E+00	4.593E+02	3.086E-02
2129	1.691E+03	9.237E+05	6.206E+01	1.582E+00	4.413E+02	2.965E-02
2130	1.624E+03	8.874E+05	5.963E+01	1.520E+00	4.240E+02	2.849E-02
2131	1.561E+03	8.526E+05	5.729E+01	1.460E+00	4.074E+02	2.737E-02
2132	1.500E+03	8.192E+05	5.504E+01	1.403E+00	3.914E+02	2.630E-02
2133	1.441E+03	7.871E+05	5.288E+01	1.348E+00	3.761E+02	2.527E-02
2134	1.384E+03	7.562E+05	5.081E+01	1.295E+00	3.613E+02	2.428E-02
2135	1.330E+03	7.266E+05	4.882E+01	1.244E+00	3.472E+02	2.333E-02
2136	1.278E+03	6.981E+05	4.690E+01	1.196E+00	3.335E+02	2.241E-02
2137	1.228E+03	6.707E+05	4.506E+01	1.149E+00	3.205E+02	2.153E-02
2138	1.180E+03	6.444E+05	4.330E+01	1.104E+00	3.079E+02	2.069E-02
2139	1.133E+03	6.191E+05	4.160E+01	1.060E+00	2.958E+02	1.988E-02
2140	1.089E+03	5.949E+05	3.997E+01	1.019E+00	2.842E+02	1.910E-02
2141	1.046E+03	5.715E+05	3.840E+01	9.789E-01	2.731E+02	1.835E-02
2142	1.005E+03	5.491E+05	3.690E+01	9.405E-01	2.624E+02	1.763E-02
2143	9.658E+02	5.276E+05	3.545E+01	9.036E-01	2.521E+02	1.694E-02
2144	9.279E+02	5.069E+05	3.406E+01	8.682E-01	2.422E+02	1.627E-02
2145	8.915E+02	4.870E+05	3.272E+01	8.341E-01	2.327E+02	1.564E-02
2146	8.566E+02	4.679E+05	3.144E+01	8.014E-01	2.236E+02	1.502E-02
2147	8.230E+02	4.496E+05	3.021E+01	7.700E-01	2.148E+02	1.443E-02



Summary Report

Landfill Name or Identifier: Woodland Meadow Landfill 2028 to 2041

Date: Friday, December 16, 2022

Description/Comments:

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} k L_o \left(\frac{M_i}{10} \right) e^{-k t_{ij}}$$

Where,
Q_{CH4} = annual methane generation in the year of the calculation (*m^3/year*)
i = 1-year time increment
n = (year of the calculation) - (initial year of waste acceptance)
j = 0.1-year time increment
k = methane generation rate (*$year^{-1}$*)
L_o = potential methane generation capacity (*m^3/Mg*)

M_i = mass of waste accepted in the i^{th} year (*Mg*)
t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**2028**	
Landfill Closure Year (with 80-year limit)	**2041**	
Actual Closure Year (without limit)	***2041***	
Have Model Calculate Closure Year?	**Yes**	
Waste Design Capacity	**17,888,248**	*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.040**	*$year^{-1}$*
Potential Methane Generation Capacity, L_o	**100**	*m^3/Mg*
NMOC Concentration	**239**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1: **Total landfill gas**
Gas / Pollutant #2: **Methane**
Gas / Pollutant #3: **Carbon dioxide**
Gas / Pollutant #4: **NMOC**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2028	1,161,575	1,277,732	0	0
2029	1,161,575	1,277,732	1,161,575	1,277,732
2030	1,161,575	1,277,732	2,323,149	2,555,464
2031	1,161,575	1,277,732	3,484,724	3,833,196
2032	1,161,575	1,277,732	4,646,298	5,110,928
2033	1,161,575	1,277,732	5,807,873	6,388,660
2034	1,161,575	1,277,732	6,969,447	7,666,392
2035	1,161,575	1,277,732	8,131,022	8,944,124
2036	1,161,575	1,277,732	9,292,596	10,221,856
2037	1,161,575	1,277,732	10,454,171	11,499,588
2038	1,161,575	1,277,732	11,615,745	12,777,320
2039	1,161,575	1,277,732	12,777,320	14,055,052
2040	1,161,575	1,277,732	13,938,895	15,332,784
2041	1,161,575	1,277,732	15,100,469	16,610,516
2042	0	0	16,262,044	17,888,248
2043	0	0	16,262,044	17,888,248
2044	0	0	16,262,044	17,888,248
2045	0	0	16,262,044	17,888,248
2046	0	0	16,262,044	17,888,248
2047	0	0	16,262,044	17,888,248
2048	0	0	16,262,044	17,888,248
2049	0	0	16,262,044	17,888,248
2050	0	0	16,262,044	17,888,248
2051	0	0	16,262,044	17,888,248
2052	0	0	16,262,044	17,888,248
2053	0	0	16,262,044	17,888,248
2054	0	0	16,262,044	17,888,248
2055	0	0	16,262,044	17,888,248
2056	0	0	16,262,044	17,888,248
2057	0	0	16,262,044	17,888,248
2058	0	0	16,262,044	17,888,248
2059	0	0	16,262,044	17,888,248
2060	0	0	16,262,044	17,888,248
2061	0	0	16,262,044	17,888,248
2062	0	0	16,262,044	17,888,248
2063	0	0	16,262,044	17,888,248
2064	0	0	16,262,044	17,888,248
2065	0	0	16,262,044	17,888,248
2066	0	0	16,262,044	17,888,248
2067	0	0	16,262,044	17,888,248

WASTE ACCEPTANCE RATES (Continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg)	(short tons)
2068	0	0	16,262,044	17,888,248
2069	0	0	16,262,044	17,888,248
2070	0	0	16,262,044	17,888,248
2071	0	0	16,262,044	17,888,248
2072	0	0	16,262,044	17,888,248
2073	0	0	16,262,044	17,888,248
2074	0	0	16,262,044	17,888,248
2075	0	0	16,262,044	17,888,248
2076	0	0	16,262,044	17,888,248
2077	0	0	16,262,044	17,888,248
2078	0	0	16,262,044	17,888,248
2079	0	0	16,262,044	17,888,248
2080	0	0	16,262,044	17,888,248
2081	0	0	16,262,044	17,888,248
2082	0	0	16,262,044	17,888,248
2083	0	0	16,262,044	17,888,248
2084	0	0	16,262,044	17,888,248
2085	0	0	16,262,044	17,888,248
2086	0	0	16,262,044	17,888,248
2087	0	0	16,262,044	17,888,248
2088	0	0	16,262,044	17,888,248
2089	0	0	16,262,044	17,888,248
2090	0	0	16,262,044	17,888,248
2091	0	0	16,262,044	17,888,248
2092	0	0	16,262,044	17,888,248
2093	0	0	16,262,044	17,888,248
2094	0	0	16,262,044	17,888,248
2095	0	0	16,262,044	17,888,248
2096	0	0	16,262,044	17,888,248
2097	0	0	16,262,044	17,888,248
2098	0	0	16,262,044	17,888,248
2099	0	0	16,262,044	17,888,248
2100	0	0	16,262,044	17,888,248
2101	0	0	16,262,044	17,888,248
2102	0	0	16,262,044	17,888,248
2103	0	0	16,262,044	17,888,248
2104	0	0	16,262,044	17,888,248
2105	0	0	16,262,044	17,888,248
2106	0	0	16,262,044	17,888,248
2107	0	0	16,262,044	17,888,248

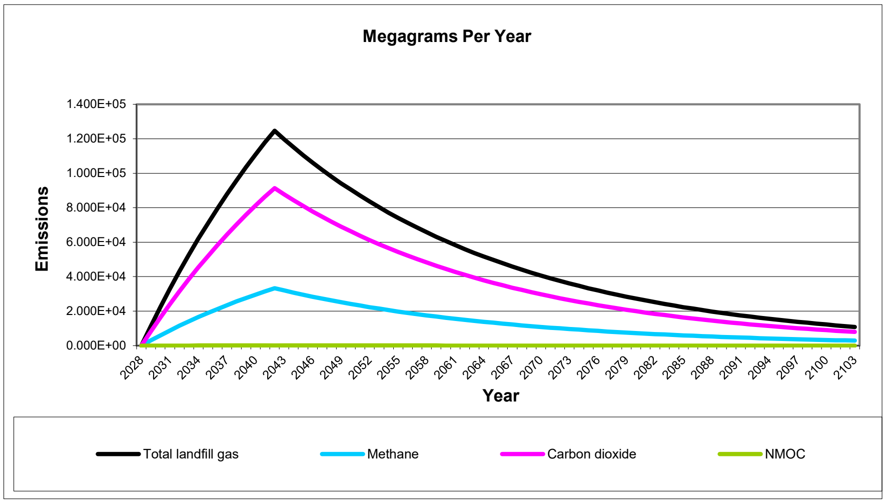
Pollutant Parameters

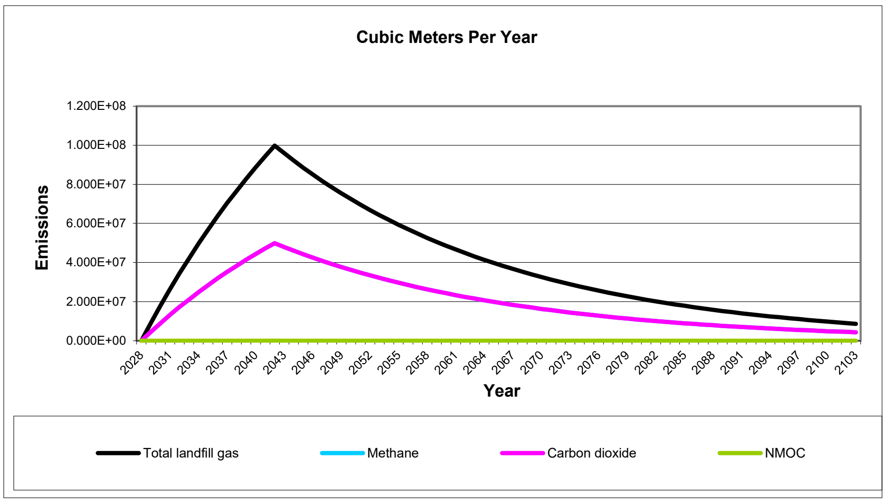
		Gas / Pollutant Default Parameters:		User-specified Pollutant Parameters:	
	Compound	Concentration (*ppmv*)	Molecular Weight	Concentration (*ppmv*)	Molecular Weight
Gases	Total landfill gas		0.00		
	Methane		16.04		
	Carbon dioxide		44.01		
	NMOC	4,000	86.18		
Pollutants	1,1,1-Trichloroethane (methyl chloroform) - HAP	0.48	133.41		
	1,1,2,2-Tetrachloroethane - HAP/VOC	1.1	167.85		
	1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	2.4	98.97		
	1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.20	96.94		
	1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.41	98.96		
	1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.18	112.99		
	2-Propanol (isopropyl alcohol) - VOC	50	60.11		
	Acetone	7.0	58.08		
	Acrylonitrile - HAP/VOC	6.3	53.06		
	Benzene - No or Unknown Co-disposal - HAP/VOC	1.9	78.11		
	Benzene - Co-disposal - HAP/VOC	11	78.11		
	Bromodichloromethane - VOC	3.1	163.83		
	Butane - VOC	5.0	58.12		
	Carbon disulfide - HAP/VOC	0.58	76.13		
	Carbon monoxide	140	28.01		
	Carbon tetrachloride - HAP/VOC	4.0E-03	153.84		
	Carbonyl sulfide - HAP/VOC	0.49	60.07		
	Chlorobenzene - HAP/VOC	0.25	112.56		
	Chlorodifluoromethane	1.3	86.47		
	Chloroethane (ethyl chloride) - HAP/VOC	1.3	64.52		
	Chloroform - HAP/VOC	0.03	119.39		
	Chloromethane - VOC	1.2	50.49		
	Dichlorobenzene - (HAP for para isomer/VOC)	0.21	147		
	Dichlorodifluoromethane	16	120.91		
	Dichlorofluoromethane - VOC	2.6	102.92		
	Dichloromethane (methylene chloride) - HAP	14	84.94		
	Dimethyl sulfide (methyl sulfide) - VOC	7.8	62.13		
	Ethane	890	30.07		
	Ethanol - VOC	27	46.08		

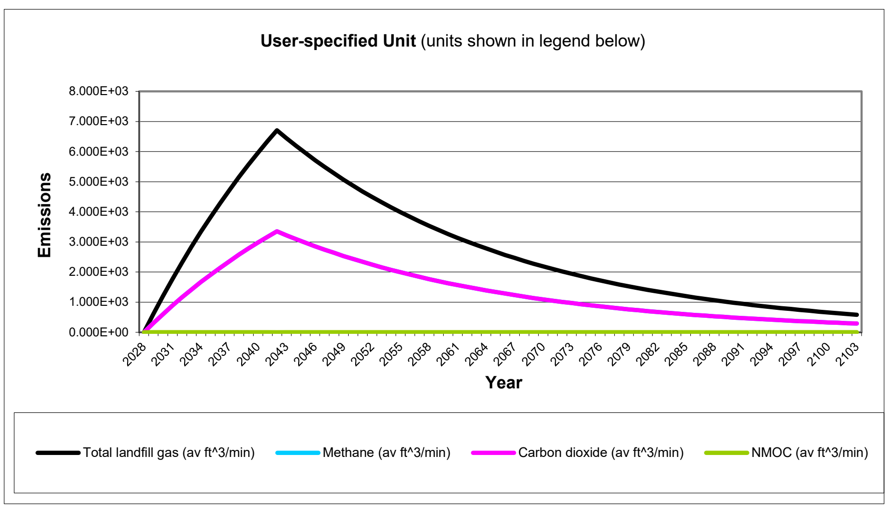
Pollutant Parameters (Continued)

	Gas / Pollutant Default Parameters:			User-specified Pollutant Parameters:	
	Compound	Concentration (*ppmv*)	Molecular Weight	Concentration (*ppmv*)	Molecular Weight
Pollutants	Ethyl mercaptan (ethanethiol) - VOC	2.3	62.13		
	Ethylbenzene - HAP/VOC	4.6	106.16		
	Ethylene dibromide - HAP/VOC	1.0E-03	187.88		
	Fluorotrichloromethane - VOC	0.76	137.38		
	Hexane - HAP/VOC	6.6	86.18		
	Hydrogen sulfide	36	34.08		
	Mercury (total) - HAP	2.9E-04	200.61		
	Methyl ethyl ketone - HAP/VOC	7.1	72.11		
	Methyl isobutyl ketone - HAP/VOC	1.9	100.16		
	Methyl mercaptan - VOC	2.5	48.11		
	Pentane - VOC	3.3	72.15		
	Perchloroethylene (tetrachloroethylene) - HAP	3.7	165.83		
	Propane - VOC	11	44.09		
	t-1,2-Dichloroethene - VOC	2.8	96.94		
	Toluene - No or Unknown Co-disposal - HAP/VOC	39	92.13		
	Toluene - Co-disposal - HAP/VOC	170	92.13		
	Trichloroethylene (trichloroethene) - HAP/VOC	2.8	131.40		
	Vinyl chloride - HAP/VOC	7.3	62.50		
	Xylenes - HAP/VOC	12	106.16		

Graphs


Megagrams Per Year
Emissions
Year
Total landfill gas
Methane
Carbon dioxide
NMOC


Cubic Meters Per Year
Emissions
Year
Total landfill gas
Methane
Carbon dioxide
NMOC


User-specified Unit (units shown in legend below)
Emissions
Year
Total landfill gas (av ft^3/min)
Methane (av ft^3/min)
Carbon dioxide (av ft^3/min)
NMOC (av ft^3/min)

Results

Year	Total landfill gas			Methane		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2028	0	0	0	0	0	0
2029	1.140E+04	9.127E+06	6.133E+02	3.045E+03	4.564E+06	3.066E+02
2030	2.235E+04	1.790E+07	1.202E+03	5.970E+03	8.948E+06	6.012E+02
2031	3.287E+04	2.632E+07	1.769E+03	8.781E+03	1.316E+07	8.843E+02
2032	4.298E+04	3.442E+07	2.313E+03	1.148E+04	1.721E+07	1.156E+03
2033	5.270E+04	4.220E+07	2.835E+03	1.408E+04	2.110E+07	1.418E+03
2034	6.203E+04	4.967E+07	3.337E+03	1.657E+04	2.483E+07	1.669E+03
2035	7.099E+04	5.685E+07	3.820E+03	1.896E+04	2.842E+07	1.910E+03
2036	7.961E+04	6.375E+07	4.283E+03	2.126E+04	3.187E+07	2.142E+03
2037	8.789E+04	7.037E+07	4.728E+03	2.348E+04	3.519E+07	2.364E+03
2038	9.584E+04	7.674E+07	5.156E+03	2.560E+04	3.837E+07	2.578E+03
2039	1.035E+05	8.286E+07	5.567E+03	2.764E+04	4.143E+07	2.784E+03
2040	1.108E+05	8.874E+07	5.962E+03	2.960E+04	4.437E+07	2.981E+03
2041	1.179E+05	9.439E+07	6.342E+03	3.149E+04	4.719E+07	3.171E+03
2042	1.246E+05	9.981E+07	6.706E+03	3.330E+04	4.991E+07	3.353E+03
2043	1.198E+05	9.590E+07	6.444E+03	3.199E+04	4.795E+07	3.222E+03
2044	1.151E+05	9.214E+07	6.191E+03	3.074E+04	4.607E+07	3.095E+03
2045	1.106E+05	8.853E+07	5.948E+03	2.953E+04	4.426E+07	2.974E+03
2046	1.062E+05	8.506E+07	5.715E+03	2.837E+04	4.253E+07	2.857E+03
2047	1.021E+05	8.172E+07	5.491E+03	2.726E+04	4.086E+07	2.745E+03
2048	9.805E+04	7.852E+07	5.276E+03	2.619E+04	3.926E+07	2.638E+03
2049	9.421E+04	7.544E+07	5.069E+03	2.516E+04	3.772E+07	2.534E+03
2050	9.051E+04	7.248E+07	4.870E+03	2.418E+04	3.624E+07	2.435E+03
2051	8.697E+04	6.964E+07	4.679E+03	2.323E+04	3.482E+07	2.339E+03
2052	8.356E+04	6.691E+07	4.495E+03	2.232E+04	3.345E+07	2.248E+03
2053	8.028E+04	6.428E+07	4.319E+03	2.144E+04	3.214E+07	2.160E+03
2054	7.713E+04	6.176E+07	4.150E+03	2.060E+04	3.088E+07	2.075E+03
2055	7.411E+04	5.934E+07	3.987E+03	1.979E+04	2.967E+07	1.994E+03
2056	7.120E+04	5.701E+07	3.831E+03	1.902E+04	2.851E+07	1.915E+03
2057	6.841E+04	5.478E+07	3.681E+03	1.827E+04	2.739E+07	1.840E+03
2058	6.573E+04	5.263E+07	3.536E+03	1.756E+04	2.632E+07	1.768E+03
2059	6.315E+04	5.057E+07	3.398E+03	1.687E+04	2.528E+07	1.699E+03
2060	6.067E+04	4.858E+07	3.264E+03	1.621E+04	2.429E+07	1.632E+03
2061	5.829E+04	4.668E+07	3.136E+03	1.557E+04	2.334E+07	1.568E+03
2062	5.601E+04	4.485E+07	3.013E+03	1.496E+04	2.242E+07	1.507E+03
2063	5.381E+04	4.309E+07	2.895E+03	1.437E+04	2.155E+07	1.448E+03
2064	5.170E+04	4.140E+07	2.782E+03	1.381E+04	2.070E+07	1.391E+03
2065	4.968E+04	3.978E+07	2.673E+03	1.327E+04	1.989E+07	1.336E+03
2066	4.773E+04	3.822E+07	2.568E+03	1.275E+04	1.911E+07	1.284E+03
2067	4.586E+04	3.672E+07	2.467E+03	1.225E+04	1.836E+07	1.234E+03
2068	4.406E+04	3.528E+07	2.370E+03	1.177E+04	1.764E+07	1.185E+03
2069	4.233E+04	3.390E+07	2.277E+03	1.131E+04	1.695E+07	1.139E+03
2070	4.067E+04	3.257E+07	2.188E+03	1.086E+04	1.628E+07	1.094E+03
2071	3.908E+04	3.129E+07	2.102E+03	1.044E+04	1.565E+07	1.051E+03
2072	3.754E+04	3.006E+07	2.020E+03	1.003E+04	1.503E+07	1.010E+03
2073	3.607E+04	2.888E+07	1.941E+03	9.635E+03	1.444E+07	9.704E+02
2074	3.466E+04	2.775E+07	1.865E+03	9.257E+03	1.388E+07	9.323E+02
2075	3.330E+04	2.666E+07	1.792E+03	8.894E+03	1.333E+07	8.958E+02
2076	3.199E+04	2.562E+07	1.721E+03	8.546E+03	1.281E+07	8.606E+02
2077	3.074E+04	2.461E+07	1.654E+03	8.211E+03	1.231E+07	8.269E+02

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2078	2.953E+04	2.365E+07	1.589E+03	7.889E+03	1.182E+07	7.945E+02
2079	2.838E+04	2.272E+07	1.527E+03	7.579E+03	1.136E+07	7.633E+02
2080	2.726E+04	2.183E+07	1.467E+03	7.282E+03	1.092E+07	7.334E+02
2081	2.619E+04	2.097E+07	1.409E+03	6.997E+03	1.049E+07	7.046E+02
2082	2.517E+04	2.015E+07	1.354E+03	6.722E+03	1.008E+07	6.770E+02
2083	2.418E+04	1.936E+07	1.301E+03	6.459E+03	9.681E+06	6.505E+02
2084	2.323E+04	1.860E+07	1.250E+03	6.205E+03	9.301E+06	6.250E+02
2085	2.232E+04	1.787E+07	1.201E+03	5.962E+03	8.937E+06	6.005E+02
2086	2.145E+04	1.717E+07	1.154E+03	5.728E+03	8.586E+06	5.769E+02
2087	2.060E+04	1.650E+07	1.109E+03	5.504E+03	8.250E+06	5.543E+02
2088	1.980E+04	1.585E+07	1.065E+03	5.288E+03	7.926E+06	5.326E+02
2089	1.902E+04	1.523E+07	1.023E+03	5.081E+03	7.615E+06	5.117E+02
2090	1.827E+04	1.463E+07	9.832E+02	4.881E+03	7.317E+06	4.916E+02
2091	1.756E+04	1.406E+07	9.447E+02	4.690E+03	7.030E+06	4.723E+02
2092	1.687E+04	1.351E+07	9.076E+02	4.506E+03	6.754E+06	4.538E+02
2093	1.621E+04	1.298E+07	8.720E+02	4.329E+03	6.489E+06	4.360E+02
2094	1.557E+04	1.247E+07	8.378E+02	4.160E+03	6.235E+06	4.189E+02
2095	1.496E+04	1.198E+07	8.050E+02	3.996E+03	5.990E+06	4.025E+02
2096	1.438E+04	1.151E+07	7.734E+02	3.840E+03	5.756E+06	3.867E+02
2097	1.381E+04	1.106E+07	7.431E+02	3.689E+03	5.530E+06	3.715E+02
2098	1.327E+04	1.063E+07	7.140E+02	3.545E+03	5.313E+06	3.570E+02
2099	1.275E+04	1.021E+07	6.860E+02	3.406E+03	5.105E+06	3.430E+02
2100	1.225E+04	9.809E+06	6.591E+02	3.272E+03	4.905E+06	3.295E+02
2101	1.177E+04	9.424E+06	6.332E+02	3.144E+03	4.712E+06	3.166E+02
2102	1.131E+04	9.055E+06	6.084E+02	3.020E+03	4.527E+06	3.042E+02
2103	1.086E+04	8.700E+06	5.845E+02	2.902E+03	4.350E+06	2.923E+02
2104	1.044E+04	8.359E+06	5.616E+02	2.788E+03	4.179E+06	2.808E+02
2105	1.003E+04	8.031E+06	5.396E+02	2.679E+03	4.015E+06	2.698E+02
2106	9.636E+03	7.716E+06	5.184E+02	2.574E+03	3.858E+06	2.592E+02
2107	9.258E+03	7.414E+06	4.981E+02	2.473E+03	3.707E+06	2.491E+02
2108	8.895E+03	7.123E+06	4.786E+02	2.376E+03	3.561E+06	2.393E+02
2109	8.546E+03	6.844E+06	4.598E+02	2.283E+03	3.422E+06	2.299E+02
2110	8.211E+03	6.575E+06	4.418E+02	2.193E+03	3.288E+06	2.209E+02
2111	7.889E+03	6.317E+06	4.245E+02	2.107E+03	3.159E+06	2.122E+02
2112	7.580E+03	6.070E+06	4.078E+02	2.025E+03	3.035E+06	2.039E+02
2113	7.283E+03	5.832E+06	3.918E+02	1.945E+03	2.916E+06	1.959E+02
2114	6.997E+03	5.603E+06	3.765E+02	1.869E+03	2.802E+06	1.882E+02
2115	6.723E+03	5.383E+06	3.617E+02	1.796E+03	2.692E+06	1.809E+02
2116	6.459E+03	5.172E+06	3.475E+02	1.725E+03	2.586E+06	1.738E+02
2117	6.206E+03	4.969E+06	3.339E+02	1.658E+03	2.485E+06	1.669E+02
2118	5.963E+03	4.775E+06	3.208E+02	1.593E+03	2.387E+06	1.604E+02
2119	5.729E+03	4.587E+06	3.082E+02	1.530E+03	2.294E+06	1.541E+02
2120	5.504E+03	4.407E+06	2.961E+02	1.470E+03	2.204E+06	1.481E+02
2121	5.288E+03	4.235E+06	2.845E+02	1.413E+03	2.117E+06	1.423E+02
2122	5.081E+03	4.069E+06	2.734E+02	1.357E+03	2.034E+06	1.367E+02
2123	4.882E+03	3.909E+06	2.627E+02	1.304E+03	1.955E+06	1.313E+02
2124	4.690E+03	3.756E+06	2.524E+02	1.253E+03	1.878E+06	1.262E+02
2125	4.506E+03	3.609E+06	2.425E+02	1.204E+03	1.804E+06	1.212E+02
2126	4.330E+03	3.467E+06	2.330E+02	1.157E+03	1.734E+06	1.165E+02
2127	4.160E+03	3.331E+06	2.238E+02	1.111E+03	1.666E+06	1.119E+02
2128	3.997E+03	3.201E+06	2.150E+02	1.068E+03	1.600E+06	1.075E+02

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2129	3.840E+03	3.075E+06	2.066E+02	1.026E+03	1.538E+06	1.033E+02
2130	3.690E+03	2.954E+06	1.985E+02	9.855E+02	1.477E+06	9.925E+01
2131	3.545E+03	2.839E+06	1.907E+02	9.469E+02	1.419E+06	9.536E+01
2132	3.406E+03	2.727E+06	1.832E+02	9.098E+02	1.364E+06	9.162E+01
2133	3.272E+03	2.620E+06	1.761E+02	8.741E+02	1.310E+06	8.803E+01
2134	3.144E+03	2.518E+06	1.692E+02	8.398E+02	1.259E+06	8.458E+01
2135	3.021E+03	2.419E+06	1.625E+02	8.069E+02	1.209E+06	8.126E+01
2136	2.902E+03	2.324E+06	1.562E+02	7.752E+02	1.162E+06	7.808E+01
2137	2.789E+03	2.233E+06	1.500E+02	7.448E+02	1.116E+06	7.501E+01
2138	2.679E+03	2.145E+06	1.441E+02	7.156E+02	1.073E+06	7.207E+01
2139	2.574E+03	2.061E+06	1.385E+02	6.876E+02	1.031E+06	6.925E+01
2140	2.473E+03	1.980E+06	1.331E+02	6.606E+02	9.902E+05	6.653E+01
2141	2.376E+03	1.903E+06	1.278E+02	6.347E+02	9.514E+05	6.392E+01
2142	2.283E+03	1.828E+06	1.228E+02	6.098E+02	9.141E+05	6.142E+01
2143	2.194E+03	1.756E+06	1.180E+02	5.859E+02	8.782E+05	5.901E+01
2144	2.108E+03	1.688E+06	1.134E+02	5.629E+02	8.438E+05	5.669E+01
2145	2.025E+03	1.621E+06	1.089E+02	5.409E+02	8.107E+05	5.447E+01
2146	1.945E+03	1.558E+06	1.047E+02	5.197E+02	7.789E+05	5.234E+01
2147	1.869E+03	1.497E+06	1.006E+02	4.993E+02	7.484E+05	5.028E+01
2148	1.796E+03	1.438E+06	9.662E+01	4.797E+02	7.190E+05	4.831E+01
2149	1.725E+03	1.382E+06	9.284E+01	4.609E+02	6.908E+05	4.642E+01
2150	1.658E+03	1.328E+06	8.920E+01	4.428E+02	6.638E+05	4.460E+01
2151	1.593E+03	1.275E+06	8.570E+01	4.255E+02	6.377E+05	4.285E+01
2152	1.530E+03	1.225E+06	8.234E+01	4.088E+02	6.127E+05	4.117E+01
2153	1.470E+03	1.177E+06	7.911E+01	3.927E+02	5.887E+05	3.955E+01
2154	1.413E+03	1.131E+06	7.601E+01	3.773E+02	5.656E+05	3.800E+01
2155	1.357E+03	1.087E+06	7.303E+01	3.626E+02	5.434E+05	3.651E+01
2156	1.304E+03	1.044E+06	7.016E+01	3.483E+02	5.221E+05	3.508E+01
2157	1.253E+03	1.003E+06	6.741E+01	3.347E+02	5.017E+05	3.371E+01
2158	1.204E+03	9.640E+05	6.477E+01	3.216E+02	4.820E+05	3.238E+01
2159	1.157E+03	9.262E+05	6.223E+01	3.089E+02	4.631E+05	3.111E+01
2160	1.111E+03	8.899E+05	5.979E+01	2.968E+02	4.449E+05	2.989E+01
2161	1.068E+03	8.550E+05	5.745E+01	2.852E+02	4.275E+05	2.872E+01
2162	1.026E+03	8.214E+05	5.519E+01	2.740E+02	4.107E+05	2.760E+01
2163	9.856E+02	7.892E+05	5.303E+01	2.633E+02	3.946E+05	2.651E+01
2164	9.470E+02	7.583E+05	5.095E+01	2.529E+02	3.791E+05	2.547E+01
2165	9.098E+02	7.286E+05	4.895E+01	2.430E+02	3.643E+05	2.448E+01
2166	8.742E+02	7.000E+05	4.703E+01	2.335E+02	3.500E+05	2.352E+01
2167	8.399E+02	6.725E+05	4.519E+01	2.243E+02	3.363E+05	2.259E+01
2168	8.070E+02	6.462E+05	4.342E+01	2.155E+02	3.231E+05	2.171E+01

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2028	0	0	0	0	0	0
2029	8.354E+03	4.564E+06	3.066E+02	7.816E+00	2.181E+03	1.465E-01
2030	1.638E+04	8.948E+06	6.012E+02	1.533E+01	4.276E+03	2.873E-01
2031	2.409E+04	1.316E+07	8.843E+02	2.254E+01	6.288E+03	4.225E-01
2032	3.150E+04	1.721E+07	1.156E+03	2.947E+01	8.222E+03	5.525E-01
2033	3.862E+04	2.110E+07	1.418E+03	3.613E+01	1.008E+04	6.773E-01
2034	4.546E+04	2.483E+07	1.669E+03	4.253E+01	1.187E+04	7.973E-01
2035	5.203E+04	2.842E+07	1.910E+03	4.868E+01	1.358E+04	9.125E-01
2036	5.834E+04	3.187E+07	2.142E+03	5.459E+01	1.523E+04	1.023E+00
2037	6.441E+04	3.519E+07	2.364E+03	6.026E+01	1.681E+04	1.130E+00
2038	7.024E+04	3.837E+07	2.578E+03	6.572E+01	1.833E+04	1.232E+00
2039	7.584E+04	4.143E+07	2.784E+03	7.096E+01	1.980E+04	1.330E+00
2040	8.122E+04	4.437E+07	2.981E+03	7.599E+01	2.120E+04	1.424E+00
2041	8.639E+04	4.719E+07	3.171E+03	8.083E+01	2.255E+04	1.515E+00
2042	9.135E+04	4.991E+07	3.353E+03	8.547E+01	2.385E+04	1.602E+00
2043	8.777E+04	4.795E+07	3.222E+03	8.212E+01	2.291E+04	1.539E+00
2044	8.433E+04	4.607E+07	3.095E+03	7.890E+01	2.201E+04	1.479E+00
2045	8.102E+04	4.426E+07	2.974E+03	7.581E+01	2.115E+04	1.421E+00
2046	7.785E+04	4.253E+07	2.857E+03	7.284E+01	2.032E+04	1.365E+00
2047	7.479E+04	4.086E+07	2.745E+03	6.998E+01	1.952E+04	1.312E+00
2048	7.186E+04	3.926E+07	2.638E+03	6.724E+01	1.876E+04	1.260E+00
2049	6.904E+04	3.772E+07	2.534E+03	6.460E+01	1.802E+04	1.211E+00
2050	6.634E+04	3.624E+07	2.435E+03	6.207E+01	1.732E+04	1.163E+00
2051	6.374E+04	3.482E+07	2.339E+03	5.963E+01	1.664E+04	1.118E+00
2052	6.124E+04	3.345E+07	2.248E+03	5.729E+01	1.598E+04	1.074E+00
2053	5.884E+04	3.214E+07	2.160E+03	5.505E+01	1.536E+04	1.032E+00
2054	5.653E+04	3.088E+07	2.075E+03	5.289E+01	1.476E+04	9.914E-01
2055	5.431E+04	2.967E+07	1.994E+03	5.082E+01	1.418E+04	9.525E-01
2056	5.218E+04	2.851E+07	1.915E+03	4.882E+01	1.362E+04	9.152E-01
2057	5.014E+04	2.739E+07	1.840E+03	4.691E+01	1.309E+04	8.793E-01
2058	4.817E+04	2.632E+07	1.768E+03	4.507E+01	1.257E+04	8.448E-01
2059	4.628E+04	2.528E+07	1.699E+03	4.330E+01	1.208E+04	8.117E-01
2060	4.447E+04	2.429E+07	1.632E+03	4.160E+01	1.161E+04	7.799E-01
2061	4.272E+04	2.334E+07	1.568E+03	3.997E+01	1.115E+04	7.493E-01
2062	4.105E+04	2.242E+07	1.507E+03	3.841E+01	1.071E+04	7.199E-01
2063	3.944E+04	2.155E+07	1.448E+03	3.690E+01	1.029E+04	6.917E-01
2064	3.789E+04	2.070E+07	1.391E+03	3.545E+01	9.891E+03	6.646E-01
2065	3.641E+04	1.989E+07	1.336E+03	3.406E+01	9.503E+03	6.385E-01
2066	3.498E+04	1.911E+07	1.284E+03	3.273E+01	9.130E+03	6.135E-01
2067	3.361E+04	1.836E+07	1.234E+03	3.144E+01	8.772E+03	5.894E-01
2068	3.229E+04	1.764E+07	1.185E+03	3.021E+01	8.428E+03	5.663E-01
2069	3.102E+04	1.695E+07	1.139E+03	2.903E+01	8.098E+03	5.441E-01
2070	2.981E+04	1.628E+07	1.094E+03	2.789E+01	7.780E+03	5.228E-01
2071	2.864E+04	1.565E+07	1.051E+03	2.679E+01	7.475E+03	5.023E-01
2072	2.752E+04	1.503E+07	1.010E+03	2.574E+01	7.182E+03	4.826E-01
2073	2.644E+04	1.444E+07	9.704E+02	2.473E+01	6.901E+03	4.636E-01
2074	2.540E+04	1.388E+07	9.323E+02	2.376E+01	6.630E+03	4.455E-01
2075	2.440E+04	1.333E+07	8.958E+02	2.283E+01	6.370E+03	4.280E-01
2076	2.345E+04	1.281E+07	8.606E+02	2.194E+01	6.120E+03	4.112E-01
2077	2.253E+04	1.231E+07	8.269E+02	2.108E+01	5.880E+03	3.951E-01

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2078	2.164E+04	1.182E+07	7.945E+02	2.025E+01	5.650E+03	3.796E-01
2079	2.080E+04	1.136E+07	7.633E+02	1.946E+01	5.428E+03	3.647E-01
2080	1.998E+04	1.092E+07	7.334E+02	1.869E+01	5.215E+03	3.504E-01
2081	1.920E+04	1.049E+07	7.046E+02	1.796E+01	5.011E+03	3.367E-01
2082	1.844E+04	1.008E+07	6.770E+02	1.726E+01	4.814E+03	3.235E-01
2083	1.772E+04	9.681E+06	6.505E+02	1.658E+01	4.626E+03	3.108E-01
2084	1.703E+04	9.301E+06	6.250E+02	1.593E+01	4.444E+03	2.986E-01
2085	1.636E+04	8.937E+06	6.005E+02	1.531E+01	4.270E+03	2.869E-01
2086	1.572E+04	8.586E+06	5.769E+02	1.471E+01	4.103E+03	2.756E-01
2087	1.510E+04	8.250E+06	5.543E+02	1.413E+01	3.942E+03	2.648E-01
2088	1.451E+04	7.926E+06	5.326E+02	1.357E+01	3.787E+03	2.545E-01
2089	1.394E+04	7.615E+06	5.117E+02	1.304E+01	3.639E+03	2.445E-01
2090	1.339E+04	7.317E+06	4.916E+02	1.253E+01	3.496E+03	2.349E-01
2091	1.287E+04	7.030E+06	4.723E+02	1.204E+01	3.359E+03	2.257E-01
2092	1.236E+04	6.754E+06	4.538E+02	1.157E+01	3.227E+03	2.168E-01
2093	1.188E+04	6.489E+06	4.360E+02	1.111E+01	3.101E+03	2.083E-01
2094	1.141E+04	6.235E+06	4.189E+02	1.068E+01	2.979E+03	2.002E-01
2095	1.097E+04	5.990E+06	4.025E+02	1.026E+01	2.862E+03	1.923E-01
2096	1.054E+04	5.756E+06	3.867E+02	9.857E+00	2.750E+03	1.848E-01
2097	1.012E+04	5.530E+06	3.715E+02	9.471E+00	2.642E+03	1.775E-01
2098	9.725E+03	5.313E+06	3.570E+02	9.099E+00	2.539E+03	1.706E-01
2099	9.344E+03	5.105E+06	3.430E+02	8.743E+00	2.439E+03	1.639E-01
2100	8.978E+03	4.905E+06	3.295E+02	8.400E+00	2.343E+03	1.575E-01
2101	8.626E+03	4.712E+06	3.166E+02	8.070E+00	2.252E+03	1.513E-01
2102	8.288E+03	4.527E+06	3.042E+02	7.754E+00	2.163E+03	1.453E-01
2103	7.963E+03	4.350E+06	2.923E+02	7.450E+00	2.078E+03	1.396E-01
2104	7.650E+03	4.179E+06	2.808E+02	7.158E+00	1.997E+03	1.342E-01
2105	7.350E+03	4.015E+06	2.698E+02	6.877E+00	1.919E+03	1.289E-01
2106	7.062E+03	3.858E+06	2.592E+02	6.608E+00	1.843E+03	1.239E-01
2107	6.785E+03	3.707E+06	2.491E+02	6.348E+00	1.771E+03	1.190E-01
2108	6.519E+03	3.561E+06	2.393E+02	6.100E+00	1.702E+03	1.143E-01
2109	6.264E+03	3.422E+06	2.299E+02	5.860E+00	1.635E+03	1.099E-01
2110	6.018E+03	3.288E+06	2.209E+02	5.631E+00	1.571E+03	1.055E-01
2111	5.782E+03	3.159E+06	2.122E+02	5.410E+00	1.509E+03	1.014E-01
2112	5.555E+03	3.035E+06	2.039E+02	5.198E+00	1.450E+03	9.743E-02
2113	5.337E+03	2.916E+06	1.959E+02	4.994E+00	1.393E+03	9.361E-02
2114	5.128E+03	2.802E+06	1.882E+02	4.798E+00	1.339E+03	8.994E-02
2115	4.927E+03	2.692E+06	1.809E+02	4.610E+00	1.286E+03	8.641E-02
2116	4.734E+03	2.586E+06	1.738E+02	4.429E+00	1.236E+03	8.302E-02
2117	4.548E+03	2.485E+06	1.669E+02	4.255E+00	1.187E+03	7.977E-02
2118	4.370E+03	2.387E+06	1.604E+02	4.089E+00	1.141E+03	7.664E-02
2119	4.199E+03	2.294E+06	1.541E+02	3.928E+00	1.096E+03	7.363E-02
2120	4.034E+03	2.204E+06	1.481E+02	3.774E+00	1.053E+03	7.075E-02
2121	3.876E+03	2.117E+06	1.423E+02	3.626E+00	1.012E+03	6.797E-02
2122	3.724E+03	2.034E+06	1.367E+02	3.484E+00	9.720E+02	6.531E-02
2123	3.578E+03	1.955E+06	1.313E+02	3.347E+00	9.339E+02	6.275E-02
2124	3.438E+03	1.878E+06	1.262E+02	3.216E+00	8.973E+02	6.029E-02
2125	3.303E+03	1.804E+06	1.212E+02	3.090E+00	8.621E+02	5.792E-02
2126	3.173E+03	1.734E+06	1.165E+02	2.969E+00	8.283E+02	5.565E-02
2127	3.049E+03	1.666E+06	1.119E+02	2.853E+00	7.958E+02	5.347E-02
2128	2.929E+03	1.600E+06	1.075E+02	2.741E+00	7.646E+02	5.137E-02

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2129	2.814E+03	1.538E+06	1.033E+02	2.633E+00	7.346E+02	4.936E-02
2130	2.704E+03	1.477E+06	9.925E+01	2.530E+00	7.058E+02	4.742E-02
2131	2.598E+03	1.419E+06	9.536E+01	2.431E+00	6.781E+02	4.556E-02
2132	2.496E+03	1.364E+06	9.162E+01	2.335E+00	6.515E+02	4.378E-02
2133	2.398E+03	1.310E+06	8.803E+01	2.244E+00	6.260E+02	4.206E-02
2134	2.304E+03	1.259E+06	8.458E+01	2.156E+00	6.015E+02	4.041E-02
2135	2.214E+03	1.209E+06	8.126E+01	2.071E+00	5.779E+02	3.883E-02
2136	2.127E+03	1.162E+06	7.808E+01	1.990E+00	5.552E+02	3.730E-02
2137	2.044E+03	1.116E+06	7.501E+01	1.912E+00	5.334E+02	3.584E-02
2138	1.964E+03	1.073E+06	7.207E+01	1.837E+00	5.125E+02	3.444E-02
2139	1.887E+03	1.031E+06	6.925E+01	1.765E+00	4.924E+02	3.309E-02
2140	1.813E+03	9.902E+05	6.653E+01	1.696E+00	4.731E+02	3.179E-02
2141	1.742E+03	9.514E+05	6.392E+01	1.629E+00	4.546E+02	3.054E-02
2142	1.673E+03	9.141E+05	6.142E+01	1.566E+00	4.367E+02	2.934E-02
2143	1.608E+03	8.782E+05	5.901E+01	1.504E+00	4.196E+02	2.819E-02
2144	1.545E+03	8.438E+05	5.669E+01	1.445E+00	4.032E+02	2.709E-02
2145	1.484E+03	8.107E+05	5.447E+01	1.388E+00	3.874E+02	2.603E-02
2146	1.426E+03	7.789E+05	5.234E+01	1.334E+00	3.722E+02	2.501E-02
2147	1.370E+03	7.484E+05	5.028E+01	1.282E+00	3.576E+02	2.403E-02
2148	1.316E+03	7.190E+05	4.831E+01	1.231E+00	3.436E+02	2.308E-02
2149	1.265E+03	6.908E+05	4.642E+01	1.183E+00	3.301E+02	2.218E-02
2150	1.215E+03	6.638E+05	4.460E+01	1.137E+00	3.171E+02	2.131E-02
2151	1.167E+03	6.377E+05	4.285E+01	1.092E+00	3.047E+02	2.047E-02
2152	1.122E+03	6.127E+05	4.117E+01	1.049E+00	2.928E+02	1.967E-02
2153	1.078E+03	5.887E+05	3.955E+01	1.008E+00	2.813E+02	1.890E-02
2154	1.035E+03	5.656E+05	3.800E+01	9.687E-01	2.703E+02	1.816E-02
2155	9.948E+02	5.434E+05	3.651E+01	9.307E-01	2.597E+02	1.745E-02
2156	9.558E+02	5.221E+05	3.508E+01	8.942E-01	2.495E+02	1.676E-02
2157	9.183E+02	5.017E+05	3.371E+01	8.592E-01	2.397E+02	1.610E-02
2158	8.823E+02	4.820E+05	3.238E+01	8.255E-01	2.303E+02	1.547E-02
2159	8.477E+02	4.631E+05	3.111E+01	7.931E-01	2.213E+02	1.487E-02
2160	8.144E+02	4.449E+05	2.989E+01	7.620E-01	2.126E+02	1.428E-02
2161	7.825E+02	4.275E+05	2.872E+01	7.321E-01	2.043E+02	1.372E-02
2162	7.518E+02	4.107E+05	2.760E+01	7.034E-01	1.962E+02	1.319E-02
2163	7.223E+02	3.946E+05	2.651E+01	6.758E-01	1.885E+02	1.267E-02
2164	6.940E+02	3.791E+05	2.547E+01	6.493E-01	1.812E+02	1.217E-02
2165	6.668E+02	3.643E+05	2.448E+01	6.239E-01	1.741E+02	1.169E-02
2166	6.407E+02	3.500E+05	2.352E+01	5.994E-01	1.672E+02	1.124E-02
2167	6.155E+02	3.363E+05	2.259E+01	5.759E-01	1.607E+02	1.080E-02
2168	5.914E+02	3.231E+05	2.171E+01	5.533E-01	1.544E+02	1.037E-02

PIPE2020 HEAD LOSS CALCULATIONS

PIPE2020 was developed by Civil Engineering professors from the University of Kentucky and has been continuously updated and maintained for over 40 years. PIPE2020 is used to determine head losses, system pressures, and velocities in piping systems controlled under vacuum. PIPE2020 operates under the assumptions that all flow in the piping system is steady, one-dimensional, isothermal flow for an ideal gas. The program uses the Darcy-Weisbach equation for head losses related to uncompressible flow and the ideal gas law for pressure-temperature-density relationships.

PIPE2020 has several useful options to develop LFG systems. The program allows the user to develop pipe models for any type of piping system material or configurations to coincide with field conditions. Models are made up of pipe links, end nodes and internal nodes to develop, modify and define simple and complex pipe systems.

Maps, grid lines and drawings in a variety of formats can be used for backgrounds. The program includes tabular and graphic interfaces for the input of information regarding the system. Multiple blower locations may be used in the program to simulate actual field conditions. In addition, blower performance curves may be entered into the program for comparison to operational and actual field conditions. PIPE2020 is capable of running multiple scenarios for any piping configuration including looped header systems. LFG flow units and pressure values at the wells are user specified for comparison to values obtained in the field.

As previously stated, PIPE2020 allows the user to input information in either a tabular or graphical method. The graphical method is called KYCAD. KYCAD allows the user to input the piping network to scale in an AutoCAD format. The user constructs the system on the computer by drawing the system as it will appear in the field and then adjusts the necessary pipe lengths and location of wells (nodes) as required. Site specific conditions are considered when laying out the system. No elevations are used for the various nodes in the analysis. It is assumed that all LFG flow will proceed through the system regardless of node elevations.

The following parameters are required for operation of PIPE2020:

Pipe inside diameter	VARIES
Pipe length	VARIES
Sum M-Fact (sum K's) per pipe section	1.3
Roughness within the pipe	0.07 Millifeet
LFG flow rate into the system at each well or node	VARIES
LFG operating temperature	110^{o}F
LFG specific gravity	1.036
Ratio of specific heats	1.303
LFG absolute viscosity	2.82x10^{-7} lb-sec/sf
Reference density at standard pressure	7.2x10^{-2} lbs/cf
LFG molecular weight	30.01 g/mole
Gas constant	51.489
Total Flow for Design Purposes	16,604 scfm (Per LandGEM)
Total Flow as a Sum of LFG Extraction Points	16,604 scfm (in PIPE2020)

The design process begins with the development of the LFG flow rates using the USEPA LFG model LandGEM. For the purposes of this analysis, a new 2022 LandGEM analysis for Woodland Meadows Landfill was created using multiple LandGEM models. These were created using historical waste intake receipts, previous GCCS Plans and previous LandGEM models. The next step involved developing and entering the proposed LFG collection and control system (GCCS) into the PIPE2020 model. Based on the planned phasing and conceptual design of the LFG system, the total design LFG flow is distributed evenly throughout the LFG extraction over the life of the site. The amount of flow at each extraction well location has been accurately represented from the LandGEMs (i.e. total estimated maximum flow for design purposes is 16,604 scfm and was matched in the PIPE2020 at a flow of 16,604 scfm).

Once all information is inputted into the model, the engineer and PIPE 2020 uses an iterative process which begins by balancing the system to control LFG velocity, pressure loss and pipe diameter for various parts of the system. The initial flow rates and their input locations into the system remain unchanged through this process. The engineer adjusts the pipe diameter to achieve the desired LFG velocity and pressure differential in each pipe. Once the key system parameters meet the design criteria, the engineer may proceed with developing and finalizing the system for consideration.

Peak flow of 16,604 scfm from the LandGEM is based on an assumed collection efficiency of 100% as a precaution. The submitted LandGEM models will show a steady decrease in flow after the peak.

The results of the PIPE2020 analysis for the Woodland Meadows GCCS Design Plan:

Total Maximum Flow	16,604 scfm
Maximum system pressure	-48.40-inches of w.c.
Maximum Con-Current Velocity	37.02 ft./sec. @ P-400 Prop. 30” SDR17
Maximum Counter-Current Velocity	33.12 ft./sec @ P-79 Exist. 20” SDR17
Maximum Loss per 100 feet of Pipe	0.55-inches of w.c

Please refer to the attached PIPE2020 output files for the entire analysis. All values are reasonably within the selected allowable operational ranges.

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*                                                                 *
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*  Version: 10.009  10/01/2019                                    *
*  Company:  BELENV        Serial #:  0                           *
*  Interface:  Classic                                            *
*  Licensed for Pipe2020                                          *
*                                                                 *
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INPUT DATA FILE NAME FOR THIS SIMULATION = C:\Users\PATRIC~1\Desktop\Random\WM KYPI~1\WMKYPI~3.KYP\wm_kypip.DAT
OUTPUT DATA FILE NAME FOR THIS SIMULATION = C:\Users\PATRIC~1\Desktop\Random\WM KYPI~1\WMKYPI~3.KYP\wm_kypip.OT2

DATE FOR THIS COMPUTER RUN   : 12-16-2022
START TIME FOR THIS COMPUTER RUN : 22:30:30:84

SUMMARY OF DISTRIBUTION SYSTEM CHARACTERISTICS:

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NUMBER OF PIPES           =   605
NUMBER OF JUNCTION NODES  =   587

UNITS SPECIFIED           = ENGLISH
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PROPERTIES OF THE GAS FOR THIS ANALYSIS ARE:

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OPERATING TEMPERATURE                =    110.000 DEGREES FAHRENHEIT
REFERENCE DENSITY (@ STD. PRESSURE) =    .72E-01 POUNDS/CUBIC FOOT
GAS MOLECULAR WEIGHT                 =     30.010
GAS SPECIFIC GRAVITY                 =      1.036
RATIO OF SPECIFIC HEATS              =      1.303
GAS CONSTANT                         =     51.489
ABSOLUTE VISCOSITY                   =   .282E-06 POUND SECONDS/SQUARE FOOT

    USER SPEC. FLOW UNITS (USFU)      = SCF / MIN.
   USER SPEC. PRESSURE UNITS(USPU)  = INCHES OF WATER (GAUGE)
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------- SUMMARY OF PIPE NETWORK GEOMETRIC AND OPERATING DATA -------

PIPE NAME	NODE #1	NODE #2	LENGTH (FT.)	DIAM. (IN.)	ROUGHNESS (MILLIFEET)	SUM-M FACT.	PUMP ID	ELEVATION CHANGE
a	J-41m	PS-8	19.0	17.5	.070	1.3	0	.0

P-1	J-2a	J-2b	249.0	7.5	.070	1.3	0	.0
P-10	W-118	J-149	64.0	7.5	.070	1.3	0	.0
P-100	J-26	J-44	117.0	17.5	.070	1.3	0	.0
P-101	J-47	J-26	188.0	17.5	.070	1.3	0	.0
P-102	J-46	J-47	164.0	7.5	.070	1.3	0	.0
P-103	J-16	J-15x	260.0	21.0	.070	1.3	0	.0
P-104	J-15x	J-48	204.0	21.0	.070	1.3	0	.0
P-105	J-15o	J-45	32.0	17.5	.070	1.3	0	.0
P-106	J-15o	J-15q	266.0	21.0	.070	1.3	0	.0
P-107	J-15q	J-48	122.0	21.0	.070	1.3	0	.0
P-108	J-15l	J-15i	199.0	17.5	.070	1.3	0	.0
P-109	J-15i	J-45a	150.0	17.5	.070	1.3	0	.0
P-11	J-2p	J-2q	96.0	15.8	.070	1.3	0	.0
P-110	J-13	J-45b	574.0	17.5	.070	1.3	0	.0
P-111	J-13	J-15d	182.0	17.5	.070	1.3	0	.0
P-112	J-15d	J-15f	225.0	17.5	.070	1.3	0	.0
P-113	J-15f	J-45a	21.0	17.5	.070	1.3	0	.0
P-114	J-2	J-2c	275.0	17.5	.070	1.3	0	.0
P-115	J-2	J-6	176.0	17.5	.070	1.3	0	.0
P-116	J-6	J-9	202.0	17.5	.070	1.3	0	.0
P-117	J-9	J-45b	51.0	17.5	.070	1.3	0	.0
P-118	J-2c	J-45ca	299.0	17.5	.070	1.3	0	.0
P-119	J-2h	J-2j	358.0	17.5	.070	1.3	0	.0
P-12	W-117	J-59	74.0	5.8	.070	1.3	0	.0
P-120	J-2h	J-45ca	21.0	17.5	.070	1.3	0	.0
P-121	J-2j	J-73	66.0	17.5	.070	1.3	0	.0
P-122	J-2l	J-127	23.0	17.5	.070	1.3	0	.0
P-123	J-2n	J-2q	169.0	17.5	.070	1.3	0	.0
P-124	J-2q	J-2t	185.0	17.5	.070	1.3	0	.0
P-125	J-2t	J-45d	30.0	17.5	.070	1.3	0	.0
P-126	J-45e	J-2y	70.0	17.5	.070	1.3	0	.0
P-127	J-2y	J-77	147.0	17.5	.070	1.3	0	.0
P-128	J-2w	J-45d	159.0	17.5	.070	1.3	0	.0
P-129	J-57	W-168	178.0	5.8	.070	1.3	0	.0
P-13	J-2s	J-2t	92.0	11.2	.070	1.3	0	.0
P-130	J-45g	J-41ya	214.0	17.5	.070	1.3	0	.0
P-131	J-66e	J-15h	206.0	7.5	.070	1.3	0	.0
P-132	J-50	W-46A	263.0	15.8	.070	1.3	0	.0
P-133	J-50	J-70	244.0	15.8	.070	1.3	0	.0
P-134	W-46A	J-45j	244.0	15.8	.070	1.3	0	.0
P-135	J-45j	J-41c	210.0	5.8	.070	1.3	0	.0
P-136	J-45k	J-45j	10.0	15.8	.070	1.3	0	.0
P-137	J-45l	J-45k	609.0	15.8	.070	1.3	0	.0
P-138	J-45m	J-45n	271.0	5.8	.070	1.3	0	.0
P-139	J-45n	J-34	180.0	5.8	.070	1.3	0	.0
P-14	W-116	J-60	69.0	11.2	.070	1.3	0	.0
P-140	J-45l	J-75	208.0	15.8	.070	1.3	0	.0
P-141	J-45	J-51	75.0	17.5	.070	1.3	0	.0
P-142	J-45	J-49	258.0	5.8	.070	1.3	0	.0
P-143	J-51	J-151	145.0	17.5	.070	1.3	0	.0
P-144	J-51	J-52	198.0	5.8	.070	1.3	0	.0
P-145	J-53	J-229	242.0	11.2	.070	1.3	0	.0
P-146	J-292	J-293	197.0	5.8	.070	1.3	0	.0
P-147	J-55	J-41x	90.0	5.8	.070	1.3	0	.0
P-148	J-56	J-15u	192.0	11.2	.070	1.3	0	.0

P-149	J-344	J-15	223.0	21.0	.070	1.3	0	.0
P-15	J-2v	J-2w	96.0	11.2	.070	1.3	0	.0
P-150	J-58	J-2p	182.0	15.8	.070	1.3	0	.0
P-151	J-59	J-2s	157.0	11.2	.070	1.3	0	.0
P-152	J-60	J-2v	155.0	11.2	.070	1.3	0	.0
P-153	EW-	J-12	205.0	5.8	.070	1.3	0	.0
P-154	J-15	J-63	180.0	11.2	.070	1.3	0	.0
P-155	W-23AF	W-23AE	194.0	5.8	.070	1.3	0	.0
P-156	J-138b	J-15k	142.0	15.8	.070	1.3	0	.0
P-157	J-344	J-138b	102.0	15.8	.070	1.3	0	.0
P-158	W-23AE	J-71	155.0	5.8	.070	1.3	0	.0
P-159	J-71	J-63	62.0	5.8	.070	1.3	0	.0
P-16	J-206	W-21B	165.0	15.8	.070	1.3	0	.0
P-160	e	c	200.0	5.8	.070	1.3	0	.0
P-161	d	c	181.0	5.8	.070	1.3	0	.0
P-162	c	J-111	268.0	5.8	.070	1.3	0	.0
P-163	b	J-111	152.0	5.8	.070	1.3	0	.0
P-164	J-134	J-141j	43.0	5.8	.070	1.3	0	.0
P-165	J-111	J-64	157.0	11.2	.070	1.3	0	.0
P-166	g	i	274.0	5.8	.070	1.3	0	.0
P-167	h	i	178.0	5.8	.070	1.3	0	.0
P-168	i	j	212.0	5.8	.070	1.3	0	.0
P-169	J-137	J-113	34.0	5.8	.070	1.3	0	.0
P-17	J-2z	J-3	294.0	7.5	.070	1.3	0	.0
P-170	j	J-65	181.0	5.8	.070	1.3	0	.0
P-171	l	m	235.0	5.8	.070	1.3	0	.0
P-172	n	p	157.0	5.8	.070	1.3	0	.0
P-173	o	p	146.0	5.8	.070	1.3	0	.0
P-174	p	J-66	178.0	7.5	.070	1.3	0	.0
P-175	q	J-66	30.0	5.8	.070	1.3	0	.0
P-176	J-67	J-72	259.0	21.0	.070	1.3	0	.0
P-177	J-66	J-67	79.0	7.5	.070	1.3	0	.0
P-178	J-117	r	236.0	5.8	.070	1.3	0	.0
P-179	r	J-19	150.0	5.8	.070	1.3	0	.0
P-18	J-3	J-2	196.0	7.5	.070	1.3	0	.0
P-180	J-72	J-21	147.0	21.0	.070	1.3	0	.0
P-181	J-19	J-72	68.0	5.8	.070	1.3	0	.0
P-182	s	r	175.0	5.8	.070	1.3	0	.0
P-183	J-75	J-21	214.0	15.8	.070	1.3	0	.0
P-184	t	J-75	216.0	5.8	.070	1.3	0	.0
P-185	W-22D	J-451	165.0	5.8	.070	1.3	0	.0
P-186	J-76	J-37	212.0	17.5	.070	1.3	0	.0
P-187	J-33	J-76	216.0	5.8	.070	1.3	0	.0
P-188	u	v	231.0	5.8	.070	1.3	0	.0
P-189	v	J-41b	266.0	5.8	.070	1.3	0	.0
P-19	J-4	J-6	268.0	5.8	.070	1.3	0	.0
P-190	J-118	x	304.0	5.8	.070	1.3	0	.0
P-191	x	y	243.0	5.8	.070	1.3	0	.0
P-192	w	x	193.0	5.8	.070	1.3	0	.0
P-193	y	J-36	228.0	5.8	.070	1.3	0	.0
P-194	J-194	J-193	261.0	5.8	.070	1.3	0	.0
P-195	J-193	J-121	315.0	5.8	.070	1.3	0	.0
P-196	J-121	J-45h	541.0	15.8	.070	1.3	0	.0
P-197	J-128	J-138o	175.0	5.8	.070	1.3	0	.0
P-198	J-138o	J-45h	110.0	15.8	.070	1.3	0	.0

P-199	J-54	J-207	182.0	21.0	.070	1.3	0	.0
P-2	J-2b	J-2d	66.0	7.5	.070	1.3	0	.0
P-20	J-5	J-7	265.0	7.5	.070	1.3	0	.0
P-200	J-61	J-54	90.0	5.8	.070	1.3	0	.0
P-201	J-261	J-295	181.0	5.8	.070	1.3	0	.0
P-202	J-200	J-195	170.0	15.8	.070	1.3	0	.0
P-203	J-199	J-121	315.0	15.8	.070	1.3	0	.0
P-204	a	J-41o	197.0	15.8	.070	1.3	0	.0
P-205	J-202	J-203	220.0	15.8	.070	1.3	0	.0
P-206	J-203	J-205	383.0	15.8	.070	1.3	0	.0
P-207	W-178	J-115	82.0	11.2	.070	1.3	0	.0
P-208	J-136	J-2y	102.0	5.8	.070	1.3	0	.0
P-209	J-236	J-237	147.0	5.8	.070	1.3	0	.0
P-21	J-7	J-8	141.0	7.5	.070	1.3	0	.0
P-210	J-141	J-79	28.0	26.3	.070	1.3	0	.0
P-211	J-70	J-45h	5.0	15.8	.070	1.3	0	.0
P-212	J-205	J-206	191.0	15.8	.070	1.3	0	.0
P-213	J-146	J-1431	256.0	15.8	.070	1.3	0	.0
P-214	J-142	J-78	420.0	21.0	.070	1.3	0	.0
P-215	J-150	J-147	200.0	15.8	.070	1.3	0	.0
P-216	J-141b	J-114	203.0	5.8	.070	1.3	0	.0
P-217	J-295	J-298	202.0	5.8	.070	1.3	0	.0
P-218	J-65	J-67	234.0	21.0	.070	1.3	0	.0
P-219	J-142	J-140	112.0	21.0	.070	1.3	0	.0
P-22	J-8	J-9	76.0	7.5	.070	1.3	0	.0
P-220	J-142	J-213	123.0	21.0	.070	1.3	0	.0
P-221	J-213	J-69	228.0	21.0	.070	1.3	0	.0
P-222	J-145	J-144	6.0	21.0	.070	1.3	0	.0
P-223	J-144	J-57	107.0	21.0	.070	1.3	0	.0
P-224	J-146a	J-21	6.0	5.8	.070	1.3	0	.0
P-225	J-225	J-224	204.0	5.8	.070	1.3	0	.0
P-226	J-141e	J-141c	170.0	5.8	.070	1.3	0	.0
P-227	J-298	J-300	195.0	5.8	.070	1.3	0	.0
P-228	J-224	J-223	236.0	5.8	.070	1.3	0	.0
P-229	W-134A	W-135	197.0	15.8	.070	1.3	0	.0
P-23	J-10	J-8	179.0	5.8	.070	1.3	0	.0
P-230	J-148	J-349	138.0	7.5	.070	1.3	0	.0
P-231	J-223	J-222	249.0	5.8	.070	1.3	0	.0
P-232	J-73	J-21	50.0	17.5	.070	1.3	0	.0
P-233	J-222	J-112	247.0	7.5	.070	1.3	0	.0
P-234	J-112	W-179	164.0	11.2	.070	1.3	0	.0
P-235	J-141c	W-158	186.0	5.8	.070	1.3	0	.0
P-236	J-120	J-137	185.0	5.8	.070	1.3	0	.0
P-237	J-113	J-141	222.0	21.0	.070	1.3	0	.0
P-238	J-159s	J-159x	222.0	5.8	.070	1.3	0	.0
P-239	J-126	J-119s	209.0	5.8	.070	1.3	0	.0
P-24	J-11	J-13	181.0	5.8	.070	1.3	0	.0
P-240	J-214	J-218	198.0	5.8	.070	1.3	0	.0
P-241	J-218	J-217	211.0	5.8	.070	1.3	0	.0
P-242	J-217	J-141a	196.0	5.8	.070	1.3	0	.0
P-243	W-150	W-158	199.0	5.8	.070	1.3	0	.0
P-244	J-61	W-23AB	199.0	5.8	.070	1.3	0	.0
P-245	J-151	J-344	138.0	21.0	.070	1.3	0	.0
P-246	J-151	W-21G	84.0	5.8	.070	1.3	0	.0
P-247	W-168	W-23AC	155.0	5.8	.070	1.3	0	.0

P-248	J-62	J-54	183.0	21.0	.070	1.3	0	.0
P-249	J-138w	J-65	33.0	21.0	.070	1.3	0	.0
P-25	J-14	J-15a	183.0	5.8	.070	1.3	0	.0
P-250	W-23W	J-206	200.0	5.8	.070	1.3	0	.0
P-251	J-204	J-205	196.0	5.8	.070	1.3	0	.0
P-252	z	J-128	246.0	5.8	.070	1.3	0	.0
P-253	J-197	J-198	207.0	7.5	.070	1.3	0	.0
P-254	J-196	J-197	170.0	7.5	.070	1.3	0	.0
P-255	J-196	J-201	189.0	7.5	.070	1.3	0	.0
P-256	J-201	J-78b	221.0	11.2	.070	1.3	0	.0
P-257	J-78b	a	241.0	11.2	.070	1.3	0	.0
P-258	W-67B	J-78b	39.0	5.8	.070	1.3	0	.0
P-259	W-158	J-157	192.0	7.5	.070	1.3	0	.0
P-26	J-12	J-15a	141.0	5.8	.070	1.3	0	.0
P-260	J-366	J-200	84.0	15.8	.070	1.3	0	.0
P-261	J-141i	J-159w	111.0	7.5	.070	1.3	0	.0
P-262	J-300	J-158a	84.0	7.5	.070	1.3	0	.0
P-263	J-297	J-299	191.0	5.8	.070	1.3	0	.0
P-264	J-159q	J-159y	221.0	15.8	.070	1.3	0	.0
P-265	J-138f	W-23F	198.0	5.8	.070	1.3	0	.0
P-266	W-23D	W-119A	200.0	5.8	.070	1.3	0	.0
P-267	J-138s	J-153	117.0	5.8	.070	1.3	0	.0
P-268	J-212	W-23Q	196.0	7.5	.070	1.3	0	.0
P-269	W-23Q	J-211	228.0	11.2	.070	1.3	0	.0
P-27	J-15a	J-15c	45.0	7.5	.070	1.3	0	.0
P-270	J-69	J-78d	231.0	21.0	.070	1.3	0	.0
P-271	J-211	J-69	107.0	11.2	.070	1.3	0	.0
P-272	J-209	J-210	199.0	5.8	.070	1.3	0	.0
P-273	J-68	J-69	151.0	5.8	.070	1.3	0	.0
P-274	J-78d	J-62	279.0	21.0	.070	1.3	0	.0
P-275	J-208	J-78d	125.0	5.8	.070	1.3	0	.0
P-276	W-37A	J-78e	343.0	7.5	.070	1.3	0	.0
P-277	J-78e	W-110	61.0	7.5	.070	1.3	0	.0
P-278	J-74	J-2n	45.0	21.0	.070	1.3	0	.0
P-279	J-78	J-74	23.0	21.0	.070	1.3	0	.0
P-28	J-80	J-355	25.0	21.0	.070	1.3	0	.0
P-280	J-78	J-21	68.0	21.0	.070	1.3	0	.0
P-281	J-103	W-22F	176.0	5.8	.070	1.3	0	.0
P-282	W-22F	J-24	153.0	5.8	.070	1.3	0	.0
P-283	W-23F	W-23E	206.0	5.8	.070	1.3	0	.0
P-284	W-23E	J-148	216.0	7.5	.070	1.3	0	.0
P-285	W-135	W-142	213.0	15.8	.070	1.3	0	.0
P-286	W-21B	J-62	30.0	21.0	.070	1.3	0	.0
P-287	J-130	J-135	83.0	21.0	.070	1.3	0	.0
P-288	J-310	J-158c	191.0	5.8	.070	1.3	0	.0
P-289	J-115	J-53	142.0	11.2	.070	1.3	0	.0
P-29	J-15c	J-15d	178.0	7.5	.070	1.3	0	.0
P-290	m	p	188.0	5.8	.070	1.3	0	.0
P-291	J-77	J-2w	36.0	17.5	.070	1.3	0	.0
P-292	W-142	J-146g	203.0	15.8	.070	1.3	0	.0
P-293	J-159y	J-141k	21.0	15.8	.070	1.3	0	.0
P-294	J-250	J-249	287.0	5.8	.070	1.3	0	.0
P-295	J-114	J-156	105.0	5.8	.070	1.3	0	.0
P-296	J-141l	J-167	291.0	5.8	.070	1.3	0	.0
P-297	J-141n	J-253	111.0	5.8	.070	1.3	0	.0

P-298	J-141o	J-253	124.0	5.8	.070	1.3	0	.0
P-299	W-23L	W-23N	197.0	21.0	.070	1.3	0	.0
P-3	J-1	J-2d	192.0	5.8	.070	1.3	0	.0
P-30	J-15e	J-15f	115.0	5.8	.070	1.3	0	.0
P-300	J-79	R-1	214.0	26.3	.070	1.3	0	.0
P-301	J-82	J-83	84.0	21.0	.070	1.3	0	.0
P-302	J-153	J-212	99.0	7.5	.070	1.3	0	.0
P-303	W-23N	J-153	167.0	21.0	.070	1.3	0	.0
P-304	J-149	J-58	96.0	7.5	.070	1.3	0	.0
P-305	J-141r	J-254	197.0	15.8	.070	1.3	0	.0
P-306	J-78aa	J-138s	189.0	5.8	.070	1.3	0	.0
P-307	W-230	W-23D	221.0	5.8	.070	1.3	0	.0
P-308	J-141q	J-141r	117.0	5.8	.070	1.3	0	.0
P-309	J-138	J-41z	32.0	21.0	.070	1.3	0	.0
P-31	J-15g	J-66e	17.0	7.5	.070	1.3	0	.0
P-310	W-23G	W-23I	224.0	5.8	.070	1.3	0	.0
P-311	J-198	W-23G	187.0	5.8	.070	1.3	0	.0
P-312	J-141p	J-141r	129.0	5.8	.070	1.3	0	.0
P-313	J-122	J-159u	205.0	5.8	.070	1.3	0	.0
P-314	J-159u	J-159v	229.0	5.8	.070	1.3	0	.0
P-315	J-159v	J-263	221.0	5.8	.070	1.3	0	.0
P-316	J-263	J-158d	91.0	7.5	.070	1.3	0	.0
P-317	J-141s	J-141t	287.0	5.8	.070	1.3	0	.0
P-318	J-141t	J-254	115.0	5.8	.070	1.3	0	.0
P-319	J-81	J-80	237.0	21.0	.070	1.3	0	.0
P-32	J-15h	J-15i	239.0	7.5	.070	1.3	0	.0
P-320	J-81	J-82	293.0	21.0	.070	1.3	0	.0
P-321	J-304	J-305	289.0	5.8	.070	1.3	0	.0
P-322	J-83	J-190	253.0	21.0	.070	1.3	0	.0
P-323	J-318	J-84	123.0	21.0	.070	1.3	0	.0
P-324	J-320	J-85	50.0	21.0	.070	1.3	0	.0
P-325	J-341	J-87	109.0	21.0	.070	1.3	0	.0
P-326	J-86	J-88	369.0	21.0	.070	1.3	0	.0
P-327	J-89	J-340	197.0	21.0	.070	1.3	0	.0
P-328	J-339	J-89	320.0	21.0	.070	1.3	0	.0
P-329	J-163	J-143b	63.0	15.8	.070	1.3	0	.0
P-33	J-15j	J-344	21.0	5.8	.070	1.3	0	.0
P-330	J-91	J-337	114.0	21.0	.070	1.3	0	.0
P-331	J-92	J-93	130.0	21.0	.070	1.3	0	.0
P-332	J-336	J-93	149.0	21.0	.070	1.3	0	.0
P-333	J-95	J-94	186.0	26.3	.070	1.3	0	.0
P-334	J-335	J-95	160.0	26.3	.070	1.3	0	.0
P-335	J-96	J-334	447.0	26.3	.070	1.3	0	.0
P-336	J-98	J-326	75.0	26.3	.070	1.3	0	.0
P-337	J-99	J-97	262.0	26.3	.070	1.3	0	.0
P-338	J-333	J-99	34.0	26.3	.070	1.3	0	.0
P-339	J-101	J-100	198.0	26.3	.070	1.3	0	.0
P-34	J-15k	J-15l	221.0	15.8	.070	1.3	0	.0
P-340	J-332	J-101	136.0	26.3	.070	1.3	0	.0
P-341	J-102	J-104	396.0	26.3	.070	1.3	0	.0
P-342	J-155	J-138w	47.0	21.0	.070	1.3	0	.0
P-343	J-104	J-105	202.0	26.3	.070	1.3	0	.0
P-344	J-105	R-1	259.0	26.3	.070	1.3	0	.0
P-345	J-41z	J-107	39.0	21.0	.070	1.3	0	.0
P-346	J-107	J-131	71.0	21.0	.070	1.3	0	.0

P-347	W-179	J-141	422.0	26.3	.070	1.3	0	.0
P-348	J-305	J-158e	100.0	5.8	.070	1.3	0	.0
P-349	J-158h	J-150	382.0	15.8	.070	1.3	0	.0
P-35	J-15m	J-15n	255.0	7.5	.070	1.3	0	.0
P-350	J-358	J-119o	21.0	5.8	.070	1.3	0	.0
P-351	J-359	J-119n	60.0	5.8	.070	1.3	0	.0
P-352	J-135	R-1	220.0	21.0	.070	1.3	0	.0
P-353	J-108	J-41v	49.0	17.5	.070	1.3	0	.0
P-354	J-141u	J-254	127.0	5.8	.070	1.3	0	.0
P-355	J-129	a	42.0	15.8	.070	1.3	0	.0
P-356	W-89	J-129	71.0	5.8	.070	1.3	0	.0
P-357	J-242	J-143n	116.0	26.3	.070	1.3	0	.0
P-358	J-174	J-257	282.0	5.8	.070	1.3	0	.0
P-359	J-158i	J-141y	201.0	15.8	.070	1.3	0	.0
P-36	J-15n	J-15o	243.0	7.5	.070	1.3	0	.0
P-360	J-159a	J-119a	218.0	5.8	.070	1.3	0	.0
P-361	J-159g	J-119c	224.0	5.8	.070	1.3	0	.0
P-362	J-356	W-186	30.0	26.3	.070	1.3	0	.0
P-363	J-119c	J-362	53.0	26.3	.070	1.3	0	.0
P-364	J-159f	J-119d	230.0	5.8	.070	1.3	0	.0
P-365	J-241	J-119j	42.0	26.3	.070	1.3	0	.0
P-366	J-202	J-366	141.0	15.8	.070	1.3	0	.0
P-367	J-257	J-255	137.0	5.8	.070	1.3	0	.0
P-368	W-180	W-179	214.0	26.3	.070	1.3	0	.0
P-369	J-119s	J-119t	112.0	5.8	.070	1.3	0	.0
P-37	J-15p	J-56	88.0	5.8	.070	1.3	0	.0
P-370	J-119u	J-119va	179.0	5.8	.070	1.3	0	.0
P-371	J-119j	J-119d	51.0	26.3	.070	1.3	0	.0
P-372	J-109	J-110	201.0	17.5	.070	1.3	0	.0
P-373	J-159h	J-244	289.0	5.8	.070	1.3	0	.0
P-374	J-119k	J-234	145.0	5.8	.070	1.3	0	.0
P-375	J-110	J-138	52.0	17.5	.070	1.3	0	.0
P-376	J-119l	W-187	28.0	21.0	.070	1.3	0	.0
P-377	W-187	J-119l	28.0	5.8	.070	1.3	0	.0
P-378	J-119d	J-356	34.0	26.3	.070	1.3	0	.0
P-379	W-186	J-39	47.0	26.3	.070	1.3	0	.0
P-38	J-15s	J-15q	169.0	11.2	.070	1.3	0	.0
P-380	J-159e	J-119e	225.0	5.8	.070	1.3	0	.0
P-381	J-39	J-119e	74.0	26.3	.070	1.3	0	.0
P-382	J-39	J-119e	74.0	5.8	.070	1.3	0	.0
P-383	J-159d	J-119f	223.0	5.8	.070	1.3	0	.0
P-384	J-119e	J-119l	126.0	21.0	.070	1.3	0	.0
P-385	W-187	J-119f	33.0	21.0	.070	1.3	0	.0
P-386	J-159c	J-119g	226.0	5.8	.070	1.3	0	.0
P-387	J-119m	J-235	127.0	5.8	.070	1.3	0	.0
P-388	J-119f	J-119n	137.0	21.0	.070	1.3	0	.0
P-389	J-119n	J-240	34.0	21.0	.070	1.3	0	.0
P-39	J-15r	J-15s	19.0	5.8	.070	1.3	0	.0
P-390	J-240	J-119g	33.0	21.0	.070	1.3	0	.0
P-391	J-252	J-169	278.0	5.8	.070	1.3	0	.0
P-392	J-119o	W-189	37.0	21.0	.070	1.3	0	.0
P-393	J-119g	J-119o	151.0	21.0	.070	1.3	0	.0
P-394	W-189	J-119a	23.0	21.0	.070	1.3	0	.0
P-395	J-169	J-255	125.0	5.8	.070	1.3	0	.0
P-396	J-119h	J-119p	48.0	21.0	.070	1.3	0	.0

P-397	J-119a	J-119p	145.0	21.0	.070	1.3	0	.0
P-398	J-141z	J-80	114.0	21.0	.070	1.3	0	.0
P-399	J-119h	J-141z	56.0	21.0	.070	1.3	0	.0
P-4	J-2d	J-2c	132.0	7.5	.070	1.3	0	.0
P-40	J-15t	J-15u	136.0	5.8	.070	1.3	0	.0
P-400	J-171	J-177	295.0	5.8	.070	1.3	0	.0
P-401	J-119w	W-181	283.0	5.8	.070	1.3	0	.0
P-402	J-119x	J-119y	204.0	5.8	.070	1.3	0	.0
P-403	J-119z	J-119	279.0	5.8	.070	1.3	0	.0
P-404	J-123	W-180	284.0	5.8	.070	1.3	0	.0
P-405	J-242	J-119r	36.0	26.3	.070	1.3	0	.0
P-406	J-119r	J-119c	59.0	26.3	.070	1.3	0	.0
P-407	W-183	J-119y	84.0	26.3	.070	1.3	0	.0
P-408	J-119y	J-244	116.0	26.3	.070	1.3	0	.0
P-409	J-244	J-119va	83.0	26.3	.070	1.3	0	.0
P-41	J-15u	J-15s	60.0	11.2	.070	1.3	0	.0
P-410	J-119va	W-181	113.0	26.3	.070	1.3	0	.0
P-411	W-181	J-119	199.0	26.3	.070	1.3	0	.0
P-412	J-119	J-119t	123.0	26.3	.070	1.3	0	.0
P-413	J-119t	W-180	78.0	26.3	.070	1.3	0	.0
P-414	J-125	J-245	232.0	5.8	.070	1.3	0	.0
P-415	J-132	J-247	232.0	5.8	.070	1.3	0	.0
P-416	J-133	J-152	295.0	5.8	.070	1.3	0	.0
P-417	J-159i	J-159j	290.0	5.8	.070	1.3	0	.0
P-418	J-159k	J-159l	288.0	5.8	.070	1.3	0	.0
P-419	J-159m	J-159n	275.0	5.8	.070	1.3	0	.0
P-42	J-57	J-151	147.0	21.0	.070	1.3	0	.0
P-420	J-159o	J-159n	202.0	15.8	.070	1.3	0	.0
P-421	J-159p	J-159l	284.0	5.8	.070	1.3	0	.0
P-422	J-159n	J-159l	198.0	15.8	.070	1.3	0	.0
P-423	J-159l	J-159j	199.0	15.8	.070	1.3	0	.0
P-424	J-159j	J-152	219.0	15.8	.070	1.3	0	.0
P-425	J-152	J-159q	242.0	15.8	.070	1.3	0	.0
P-426	J-159r	J-260	195.0	5.8	.070	1.3	0	.0
P-427	J-141x	J-323	190.0	15.8	.070	1.3	0	.0
P-428	J-158e	J-143f	66.0	5.8	.070	1.3	0	.0
P-429	J-159x	J-141i	59.0	5.8	.070	1.3	0	.0
P-43	J-15w	J-15z	369.0	7.5	.070	1.3	0	.0
P-430	J-177	J-141x	125.0	5.8	.070	1.3	0	.0
P-431	J-159z	J-102	91.0	5.8	.070	1.3	0	.0
P-432	J-259	J-258	287.0	5.8	.070	1.3	0	.0
P-433	J-159	J-159z	225.0	5.8	.070	1.3	0	.0
P-434	J-258	J-141x	134.0	5.8	.070	1.3	0	.0
P-435	J-251	J-286	184.0	5.8	.070	1.3	0	.0
P-436	J-289	J-175	209.0	5.8	.070	1.3	0	.0
P-437	J-175	J-84	164.0	5.8	.070	1.3	0	.0
P-438	J-191	J-284	204.0	5.8	.070	1.3	0	.0
P-439	J-280	J-282	197.0	5.8	.070	1.3	0	.0
P-44	J-15y	J-15z	154.0	7.5	.070	1.3	0	.0
P-440	J-141m	J-189	204.0	5.8	.070	1.3	0	.0
P-441	J-186	J-248	297.0	5.8	.070	1.3	0	.0
P-442	J-162	J-91	181.0	21.0	.070	1.3	0	.0
P-443	J-178	J-90	200.0	15.8	.070	1.3	0	.0
P-444	J-184	J-248	216.0	5.8	.070	1.3	0	.0
P-445	J-165	J-249	202.0	5.8	.070	1.3	0	.0

P-446	J-188	J-141y	211.0	5.8	.070	1.3	0	.0
P-447	J-141z	J-158i	217.0	15.8	.070	1.3	0	.0
P-448	J-166	J-168	199.0	5.8	.070	1.3	0	.0
P-449	J-141y	J-143aa	212.0	15.8	.070	1.3	0	.0
P-45	J-15z	J-15x	25.0	7.5	.070	1.3	0	.0
P-450	J-143aa	J-143k	232.0	15.8	.070	1.3	0	.0
P-451	J-279	J-143h	272.0	15.8	.070	1.3	0	.0
P-452	J-285	J-143g	227.0	15.8	.070	1.3	0	.0
P-453	J-143b	J-162	89.0	15.8	.070	1.3	0	.0
P-454	J-273	J-143b	340.0	15.8	.070	1.3	0	.0
P-455	J-306	J-158e	205.0	5.8	.070	1.3	0	.0
P-456	J-307	J-309	247.0	5.8	.070	1.3	0	.0
P-457	J-180	J-178	197.0	15.8	.070	1.3	0	.0
P-458	J-176	J-178	281.0	5.8	.070	1.3	0	.0
P-459	J-180	J-182	206.0	15.8	.070	1.3	0	.0
P-46	k	J-63	199.0	5.8	.070	1.3	0	.0
P-460	J-179	J-180	286.0	5.8	.070	1.3	0	.0
P-461	J-182	J-184	189.0	11.2	.070	1.3	0	.0
P-462	J-181	J-182	283.0	5.8	.070	1.3	0	.0
P-463	J-309	J-158c	63.0	5.8	.070	1.3	0	.0
P-464	J-183	J-184	277.0	5.8	.070	1.3	0	.0
P-465	J-185	J-180	284.0	5.8	.070	1.3	0	.0
P-466	J-159w	J-141k	215.0	21.0	.070	1.3	0	.0
P-467	J-141k	J-141j	204.0	21.0	.070	1.3	0	.0
P-468	J-187	J-83	193.0	5.8	.070	1.3	0	.0
P-469	J-141j	J-130	203.0	21.0	.070	1.3	0	.0
P-47	J-17	J-18	172.0	7.5	.070	1.3	0	.0
P-470	J-190	J-331	164.0	21.0	.070	1.3	0	.0
P-471	J-158c	J-99	144.0	5.8	.070	1.3	0	.0
P-472	J-192	J-190	82.0	7.5	.070	1.3	0	.0
P-473	J-195	J-199	177.0	15.8	.070	1.3	0	.0
P-474	W-21E	J-144	34.0	5.8	.070	1.3	0	.0
P-475	J-207	J-145	232.0	21.0	.070	1.3	0	.0
P-476	J-138v	J-207	17.0	5.8	.070	1.3	0	.0
P-477	J-210	J-68	197.0	5.8	.070	1.3	0	.0
P-478	J-312	J-345	126.0	5.8	.070	1.3	0	.0
P-479	J-313	J-345	117.0	5.8	.070	1.3	0	.0
P-48	J-18	J-16	192.0	7.5	.070	1.3	0	.0
P-480	J-345	J-158f	240.0	5.8	.070	1.3	0	.0
P-481	J-245	J-246	245.0	5.8	.070	1.3	0	.0
P-482	J-246	J-130	91.0	5.8	.070	1.3	0	.0
P-483	J-247	J-134	251.0	5.8	.070	1.3	0	.0
P-484	J-158f	J-326	165.0	5.8	.070	1.3	0	.0
P-485	J-249	J-167	212.0	5.8	.070	1.3	0	.0
P-486	J-314	J-158f	132.0	5.8	.070	1.3	0	.0
P-487	J-315	J-158f	105.0	5.8	.070	1.3	0	.0
P-488	J-124	J-324	267.0	5.8	.070	1.3	0	.0
P-489	J-253	J-141r	210.0	15.8	.070	1.3	0	.0
P-49	k	J-139	202.0	5.8	.070	1.3	0	.0
P-490	J-254	J-255	205.0	15.8	.070	1.3	0	.0
P-491	J-255	J-141x	199.0	15.8	.070	1.3	0	.0
P-492	J-143g	J-273	219.0	15.8	.070	1.3	0	.0
P-493	J-288	J-143g	99.0	7.5	.070	1.3	0	.0
P-494	J-143h	J-285	171.0	15.8	.070	1.3	0	.0
P-495	J-282	J-143h	98.0	5.8	.070	1.3	0	.0

P-496	J-260	J-159s	228.0	5.8	.070	1.3	0	.0
P-497	J-143i	J-279	193.0	15.8	.070	1.3	0	.0
P-498	J-262	J-159z	84.0	5.8	.070	1.3	0	.0
P-499	J-168	J-143i	79.0	5.8	.070	1.3	0	.0
P-5	W-36A	J-2g	292.0	7.5	.070	1.3	0	.0
P-50	J-21	J-22	234.0	15.8	.070	1.3	0	.0
P-500	J-264	J-265	212.0	5.8	.070	1.3	0	.0
P-501	J-265	J-192	163.0	5.8	.070	1.3	0	.0
P-502	J-266	J-192	112.0	5.8	.070	1.3	0	.0
P-503	J-159o	J-143	89.0	15.8	.070	1.3	0	.0
P-504	J-342	J-318	224.0	21.0	.070	1.3	0	.0
P-505	J-143	J-90	112.0	15.8	.070	1.3	0	.0
P-506	J-276	J-319	249.0	5.8	.070	1.3	0	.0
P-507	J-87	J-320	306.0	21.0	.070	1.3	0	.0
P-508	J-319	J-320	88.0	7.5	.070	1.3	0	.0
P-509	J-277	J-319	160.0	5.8	.070	1.3	0	.0
P-51	J-22	J-23	172.0	15.8	.070	1.3	0	.0
P-510	J-278	J-319	196.0	5.8	.070	1.3	0	.0
P-511	J-143j	J-143i	230.0	15.8	.070	1.3	0	.0
P-512	J-167	J-143j	158.0	7.5	.070	1.3	0	.0
P-513	J-143k	J-143j	202.0	15.8	.070	1.3	0	.0
P-514	J-189	J-143k	48.0	5.8	.070	1.3	0	.0
P-515	J-248	J-143aa	136.0	21.0	.070	1.3	0	.0
P-516	J-141f	J-106	35.0	15.8	.070	1.3	0	.0
P-517	J-284	J-86	220.0	5.8	.070	1.3	0	.0
P-518	J-286	J-287	199.0	5.8	.070	1.3	0	.0
P-519	J-287	J-288	203.0	5.8	.070	1.3	0	.0
P-52	J-20	J-24	192.0	7.5	.070	1.3	0	.0
P-520	W-23K	W-23B	205.0	5.8	.070	1.3	0	.0
P-521	J-290	J-321	25.0	5.8	.070	1.3	0	.0
P-522	J-321	J-89	151.0	5.8	.070	1.3	0	.0
P-523	J-291	J-321	211.0	5.8	.070	1.3	0	.0
P-524	J-322	J-290	54.0	5.8	.070	1.3	0	.0
P-525	W-23B	W-23C	188.0	5.8	.070	1.3	0	.0
P-526	J-271	J-272	198.0	5.8	.070	1.3	0	.0
P-527	J-84	J-331	160.0	21.0	.070	1.3	0	.0
P-528	J-85	J-342	33.0	21.0	.070	1.3	0	.0
P-529	J-341	J-86	55.0	21.0	.070	1.3	0	.0
P-53	J-24	J-26	414.0	7.5	.070	1.3	0	.0
P-530	J-340	J-88	88.0	21.0	.070	1.3	0	.0
P-531	J-339	J-338	133.0	21.0	.070	1.3	0	.0
P-532	J-337	J-92	118.0	21.0	.070	1.3	0	.0
P-533	J-336	J-94	183.0	26.3	.070	1.3	0	.0
P-534	J-96	J-335	283.0	26.3	.070	1.3	0	.0
P-535	J-334	J-98	80.0	26.3	.070	1.3	0	.0
P-536	J-100	J-333	162.0	26.3	.070	1.3	0	.0
P-537	J-332	J-102	63.0	26.3	.070	1.3	0	.0
P-538	J-338	J-162	54.0	21.0	.070	1.3	0	.0
P-539	J-272	J-273	205.0	5.8	.070	1.3	0	.0
P-54	J-25	J-27	175.0	5.8	.070	1.3	0	.0
P-540	W-23C	W-126A	190.0	5.8	.070	1.3	0	.0
P-541	J-163	J-323	204.0	15.8	.070	1.3	0	.0
P-542	J-268	J-323	120.0	5.8	.070	1.3	0	.0
P-543	J-269	J-163	132.0	5.8	.070	1.3	0	.0
P-544	J-267	J-323	132.0	5.8	.070	1.3	0	.0

P-545	J-127	J-2n	24.0	17.5	.070	1.3	0	.0
P-546	J-270	J-163	128.0	5.8	.070	1.3	0	.0
P-547	J-324	J-336	110.0	7.5	.070	1.3	0	.0
P-548	PS-8	J-41ya	10.0	17.5	.070	1.3	0	.0
P-549	J-131	R-1	120.0	21.0	.070	1.3	0	.0
P-55	J-28	J-29	197.0	5.8	.070	1.3	0	.0
P-550	J-293	J-294	204.0	5.8	.070	1.3	0	.0
P-551	J-156	J-119k	128.0	5.8	.070	1.3	0	.0
P-552	J-296	J-297	197.0	5.8	.070	1.3	0	.0
P-553	J-141z	J-158h	229.0	15.8	.070	1.3	0	.0
P-554	J-301	J-302	300.0	5.8	.070	1.3	0	.0
P-555	J-302	J-324	133.0	5.8	.070	1.3	0	.0
P-556	W-126A	J-143l	18.0	7.5	.070	1.3	0	.0
P-557	J-116	J-143l	186.0	5.8	.070	1.3	0	.0
P-558	J-316	J-325	123.0	7.5	.070	1.3	0	.0
P-559	W-126A	J-143l	18.0	21.0	.070	1.3	0	.0
P-56	J-30	J-31	204.0	5.8	.070	1.3	0	.0
P-560	J-317	J-325	215.0	7.5	.070	1.3	0	.0
P-561	J-303	J-324	238.0	5.8	.070	1.3	0	.0
P-562	J-325	J-335	135.0	7.5	.070	1.3	0	.0
P-563	J-311	J-158g	48.0	7.5	.070	1.3	0	.0
P-564	J-158g	J-143f	286.0	21.0	.070	1.3	0	.0
P-565	J-158g	J-299	296.0	21.0	.070	1.3	0	.0
P-566	J-143l	W-127A	289.0	15.8	.070	1.3	0	.0
P-567	J-299	J-158a	164.0	21.0	.070	1.3	0	.0
P-568	J-326	J-97	57.0	26.3	.070	1.3	0	.0
P-569	J-158a	J-294	286.0	21.0	.070	1.3	0	.0
P-57	J-32	J-45n	19.0	5.8	.070	1.3	0	.0
P-570	J-294	J-143b	326.0	21.0	.070	1.3	0	.0
P-571	J-143f	J-308	200.0	21.0	.070	1.3	0	.0
P-572	J-308	J-158d	215.0	21.0	.070	1.3	0	.0
P-573	J-158d	J-159w	219.0	21.0	.070	1.3	0	.0
P-574	J-146g	J-141f	285.0	15.8	.070	1.3	0	.0
P-575	J-141a	J-106	190.0	7.5	.070	1.3	0	.0
P-576	J-219	J-216	144.0	5.8	.070	1.3	0	.0
P-577	W-177	J-158b	497.0	15.8	.070	1.3	0	.0
P-578	J-158b	J-113	233.0	21.0	.070	1.3	0	.0
P-579	W-127A	W-134A	207.0	15.8	.070	1.3	0	.0
P-58	J-33	J-35	198.0	5.8	.070	1.3	0	.0
P-580	J-157	J-158b	50.0	7.5	.070	1.3	0	.0
P-581	J-155	J-64	77.0	21.0	.070	1.3	0	.0
P-582	J-106	J-216	166.0	15.8	.070	1.3	0	.0
P-583	J-216	W-177	116.0	15.8	.070	1.3	0	.0
P-584	J-349	W-178	231.0	11.2	.070	1.3	0	.0
P-585	J-350	J-64	158.0	21.0	.070	1.3	0	.0
P-586	f	J-350	69.0	7.5	.070	1.3	0	.0
P-587	J-238	J-158h	108.0	5.8	.070	1.3	0	.0
P-588	J-143n	W-183	86.0	26.3	.070	1.3	0	.0
P-589	J-143	J-253	263.0	15.8	.070	1.3	0	.0
P-59	J-35	J-41c	22.0	5.8	.070	1.3	0	.0
P-590	W-119A	J-146	101.0	5.8	.070	1.3	0	.0
P-591	J-147	J-146	106.0	15.8	.070	1.3	0	.0
P-592	J-355	J-45e	32.0	21.0	.070	1.3	0	.0
P-593	J-362	J-241	49.0	26.3	.070	1.3	0	.0
P-594	J-147	J-140	38.0	21.0	.070	1.3	0	.0

P-595	J-237	J-358	189.0	5.8	.070	1.3	0	.0
P-596	J-235	J-359	137.0	5.8	.070	1.3	0	.0
P-597	J-234	J-1191	194.0	7.5	.070	1.3	0	.0
P-598	J-347	J-150	144.0	5.8	.070	1.3	0	.0
P-599	J-141h	J-156	179.0	5.8	.070	1.3	0	.0
P-6	J-2g	J-2h	187.0	7.5	.070	1.3	0	.0
P-60	J-36	W-46A	13.0	5.8	.070	1.3	0	.0
P-600	J-119i	J-119j	201.0	21.0	.070	1.3	0	.0
P-601	J-154	J-158i	54.0	5.8	.070	1.3	0	.0
P-602	J-119q	J-119r	191.0	5.8	.070	1.3	0	.0
P-604	W-23J	J-366	130.0	5.8	.070	1.3	0	.0
P-61	W-17	J-38	136.0	7.5	.070	1.3	0	.0
P-62	J-38	J-40	71.0	7.5	.070	1.3	0	.0
P-63	J-41a	J-41b	19.0	5.8	.070	1.3	0	.0
P-64	J-41b	J-45k	32.0	5.8	.070	1.3	0	.0
P-65	J-41c	J-37	191.0	5.8	.070	1.3	0	.0
P-66	J-41d	W-16	266.0	5.8	.070	1.3	0	.0
P-67	W-16	J-41f	200.0	5.8	.070	1.3	0	.0
P-68	J-41g	J-41h	198.0	5.8	.070	1.3	0	.0
P-69	J-41i	W-44	219.0	5.8	.070	1.3	0	.0
P-7	W-9	J-2j	186.0	5.8	.070	1.3	0	.0
P-70	W-44	J-41k	234.0	5.8	.070	1.3	0	.0
P-71	J-74	J-2n	45.0	5.8	.070	1.3	0	.0
P-72	J-228	J-41m	157.0	5.8	.070	1.3	0	.0
P-73	J-141v	J-141u	280.0	5.8	.070	1.3	0	.0
P-74	W-159	J-53	50.0	5.8	.070	1.3	0	.0
P-75	J-229	J-41r	103.0	11.2	.070	1.3	0	.0
P-76	J-230	J-41t	311.0	5.8	.070	1.3	0	.0
P-77	J-231	J-41v	99.0	5.8	.070	1.3	0	.0
P-78	J-41w	J-55	46.0	5.8	.070	1.3	0	.0
P-79	J-41x	J-108	114.0	17.5	.070	1.3	0	.0
P-8	J-15	J-350	170.0	21.0	.070	1.3	0	.0
P-80	J-41x	J-109	85.0	17.5	.070	1.3	0	.0
P-81	J-41v	J-41t	104.0	17.5	.070	1.3	0	.0
P-82	J-41t	J-41r	92.0	17.5	.070	1.3	0	.0
P-83	J-41r	J-41m	154.0	17.5	.070	1.3	0	.0
P-84	J-70	J-129	134.0	15.8	.070	1.3	0	.0
P-85	J-41k	J-41h	140.0	17.5	.070	1.3	0	.0
P-86	J-41k	J-45g	195.0	17.5	.070	1.3	0	.0
P-87	J-41h	J-41f	204.0	17.5	.070	1.3	0	.0
P-88	J-41f	J-41	66.0	17.5	.070	1.3	0	.0
P-89	J-42	J-76	56.0	17.5	.070	1.3	0	.0
P-9	W-110	J-74	183.0	11.2	.070	1.3	0	.0
P-90	J-37	J-40	210.0	17.5	.070	1.3	0	.0
P-91	J-40	J-41	143.0	17.5	.070	1.3	0	.0
P-92	J-42	J-34	143.0	17.5	.070	1.3	0	.0
P-93	J-34	J-43	122.0	17.5	.070	1.3	0	.0
P-94	J-31	J-29	349.0	17.5	.070	1.3	0	.0
P-95	J-31	J-43	91.0	17.5	.070	1.3	0	.0
P-96	J-29	J-27	354.0	17.5	.070	1.3	0	.0
P-97	J-27	J-44	97.0	17.5	.070	1.3	0	.0
P-98	J-23	J-16	210.0	21.0	.070	1.3	0	.0
P-99	J-23	J-47	191.0	17.5	.070	1.3	0	.0

JUNCTION NAME	NODE TITLE	ELEV	DEMAND (USFU)	FPN PRESSURE
a		.00	.00	
b	EW-	.00	-47.85	
c	EW-	.00	-47.85	
d	EW-	.00	-47.85	
e	EW-	.00	-47.85	
EW-	EW-	.00	-47.85	
f	EW-	.00	-47.85	
g	EW-	.00	-47.85	
h	EW-	.00	-47.85	
i	EW-	.00	-47.85	
j	EW-	.00	-47.85	
J-1	W-93A	.00	-47.85	
J-10	W-91A	.00	-47.85	
J-100		.00	.00	
J-101		.00	.00	
J-102		.00	.00	
J-103	EW-	.00	-47.85	
J-104		.00	.00	
J-105		.00	.00	
J-106		.00	.00	
J-107		.00	.00	
J-108		.00	.00	
J-109		.00	.00	
J-11	W-3A	.00	-47.85	
J-110		.00	.00	
J-111	W-100A	.00	-47.85	
J-112	EW-	.00	-47.85	
J-113		.00	.00	
J-114	EW-	.00	-47.85	
J-115		.00	.00	
J-116	EW-	.00	-47.85	
J-117	EW-	.00	-47.85	
J-118	EW-	.00	-47.85	
J-119		.00	.00	
J-119a		.00	.00	
J-119c		.00	.00	
J-119d		.00	.00	
J-119e		.00	.00	
J-119f		.00	.00	
J-119g		.00	.00	
J-119h		.00	.00	
J-119i	W-173	.00	-47.85	
J-119j		.00	.00	
J-119k	W-129A	.00	-47.85	
J-119l		.00	-47.85	
J-119m	W-124	.00	-47.85	
J-119n		.00	-47.85	
J-119o		.00	.00	
J-119p	EW-	.00	-47.85	
J-119q	W-174	.00	-47.85	
J-119r		.00	.00	
J-119s	EW-	.00	-47.85	

J-119t		.00	.00
J-119u	W-176	.00	-47.85
J-119va		.00	.00
J-119w	EW-	.00	-47.85
J-119x	W-175	.00	-47.85
J-119y		.00	.00
J-119z	EW-	.00	-47.85
J-12	W-32A	.00	-47.85
J-120	EW-	.00	-47.85
J-121	W-83	.00	-47.85
J-122	EW-	.00	-47.85
J-123	EW-	.00	-47.85
J-124	EW-	.00	-47.85
J-125	EW-	.00	-47.85
J-126	EW-	.00	-47.85
J-127		.00	.00
J-128	W-74	.00	-47.85
J-129		.00	.00
J-13		.00	.00
J-130		.00	.00
J-131		.00	.00
J-132	EW-	.00	-47.85
J-133	EW-	.00	-47.85
J-134	EW-	.00	-47.85
J-135		.00	.00
J-136	W-114	.00	-47.85
J-137	W-163	.00	-47.85
J-138		.00	.00
J-138b		.00	.00
J-138f	EW-	.00	-47.85
J-138o	W-171A	.00	-47.85
J-138s	EW-	.00	-47.85
J-138v	EW-	.00	-47.85
J-138w	EW-	.00	-47.85
J-139	EW-	.00	-47.85
J-14	W-57A	.00	-47.85
J-140		.00	.00
J-141		.00	.00
J-141a	EW-	.00	-47.85
J-141b	EW-	.00	-47.85
J-141c	EW-	.00	-47.85
J-141e	EW-	.00	-47.85
J-141f	EW-	.00	-47.85
J-141h	EW-	.00	-47.85
J-141i		.00	.00
J-141j		.00	.00
J-141k		.00	.00
J-141l	EW-	.00	-47.85
J-141m	EW-	.00	-47.85
J-141n	EW-	.00	-47.85
J-141o	EW-	.00	-47.85
J-141p	EW-	.00	-47.85
J-141q	EW-	.00	-47.85
J-141r		.00	.00
J-141s	EW-	.00	-47.85

J-141t	EW-	.00	-47.85
J-141u	EW-	.00	-47.85
J-141v	EW-	.00	-47.85
J-141x		.00	.00
J-141y		.00	-47.85
J-141z		.00	.00
J-142		.00	.00
J-143	HP-	.00	.00
J-143aa		.00	.00
J-143b		.00	.00
J-143f		.00	.00
J-143g		.00	.00
J-143h		.00	.00
J-143i		.00	.00
J-143j		.00	.00
J-143k		.00	.00
J-143l		.00	.00
J-143n		.00	.00
J-144		.00	.00
J-145		.00	.00
J-146		.00	.00
J-146a		.00	.00
J-146g	EW-	.00	-47.85
J-147		.00	.00
J-148		.00	.00
J-149		.00	.00
J-15		.00	.00
J-150		.00	.00
J-151		.00	.00
J-152	EW-	.00	-47.85
J-153		.00	.00
J-154	EW-	.00	-47.85
J-155	HP-	.00	.00
J-156		.00	.00
J-157	EW-	.00	-47.85
J-158a		.00	.00
J-158b		.00	.00
J-158c		.00	.00
J-158d		.00	.00
J-158e		.00	.00
J-158f		.00	.00
J-158g		.00	.00
J-158h		.00	.00
J-158i		.00	.00
J-159	EW-	.00	-47.85
J-159a	EW-	.00	-47.85
J-159c	EW-	.00	-47.85
J-159d	EW-	.00	-47.85
J-159e	EW-	.00	-47.85
J-159f	EW-	.00	-47.85
J-159g	EW-	.00	-47.85
J-159h	EW-	.00	-47.85
J-159i	EW-	.00	-47.85
J-159j	EW-	.00	-47.85
J-159k	EW-	.00	-47.85

J-159l	EW-	.00	-47.85
J-159m	EW-	.00	-47.85
J-159n	EW-	.00	-47.85
J-159o	EW-	.00	-47.85
J-159p	EW-	.00	-47.85
J-159q	EW-	.00	-47.85
J-159r	EW-	.00	-47.85
J-159s	EW-	.00	-47.85
J-159u	EW-	.00	-47.85
J-159v	EW-	.00	-47.85
J-159w		.00	.00
J-159x	EW-	.00	-47.85
J-159y	EW-	.00	-47.85
J-159z		.00	.00
J-15a		.00	.00
J-15c	W-2B	.00	-47.85
J-15d		.00	.00
J-15e	W-1	.00	-47.85
J-15f		.00	.00
J-15g	W-58B	.00	-47.85
J-15h	W-88A	.00	-47.85
J-15i		.00	.00
J-15j	W-56B	.00	-47.85
J-15k	W-31A	.00	-47.85
J-15l		.00	.00
J-15m	W-55A	.00	-47.85
J-15n	W-30B	.00	-47.85
J-15o		.00	.00
J-15p	W-54A	.00	-47.85
J-15q		.00	.00
J-15r	W-29	.00	-47.85
J-15s		.00	.00
J-15t	W-169	.00	-47.85
J-15u		.00	.00
J-15w	W-53	.00	-47.85
J-15x		.00	.00
J-15y	W-28	.00	-47.85
J-15z		.00	.00
J-16		.00	.00
J-162		.00	.00
J-163		.00	.00
J-165	EW-	.00	-47.85
J-166	EW-	.00	-47.85
J-167	EW-	.00	-47.85
J-168	HP-	.00	-47.85
J-169	EW-	.00	-47.85
J-17	W-52	.00	-47.85
J-171	EW-	.00	-47.85
J-174	EW-	.00	-47.85
J-175	EW-	.00	-47.85
J-176	EW-	.00	-47.85
J-177	EW-	.00	-47.85
J-178	EW-	.00	-47.85
J-179	EW-	.00	-47.85
J-18	W-27	.00	-47.85

J-180	EW-	.00	-47.85
J-181	EW-	.00	-47.85
J-182	EW-	.00	-47.85
J-183	EW-	.00	-47.85
J-184	EW-	.00	-47.85
J-185	EW-	.00	-47.85
J-186	EW-	.00	-47.85
J-187	EW-	.00	-47.85
J-188	EW-	.00	-47.85
J-189	EW-	.00	-47.85
J-19	EW-	.00	-47.85
J-190		.00	.00
J-191	EW-	.00	-47.85
J-192		.00	.00
J-193	W-66B	.00	-47.85
J-194	EW-	.00	-47.85
J-195	EW-	.00	-47.85
J-196	EW-	.00	-47.85
J-197	EW-	.00	-47.85
J-198	EW-	.00	-47.85
J-199	EW-	.00	-47.85
J-2		.00	.00
J-20	W-108	.00	-47.85
J-200	W-64	.00	-47.85
J-201	W-179	.00	-47.85
J-202	EW-	.00	-47.85
J-203	EW-	.00	-47.85
J-204	W-78	.00	-47.85
J-205	EW-	.00	-47.85
J-206	EW-	.00	-47.85
J-207		.00	.00
J-208	W-94A	.00	-47.85
J-209	EW-	.00	-47.85
J-21	W-51	.00	-47.85
J-210	EW-	.00	-47.85
J-211	EW-	.00	-47.85
J-212	W-39	.00	-47.85
J-213	W-10A	.00	-47.85
J-214	EW-	.00	-47.85
J-216	EW-	.00	-47.85
J-217	EW-	.00	-47.85
J-218	EW-	.00	-47.85
J-219	EW-	.00	-47.85
J-22	W-26	.00	-47.85
J-222	W-153	.00	-47.85
J-223	W-148	.00	-47.85
J-224	W-144	.00	-47.85
J-225	W-140	.00	-47.85
J-228	W-167	.00	-47.85
J-229	W-166	.00	-47.85
J-23		.00	.00
J-230	W-160	.00	-47.85
J-231	W-165	.00	-47.85
J-234	W-130	.00	-47.85
J-235	W-123	.00	-47.85

J-236	W-121A	.00	-47.85
J-237	W-122	.00	-47.85
J-238	W-115	.00	-47.85
J-24	W-50	.00	-47.85
J-240	EW-	.00	.00
J-241	EW-	.00	-47.85
J-242	EW-	.00	-47.85
J-244	EW-	.00	-47.85
J-245	EW-	.00	-47.85
J-246	EW-	.00	-47.85
J-247	EW-	.00	-47.85
J-248	EW-	.00	-47.85
J-249	EW-	.00	-47.85
J-25	W-23	.00	-47.85
J-250	EW-	.00	-47.85
J-251	EW-	.00	-47.85
J-252	EW-	.00	-47.85
J-253	EW-	.00	.00
J-254	EW-	.00	.00
J-255	EW-	.00	.00
J-257	EW-	.00	-47.85
J-258	EW-	.00	-47.85
J-259	EW-	.00	-47.85
J-26		.00	.00
J-260	EW-	.00	-47.85
J-261	EW-	.00	-47.85
J-262	EW-	.00	-47.85
J-263	EW-	.00	-47.85
J-264	EW-	.00	-47.85
J-265	EW-	.00	-47.85
J-266	EW-	.00	-47.85
J-267	EW-	.00	-47.85
J-268	EW-	.00	-47.85
J-269	EW-	.00	-47.85
J-27		.00	.00
J-270	EW-	.00	-47.85
J-271	EW-	.00	-47.85
J-272	EW-	.00	-47.85
J-273	EW-	.00	-47.85
J-276	EW-	.00	-47.85
J-277	EW-	.00	-47.85
J-278	EW-	.00	-47.85
J-279	EW-	.00	-47.85
J-28	W-22	.00	-47.85
J-280	EW-	.00	-47.85
J-282	EW-	.00	-47.85
J-284	EW-	.00	-47.85
J-285	EW-	.00	-47.85
J-286	EW-	.00	-47.85
J-287	EW-	.00	-47.85
J-288	EW-	.00	-47.85
J-289	EW-	.00	-47.85
J-29		.00	.00
J-290	EW-	.00	.00
J-291	EW-	.00	-47.85

J-292	EW-	.00	-47.85
J-293	EW-	.00	-47.85
J-294	EW-	.00	-47.85
J-295	EW-	.00	-47.85
J-296	EW-	.00	-47.85
J-297	EW-	.00	-47.85
J-298	EW-	.00	-47.85
J-299	EW-	.00	-47.85
J-2a	W-35A	.00	-47.85
J-2b	W-7A	.00	-47.85
J-2c		.00	.00
J-2d		.00	.00
J-2g	W-8A	.00	-47.85
J-2h		.00	.00
J-2j		.00	.00
J-2l		.00	.00
J-2n		.00	.00
J-2p	W-111	.00	-47.85
J-2q		.00	.00
J-2s	W-112	.00	-47.85
J-2t		.00	.00
J-2v	W-113	.00	.00
J-2w		.00	.00
J-2y		.00	.00
J-2z	W-34A	.00	-47.85
J-3	W-6A	.00	-47.85
J-30	W-21	.00	-47.85
J-300	EW-	.00	-47.85
J-301	EW-	.00	-47.85
J-302	EW-	.00	-47.85
J-303	EW-	.00	-47.85
J-304	EW-	.00	-47.85
J-305	EW-	.00	-47.85
J-306	EW-	.00	-47.85
J-307	EW-	.00	-47.85
J-308	EW-	.00	-47.85
J-309	EW-	.00	-47.85
J-31		.00	.00
J-310	EW-	.00	-47.85
J-311	EW-	.00	-47.85
J-312	EW-	.00	-47.85
J-313	EW-	.00	-47.85
J-314	EW-	.00	-47.85
J-315	EW-	.00	-47.85
J-316	EW-	.00	-47.85
J-317	EW-	.00	-47.85
J-318		.00	.00
J-319		.00	.00
J-32	W-20	.00	-47.85
J-320		.00	.00
J-321		.00	.00
J-322		.00	-47.85
J-323		.00	.00
J-324		.00	.00
J-325		.00	.00

J-326		.00	.00
J-33	W-19A	.00	-47.85
J-331	CS-	.00	.00
J-332	HP-	.00	.00
J-333		.00	.00
J-334		.00	.00
J-335		.00	.00
J-336		.00	.00
J-337		.00	.00
J-338	HP-	.00	.00
J-339		.00	.00
J-34		.00	.00
J-340		.00	.00
J-341	HP-	.00	.00
J-342		.00	.00
J-344		.00	.00
J-345		.00	.00
J-347	EW-	.00	-47.85
J-349	EW-	.00	-47.85
J-35	W-	.00	-47.85
J-350		.00	.00
J-355		.00	.00
J-356		.00	.00
J-358		.00	.00
J-359		.00	.00
J-36	W-46A	.00	-47.85
J-362		.00	.00
J-366		.00	.00
J-37		.00	.00
J-38		.00	.00
J-39		.00	-47.85
J-4	W-5A	.00	-47.85
J-40		.00	.00
J-41		.00	.00
J-41a	W-47A	.00	-47.85
J-41b		.00	.00
J-41c		.00	.00
J-41d	W-45A	.00	-47.85
J-41f		.00	.00
J-41g	W-68	.00	-47.85
J-41h		.00	.00
J-41i	W-170A	.00	-47.85
J-41k		.00	.00
J-41m		.00	.00
J-41o		.00	.00
J-41r		.00	.00
J-41t		.00	.00
J-41v		.00	.00
J-41w	W-164	.00	-47.85
J-41x		.00	.00
J-41ya		.00	.00
J-41z		.00	.00
J-42		.00	.00
J-43		.00	.00
J-44		.00	.00

J-45		.00	.00
J-45a		.00	.00
J-45b		.00	.00
J-45ca		.00	.00
J-45d		.00	.00
J-45e		.00	.00
J-45g		.00	.00
J-45h		.00	.00
J-45j		.00	.00
J-45k		.00	.00
J-45l	HP-	.00	.00
J-45m	W-48	.00	-47.85
J-45n		.00	.00
J-46	W-25	.00	-47.85
J-47		.00	.00
J-48		.00	.00
J-49		.00	.00
J-5	W-33B	.00	-47.85
J-50		.00	.00
J-51		.00	.00
J-52		.00	.00
J-53		.00	.00
J-54		.00	.00
J-55		.00	.00
J-56		.00	.00
J-57		.00	.00
J-58		.00	.00
J-59		.00	.00
J-6		.00	.00
J-60		.00	.00
J-61	W-59B	.00	-47.85
J-62	EW-	.00	-47.85
J-63		.00	.00
J-64		.00	.00
J-65		.00	.00
J-66		.00	.00
J-66e		.00	.00
J-67		.00	.00
J-68	W-38R	.00	-47.85
J-69		.00	.00
J-7	W-4A	.00	-47.85
J-70		.00	.00
J-71	W-98B	.00	-47.85
J-72		.00	.00
J-73		.00	.00
J-74		.00	.00
J-75		.00	.00
J-76		.00	.00
J-77		.00	.00
J-78		.00	.00
J-78aa	EW-	.00	-47.85
J-78b		.00	.00
J-78d		.00	.00
J-78e		.00	.00
J-79		.00	.00

J-8		.00	.00	
J-80		.00	.00	
J-81	HP-	.00	.00	
J-82		.00	.00	
J-83		.00	.00	
J-84		.00	.00	
J-85		.00	.00	
J-86		.00	.00	
J-87		.00	.00	
J-88	CS-	.00	.00	
J-89		.00	.00	
J-9		.00	.00	
J-90	EW-	.00	-47.85	
J-91		.00	.00	
J-92		.00	.00	
J-93	CS-	.00	.00	
J-94		.00	.00	
J-95		.00	.00	
J-96	HP-	.00	.00	
J-97	CS-	.00	.00	
J-98		.00	.00	
J-99		.00	.00	
k	W-76B	.00	-47.85	
l	EW-	.00	-47.85	
m	EW-	.00	-47.85	
n	EW-	.00	-47.85	
o	EW-	.00	-47.85	
p	EW-	.00	-47.85	
PS-8		.00	.00	
q	W-104R	.00	-47.85	
r	EW-	.00	-47.85	
R-1		.00	.00	-60.00
s	EW-	.00	-47.85	
t	EW-	.00	-47.85	
u	EW-	.00	-47.85	
v	EW-	.00	-47.85	
w	EW-	.00	-47.85	
W-110	W-110	.00	-47.85	
W-116	W-116	.00	-47.85	
W-117	W-117	.00	-47.85	
W-118	W-118	.00	-47.85	
W-119A	EW-	.00	-47.85	
W-126A	EW-	.00	-47.85	
W-127A	EW-	.00	-47.85	
W-134A	EW-	.00	-47.85	
W-135	EW-	.00	-47.85	
W-142	EW-	.00	-47.85	
W-150	W-150	.00	-47.85	
W-158	W-156	.00	-47.85	
W-159	W-159	.00	-47.85	
W-16	W-16	.00	-47.85	
W-168	EW-	.00	-47.85	
W-17	W-17	.00	-47.85	
W-177	EW-	.00	-47.85	
W-178	EW-	.00	-47.85	

W-179	EW-	.00	-47.85
W-180	EW-	.00	-47.85
W-181	EW-	.00	-47.85
W-183		.00	-47.85
W-186	EW-	.00	.00
W-187	EW-	.00	.00
W-189	EW-	.00	.00
W-21B		.00	-47.85
W-21E	EW-	.00	-47.85
W-21G	EW-	.00	-47.85
W-22D		.00	-47.85
W-22F		.00	-47.85
W-230	EW-	.00	-47.85
W-23AB	EW-	.00	-47.85
W-23AC	EW-	.00	-47.85
W-23AE	EW-	.00	-47.85
W-23AF	EW-	.00	-47.85
W-23B	EW-	.00	-47.85
W-23C	EW-	.00	-47.85
W-23D	EW-	.00	-47.85
W-23E	EW-	.00	-47.85
W-23F	EW-	.00	-47.85
W-23G	EW-	.00	-47.85
W-23I	EW-	.00	-47.85
W-23J	EW-	.00	-47.85
W-23K	EW-	.00	-47.85
W-23L	EW-	.00	-47.85
W-23N	EW-	.00	-47.85
W-23Q	EW-	.00	-47.85
W-23W	EW-	.00	-47.85
W-36A	W-36A	.00	-47.85
W-37A	W-37A	.00	-47.85
W-44	W-44	.00	-47.85
W-46A		.00	-47.85
W-67B	W-67B	.00	-47.85
W-89		.00	-47.85
W-9	W-9	.00	-47.85
x	EW-	.00	-47.85
y	EW-	.00	-47.85
z	W-22	.00	-47.85

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Set = 0

==================== RESULTS FOR THIS SIMULATION FOLLOW =================

Solution was obtained in 13 trials

Flow Accuracy = .2797E-03[< .500E-02]

RV Accuracy = .0000E+00[< .100E-02]

PIPE NO.	NODE #1	NODE #2	FLOW (USFU)	LOSS (USPU)	VELOCITY (FT/S)	DENSITY (#/CF)	FRICTION FACTOR	AREA RATIO
a	J-41m	PS-8	-2118.004	.20	26.86	.062	.0152	.041
P-1	J-2a	J-2b	47.850	.02	3.22	.063	.0285	.005
P-10	W-118	J-149	47.850	.01	3.23	.063	.0285	.005
P-100	J-26	J-44	1255.949	.12	15.72	.063	.0166	.024
P-101	J-47	J-26	1064.549	.12	13.32	.063	.0171	.020
P-102	J-46	J-47	47.850	.02	3.22	.063	.0285	.005
P-103	J-16	J-15x	-176.188	.00	1.53	.063	.0264	.002
P-104	J-15x	J-48	-80.488	.00	.70	.063	.0324	.001
P-105	J-15o	J-45	158.762	.00	1.99	.063	.0259	.003
P-106	J-15o	J-15q	-63.062	.00	.55	.063	.0348	.001
P-107	J-15q	J-48	80.488	.00	.70	.063	.0324	.001
P-108	J-15l	J-15i	419.363	.02	5.25	.063	.0207	.008
P-109	J-15i	J-45a	515.063	.03	6.44	.063	.0198	.010
P-11	J-2p	J-2q	95.700	.00	1.49	.063	.0287	.002
P-110	J-13	J-45b	802.163	.16	10.04	.063	.0181	.015
P-111	J-13	J-15d	-754.313	.06	9.44	.063	.0183	.015
P-112	J-15d	J-15f	-562.913	.04	7.04	.063	.0194	.011
P-113	J-15f	J-45a	-515.063	.01	6.44	.063	.0198	.010
P-114	J-2	J-2c	1089.263	.16	13.65	.063	.0171	.021
P-115	J-2	J-6	-993.563	.10	12.45	.063	.0174	.019
P-116	J-6	J-9	-945.713	.10	11.84	.063	.0175	.018
P-117	J-9	J-45b	-802.163	.04	10.04	.063	.0181	.015
P-118	J-2c	J-45ca	1232.813	.21	15.46	.063	.0167	.024
P-119	J-2h	J-2j	1328.513	.28	16.67	.063	.0164	.026
P-12	W-117	J-59	47.850	.03	5.49	.063	.0267	.008
P-120	J-2h	J-45ca	-1232.813	.07	15.46	.063	.0167	.024
P-121	J-2j	J-73	1376.363	.11	17.28	.063	.0163	.027
P-122	J-21	J-127	727.760	.02	9.14	.063	.0184	.014
P-123	J-2n	J-2q	1690.867	.27	21.25	.063	.0158	.033
P-124	J-2q	J-2t	1786.567	.31	22.48	.063	.0156	.035
P-125	J-2t	J-45d	1882.267	.17	23.70	.063	.0155	.036
P-126	J-45e	J-2y	-1977.967	.24	24.97	.063	.0154	.038
P-127	J-2y	J-77	-1930.117	.32	24.35	.063	.0154	.037
P-128	J-2w	J-45d	-1882.267	.31	23.71	.063	.0155	.036
P-129	J-57	W-168	-95.700	.22	10.91	.063	.0228	.017
P-13	J-2s	J-2t	95.700	.01	2.96	.063	.0263	.005
P-130	J-45g	J-41ya	2118.004	.47	26.82	.062	.0152	.041
P-131	J-66e	J-15h	47.850	.02	3.22	.063	.0285	.005
P-132	J-50	W-46A	236.828	.01	3.65	.063	.0230	.006
P-133	J-50	J-70	-236.828	.01	3.65	.063	.0230	.006
P-134	W-46A	J-45j	523.928	.06	8.08	.063	.0193	.012
P-135	J-45j	J-41c	240.005	1.35	27.39	.063	.0190	.042
P-136	J-45k	J-45j	-283.923	.01	4.38	.063	.0220	.007
P-137	J-45l	J-45k	-427.473	.09	6.60	.063	.0202	.010
P-138	J-45m	J-45n	47.850	.09	5.47	.063	.0267	.008
P-139	J-45n	J-34	95.700	.22	10.95	.063	.0228	.017
P-14	W-116	J-60	47.850	.00	1.48	.063	.0315	.002
P-140	J-45l	J-75	475.323	.04	7.33	.063	.0197	.011
P-141	J-45	J-51	158.762	.00	1.99	.063	.0259	.003

P-142	J-45	J-49	.000	.00	.00	.063	.0000	.000
P-143	J-51	J-151	158.762	.00	1.99	.063	.0259	.003
P-144	J-51	J-52	.000	.00	.00	.063	.0000	.000
P-145	J-53	J-229	287.100	.10	8.96	.062	.0205	.014
P-146	J-292	J-293	47.850	.07	5.53	.062	.0267	.009
P-147	J-55	J-41x	47.850	.04	5.56	.062	.0267	.009
P-148	J-56	J-15u	47.850	.00	1.47	.063	.0315	.002
P-149	J-344	J-15	-1118.163	.06	9.71	.063	.0175	.015
P-15	J-2v	J-2w	47.850	.00	1.48	.063	.0315	.002
P-150	J-58	J-2p	47.850	.00	.74	.063	.0347	.001
P-151	J-59	J-2s	47.850	.00	1.48	.063	.0315	.002
P-152	J-60	J-2v	47.850	.00	1.48	.063	.0315	.002
P-153	EW-	J-12	47.850	.07	5.45	.063	.0267	.008
P-154	J-15	J-63	-239.250	.06	7.36	.063	.0213	.011
P-155	W-23AF	W-23AE	47.850	.07	5.45	.063	.0267	.008
P-156	J-138b	J-15k	212.752	.01	3.29	.063	.0235	.005
P-157	J-344	J-138b	212.752	.01	3.29	.063	.0235	.005
P-158	W-23AE	J-71	95.700	.19	10.90	.063	.0228	.017
P-159	J-71	J-63	143.550	.20	16.35	.063	.0209	.025
P-16	J-206	W-21B	911.571	.13	14.09	.063	.0173	.022
P-160	e	c	47.850	.07	5.44	.063	.0267	.008
P-161	d	c	47.850	.06	5.44	.063	.0267	.008
P-162	c	J-111	143.550	.65	16.34	.063	.0209	.025
P-163	b	J-111	47.850	.05	5.45	.063	.0267	.008
P-164	J-134	J-141j	143.550	.16	16.71	.062	.0209	.026
P-165	J-111	J-64	239.250	.05	7.36	.063	.0213	.011
P-166	g	i	47.850	.09	5.43	.063	.0267	.008
P-167	h	i	47.850	.06	5.43	.063	.0267	.008
P-168	i	j	143.550	.53	16.31	.063	.0209	.025
P-169	J-137	J-113	95.700	.07	11.16	.062	.0228	.017
P-17	J-2z	J-3	47.850	.03	3.22	.063	.0285	.005
P-170	j	J-65	191.400	.78	21.79	.063	.0198	.033
P-171	l	m	47.850	.08	5.44	.063	.0267	.008
P-172	n	p	47.850	.06	5.44	.063	.0267	.008
P-173	o	p	47.850	.05	5.44	.063	.0267	.008
P-174	p	J-66	239.250	.34	16.07	.063	.0198	.025
P-175	q	J-66	47.850	.02	5.45	.063	.0267	.008
P-176	J-67	J-72	-65.463	.00	.57	.063	.0344	.001
P-177	J-66	J-67	287.100	.26	19.30	.063	.0191	.030
P-178	J-117	r	47.850	.08	5.44	.063	.0267	.008
P-179	r	J-19	143.550	.39	16.33	.063	.0209	.025
P-18	J-3	J-2	95.700	.07	6.45	.063	.0241	.010
P-180	J-72	J-21	125.937	.00	1.09	.063	.0287	.002
P-181	J-19	J-72	191.400	.37	21.80	.063	.0198	.034
P-182	s	r	47.850	.06	5.44	.063	.0267	.008
P-183	J-75	J-21	523.173	.05	8.07	.063	.0193	.012
P-184	t	J-75	47.850	.07	5.45	.063	.0267	.008
P-185	W-22D	J-451	47.850	.06	5.45	.063	.0267	.008
P-186	J-76	J-37	1626.044	.28	20.44	.063	.0159	.031
P-187	J-33	J-76	130.845	.46	14.97	.063	.0213	.023
P-188	u	v	47.850	.08	5.44	.063	.0267	.008
P-189	v	J-41b	95.700	.31	10.89	.063	.0228	.017
P-19	J-4	J-6	47.850	.09	5.46	.063	.0267	.008
P-190	J-118	x	47.850	.10	5.42	.064	.0267	.008
P-191	x	y	143.550	.59	16.28	.063	.0209	.025

P-192	w	x	47.850	.07	5.42	.064	.0267	.008
P-193	y	J-36	191.400	.95	21.75	.063	.0198	.033
P-194	J-194	J-193	47.850	.09	5.44	.063	.0267	.008
P-195	J-193	J-121	95.700	.36	10.89	.063	.0228	.017
P-196	J-121	J-45h	-289.522	.04	4.47	.063	.0219	.007
P-197	J-128	J-138o	95.700	.21	10.89	.063	.0228	.017
P-198	J-138o	J-45h	143.550	.00	2.21	.063	.0259	.003
P-199	J-54	J-207	-1192.511	.06	10.37	.063	.0173	.016
P-2	J-2b	J-2d	95.700	.03	6.45	.063	.0241	.010
P-20	J-5	J-7	47.850	.03	3.22	.063	.0285	.005
P-200	J-61	J-54	95.700	.12	10.91	.063	.0228	.017
P-201	J-261	J-295	47.850	.06	5.53	.062	.0267	.008
P-202	J-200	J-195	-528.771	.05	8.16	.063	.0193	.013
P-203	J-199	J-121	-433.072	.05	6.68	.063	.0201	.010
P-204	a	J-41o	.000	.00	.00	.063	.0000	.000
P-205	J-202	J-203	672.321	.09	10.38	.063	.0184	.016
P-206	J-203	J-205	720.171	.15	11.12	.063	.0181	.017
P-207	W-178	J-115	239.250	.03	7.47	.062	.0213	.011
P-208	J-136	J-2y	47.850	.04	5.50	.063	.0267	.008
P-209	J-236	J-237	47.850	.05	5.51	.062	.0267	.008
P-21	J-7	J-8	95.700	.05	6.44	.063	.0241	.010
P-210	J-141	J-79	6487.982	.37	36.97	.062	.0134	.057
P-211	J-70	J-45h	145.972	.00	2.25	.063	.0258	.003
P-212	J-205	J-206	815.871	.12	12.60	.063	.0177	.019
P-213	J-146	J-1431	1203.946	.30	18.71	.063	.0165	.029
P-214	J-142	J-78	218.804	.00	1.91	.063	.0250	.003
P-215	J-150	J-147	-1590.483	.42	24.72	.063	.0157	.038
P-216	J-141b	J-114	47.850	.07	5.51	.063	.0267	.008
P-217	J-295	J-298	95.700	.25	11.06	.062	.0228	.017
P-218	J-65	J-67	-352.563	.01	3.06	.063	.0223	.005
P-219	J-142	J-140	2650.878	.23	23.14	.063	.0150	.036
P-22	J-8	J-9	143.550	.07	9.66	.063	.0220	.015
P-220	J-142	J-213	-2869.683	.28	25.03	.063	.0148	.038
P-221	J-213	J-69	-2821.833	.37	24.59	.063	.0148	.038
P-222	J-145	J-144	-1144.661	.03	9.95	.063	.0174	.015
P-223	J-144	J-57	-1096.811	.04	9.53	.063	.0176	.015
P-224	J-146a	J-21	.000	.00	.00	.063	.0000	.000
P-225	J-225	J-224	47.850	.07	5.56	.062	.0267	.009
P-226	J-141e	J-141c	47.850	.06	5.56	.062	.0267	.009
P-227	J-298	J-300	143.550	.50	16.60	.062	.0209	.026
P-228	J-224	J-223	95.700	.28	11.12	.062	.0228	.017
P-229	W-134A	W-135	1538.896	.40	24.00	.063	.0158	.037
P-23	J-10	J-8	47.850	.06	5.46	.063	.0267	.008
P-230	J-148	J-349	143.550	.11	9.79	.062	.0220	.015
P-231	J-223	J-222	143.550	.62	16.70	.062	.0209	.026
P-232	J-73	J-21	1376.363	.10	17.29	.063	.0163	.027
P-233	J-222	J-112	191.400	.30	13.16	.062	.0207	.020
P-234	J-112	W-179	239.250	.05	7.53	.062	.0213	.012
P-235	J-141c	W-158	95.700	.23	11.13	.062	.0228	.017
P-236	J-120	J-137	47.850	.07	5.58	.062	.0267	.009
P-237	J-113	J-141	2400.196	.27	21.34	.062	.0152	.033
P-238	J-159s	J-159x	143.550	.56	16.63	.062	.0209	.026
P-239	J-126	J-119s	47.850	.07	5.57	.062	.0267	.009
P-24	J-11	J-13	47.850	.06	5.46	.063	.0267	.008
P-240	J-214	J-218	47.850	.07	5.52	.062	.0267	.008

P-241	J-218	J-217	95.700	.26	11.05	.062	.0228	.017
P-242	J-217	J-141a	143.550	.50	16.59	.062	.0209	.026
P-243	W-150	W-158	47.850	.07	5.57	.062	.0267	.009
P-244	J-61	W-23AB	-47.850	.07	5.46	.063	.0267	.008
P-245	J-151	J-344	-953.261	.04	8.28	.063	.0181	.013
P-246	J-151	W-21G	-47.850	.03	5.45	.063	.0267	.008
P-247	W-168	W-23AC	-47.850	.06	5.45	.063	.0267	.008
P-248	J-62	J-54	-1288.211	.07	11.20	.063	.0170	.017
P-249	J-138w	J-65	-543.963	.01	4.72	.063	.0203	.007
P-25	J-14	J-15a	47.850	.06	5.45	.063	.0267	.008
P-250	W-23W	J-206	47.850	.07	5.46	.063	.0267	.008
P-251	J-204	J-205	47.850	.07	5.45	.063	.0267	.008
P-252	z	J-128	47.850	.08	5.44	.063	.0267	.008
P-253	J-197	J-198	-143.550	.15	9.62	.063	.0220	.015
P-254	J-196	J-197	-191.400	.21	12.83	.063	.0207	.020
P-255	J-196	J-201	239.250	.35	16.05	.063	.0198	.025
P-256	J-201	J-78b	287.100	.09	8.82	.063	.0205	.014
P-257	J-78b	a	334.950	.13	10.29	.063	.0198	.016
P-258	W-67B	J-78b	47.850	.02	5.44	.063	.0267	.008
P-259	W-158	J-157	191.400	.24	13.15	.062	.0207	.020
P-26	J-12	J-15a	95.700	.18	10.90	.063	.0228	.017
P-260	J-366	J-200	-576.621	.04	8.90	.063	.0189	.014
P-261	J-141i	J-159w	191.400	.16	13.11	.062	.0207	.020
P-262	J-300	J-158a	191.400	.13	13.07	.062	.0207	.020
P-263	J-297	J-299	95.700	.24	11.08	.062	.0228	.017
P-264	J-159q	J-159y	1378.567	.35	21.69	.062	.0161	.033
P-265	J-138f	W-23F	47.850	.07	5.52	.062	.0267	.008
P-266	W-23D	W-119A	95.700	.24	10.96	.063	.0228	.017
P-267	J-138s	J-153	95.700	.15	10.91	.063	.0228	.017
P-268	J-212	W-23Q	239.250	.37	16.12	.063	.0198	.025
P-269	W-23Q	J-211	287.100	.09	8.85	.063	.0205	.014
P-27	J-15a	J-15c	143.550	.05	9.65	.063	.0220	.015
P-270	J-69	J-78d	-2343.333	.26	20.40	.063	.0153	.031
P-271	J-211	J-69	334.950	.07	10.33	.063	.0198	.016
P-272	J-209	J-210	47.850	.07	5.46	.063	.0267	.008
P-273	J-68	J-69	143.550	.40	16.40	.063	.0209	.025
P-274	J-78d	J-62	-2295.482	.28	19.97	.063	.0154	.031
P-275	J-208	J-78d	47.850	.05	5.46	.063	.0267	.008
P-276	W-37A	J-78e	47.850	.03	3.23	.063	.0285	.005
P-277	J-78e	W-110	47.850	.01	3.23	.063	.0285	.005
P-278	J-74	J-2n	915.462	.02	7.99	.063	.0182	.012
P-279	J-78	J-74	867.407	.02	7.57	.063	.0184	.012
P-28	J-80	J-355	-1977.967	.09	17.35	.063	.0158	.027
P-280	J-78	J-21	-648.603	.01	5.66	.063	.0195	.009
P-281	J-103	W-22F	47.850	.06	5.45	.063	.0267	.008
P-282	W-22F	J-24	95.700	.19	10.90	.063	.0228	.017
P-283	W-23F	W-23E	95.700	.25	11.05	.062	.0228	.017
P-284	W-23E	J-148	143.550	.16	9.79	.062	.0220	.015
P-285	W-135	W-142	1586.746	.44	24.77	.062	.0157	.038
P-286	W-21B	J-62	959.421	.02	8.34	.063	.0180	.013
P-287	J-130	J-135	4071.715	.48	36.23	.062	.0140	.056
P-288	J-310	J-158c	47.850	.07	5.57	.062	.0267	.009
P-289	J-115	J-53	239.250	.05	7.47	.062	.0213	.011
P-29	J-15c	J-15d	191.400	.22	12.87	.063	.0207	.020
P-290	m	p	95.700	.23	10.88	.063	.0228	.017

P-291	J-77	J-2w	-1930.117	.19	24.33	.063	.0154	.037
P-292	W-142	J-146g	1634.596	.45	25.55	.062	.0156	.039
P-293	J-159y	J-141k	1426.417	.15	22.46	.062	.0160	.035
P-294	J-250	J-249	47.850	.10	5.50	.063	.0267	.008
P-295	J-114	J-156	95.700	.14	11.02	.062	.0228	.017
P-296	J-141l	J-167	47.850	.10	5.51	.063	.0267	.008
P-297	J-141n	J-253	47.850	.04	5.53	.062	.0267	.009
P-298	J-141o	J-253	47.850	.05	5.53	.062	.0267	.009
P-299	W-23L	W-23N	47.850	.00	.42	.063	.0377	.001
P-3	J-1	J-2d	47.850	.07	5.46	.063	.0267	.008
P-30	J-15e	J-15f	47.850	.04	5.45	.063	.0267	.008
P-300	J-79	R-1	6487.982	.66	37.02	.062	.0134	.057
P-301	J-82	J-83	1167.635	.04	10.25	.062	.0174	.016
P-302	J-153	J-212	191.400	.14	12.88	.063	.0207	.020
P-303	W-23N	J-153	95.700	.00	.83	.063	.0309	.001
P-304	J-149	J-58	47.850	.01	3.23	.063	.0285	.005
P-305	J-141r	J-254	21.106	.00	.33	.062	.0447	.001
P-306	J-78aa	J-138s	47.850	.07	5.45	.063	.0267	.008
P-307	W-230	W-23D	47.850	.08	5.48	.063	.0267	.008
P-308	J-141q	J-141r	47.850	.04	5.53	.062	.0267	.009
P-309	J-138	J-41z	2644.354	.16	23.54	.062	.0150	.036
P-31	J-15g	J-66e	47.850	.00	3.22	.063	.0285	.005
P-310	W-23G	W-23I	-47.850	.08	5.43	.063	.0267	.008
P-311	J-198	W-23G	-95.700	.23	10.86	.063	.0228	.017
P-312	J-141p	J-141r	47.850	.05	5.53	.062	.0267	.009
P-313	J-122	J-159u	47.850	.07	5.54	.062	.0267	.009
P-314	J-159u	J-159v	95.700	.28	11.08	.062	.0228	.017
P-315	J-159v	J-263	143.550	.56	16.64	.062	.0209	.026
P-316	J-263	J-158d	191.400	.14	13.10	.062	.0207	.020
P-317	J-141s	J-141t	47.850	.10	5.53	.062	.0267	.009
P-318	J-141t	J-254	95.700	.15	11.06	.062	.0228	.017
P-319	J-81	J-80	-1167.635	.07	10.25	.063	.0174	.016
P-32	J-15h	J-15i	95.700	.08	6.44	.063	.0241	.010
P-320	J-81	J-82	1167.635	.08	10.25	.063	.0174	.016
P-321	J-304	J-305	47.850	.10	5.54	.062	.0267	.009
P-322	J-83	J-190	1215.486	.08	10.67	.062	.0172	.016
P-323	J-318	J-84	-1454.735	.08	12.78	.062	.0167	.020
P-324	J-320	J-85	-1454.735	.05	12.79	.062	.0167	.020
P-325	J-341	J-87	-1598.286	.09	14.06	.062	.0164	.022
P-326	J-86	J-88	1693.986	.20	14.91	.062	.0162	.023
P-327	J-89	J-340	-1693.986	.13	14.92	.062	.0162	.023
P-328	J-339	J-89	-1789.686	.20	15.77	.062	.0160	.024
P-329	J-163	J-143b	786.706	.06	12.33	.062	.0178	.019
P-33	J-15j	J-344	47.850	.01	5.45	.063	.0267	.008
P-330	J-91	J-337	2682.148	.24	23.69	.062	.0150	.036
P-331	J-92	J-93	2682.148	.25	23.72	.062	.0150	.036
P-332	J-336	J-93	-2682.148	.27	23.74	.062	.0150	.036
P-333	J-95	J-94	-2873.548	.13	16.29	.062	.0153	.025
P-334	J-335	J-95	-2873.548	.12	16.29	.062	.0153	.025
P-335	J-96	J-334	2969.248	.23	16.85	.062	.0152	.026
P-336	J-98	J-326	2969.248	.10	16.87	.062	.0152	.026
P-337	J-99	J-97	-3160.648	.18	17.97	.062	.0150	.028
P-338	J-333	J-99	-3304.198	.10	18.79	.062	.0149	.029
P-339	J-101	J-100	-3304.198	.17	18.81	.062	.0149	.029
P-34	J-15k	J-151	260.602	.02	4.02	.063	.0225	.006

P-340	J-332	J-101	-3304.198	.15	18.82	.062	.0149	.029
P-341	J-102	J-104	3399.898	.28	19.38	.062	.0148	.030
P-342	J-155	J-138w	-591.813	.01	5.14	.063	.0199	.008
P-343	J-104	J-105	3399.898	.18	19.39	.062	.0148	.030
P-344	J-105	R-1	3399.898	.21	19.40	.062	.0148	.030
P-345	J-41z	J-107	2644.354	.17	23.55	.062	.0150	.036
P-346	J-107	J-131	2644.354	.20	23.57	.062	.0150	.036
P-347	W-179	J-141	4087.785	.41	23.25	.062	.0144	.036
P-348	J-305	J-158e	95.700	.14	11.09	.062	.0228	.017
P-349	J-158h	J-150	-1638.333	.71	25.50	.063	.0156	.039
P-35	J-15m	J-15n	47.850	.03	3.22	.063	.0285	.005
P-350	J-358	J-119o	95.700	.05	11.04	.062	.0228	.017
P-351	J-359	J-119n	95.700	.09	11.05	.062	.0228	.017
P-352	J-135	R-1	4071.715	.74	36.30	.062	.0140	.056
P-353	J-108	J-41v	-2596.505	.36	33.08	.062	.0147	.051
P-354	J-141u	J-254	95.700	.17	11.06	.062	.0228	.017
P-355	J-129	a	-334.950	.01	5.17	.063	.0212	.008
P-356	W-89	J-129	47.850	.03	5.45	.063	.0267	.008
P-357	J-242	J-143n	3226.487	.13	18.27	.062	.0150	.028
P-358	J-174	J-257	47.850	.10	5.53	.062	.0267	.009
P-359	J-158i	J-141y	418.428	.04	6.53	.063	.0202	.010
P-36	J-15n	J-15o	95.700	.08	6.44	.063	.0241	.010
P-360	J-159a	J-119a	47.850	.08	5.51	.062	.0267	.008
P-361	J-159g	J-119c	47.850	.08	5.55	.062	.0267	.009
P-362	J-356	W-186	-2939.387	.08	16.60	.062	.0152	.026
P-363	J-119c	J-362	-3082.937	.09	17.44	.062	.0151	.027
P-364	J-159f	J-119d	47.850	.08	5.54	.062	.0267	.009
P-365	J-241	J-119j	-3035.087	.09	17.16	.062	.0151	.026
P-366	J-202	J-366	-624.471	.06	9.64	.063	.0186	.015
P-367	J-257	J-255	95.700	.18	11.06	.062	.0228	.017
P-368	W-180	W-179	3800.686	.23	21.60	.062	.0146	.033
P-369	J-119s	J-119t	95.700	.15	11.14	.062	.0228	.017
P-37	J-15p	J-56	47.850	.03	5.45	.063	.0267	.008
P-370	J-119u	J-119va	47.850	.06	5.56	.062	.0267	.009
P-371	J-119j	J-119d	-2987.237	.09	16.88	.062	.0152	.026
P-372	J-109	J-110	2644.354	.70	33.83	.062	.0146	.052
P-373	J-159h	J-244	47.850	.10	5.56	.062	.0267	.009
P-374	J-119k	J-234	191.400	.66	22.10	.062	.0198	.034
P-375	J-110	J-138	2644.354	.39	33.89	.062	.0146	.052
P-376	J-119l	W-187	-2412.444	.13	21.26	.062	.0152	.033
P-377	W-187	J-119l	144.143	.13	16.67	.062	.0209	.026
P-378	J-119d	J-356	-2939.387	.08	16.61	.062	.0152	.026
P-379	W-186	J-39	-2939.387	.08	16.60	.062	.0152	.026
P-38	J-15s	J-15q	143.550	.02	4.42	.063	.0239	.007
P-380	J-159e	J-119e	47.850	.08	5.54	.062	.0267	.009
P-381	J-39	J-119e	-2808.042	.08	15.86	.062	.0153	.024
P-382	J-39	J-119e	-83.495	.08	9.67	.062	.0235	.015
P-383	J-159d	J-119f	47.850	.08	5.53	.062	.0267	.009
P-384	J-119e	J-119l	-2843.687	.28	25.08	.062	.0148	.039
P-385	W-187	J-119f	-2556.587	.15	22.52	.062	.0151	.035
P-386	J-159c	J-119g	47.850	.08	5.52	.062	.0267	.008
P-387	J-119m	J-235	47.850	.05	5.52	.062	.0267	.008
P-388	J-119f	J-119n	-2508.737	.23	22.09	.062	.0151	.034
P-389	J-119n	J-240	-2365.187	.13	20.82	.062	.0153	.032
P-39	J-15r	J-15s	47.850	.01	5.45	.063	.0267	.008

P-390	J-240	J-119g	-2365.187	.13	20.81	.062	.0153	.032
P-391	J-252	J-169	47.850	.09	5.53	.062	.0267	.009
P-392	J-119o	W-189	-2221.637	.12	19.53	.062	.0154	.030
P-393	J-119g	J-119o	-2317.337	.20	20.38	.062	.0153	.031
P-394	W-189	J-119a	-2221.637	.11	19.52	.062	.0154	.030
P-395	J-169	J-255	95.700	.16	11.06	.062	.0228	.017
P-396	J-119h	J-119p	2125.937	.11	18.66	.062	.0156	.029
P-397	J-119a	J-119p	-2173.787	.18	19.09	.062	.0155	.029
P-398	J-141z	J-80	-810.332	.02	7.11	.063	.0187	.011
P-399	J-119h	J-141z	-2125.937	.12	18.66	.063	.0156	.029
P-4	J-2d	J-2c	143.550	.10	9.67	.063	.0220	.015
P-40	J-15t	J-15u	47.850	.05	5.45	.063	.0267	.008
P-400	J-171	J-177	47.850	.10	5.53	.062	.0267	.009
P-401	J-119w	W-181	47.850	.10	5.56	.062	.0267	.009
P-402	J-119x	J-119y	47.850	.07	5.56	.062	.0267	.009
P-403	J-119z	J-119	47.850	.10	5.57	.062	.0267	.009
P-404	J-123	W-180	47.850	.10	5.57	.062	.0267	.009
P-405	J-242	J-119r	-3178.636	.09	17.99	.062	.0150	.028
P-406	J-119r	J-119c	-3130.787	.10	17.71	.062	.0151	.027
P-407	W-183	J-119y	3274.336	.12	18.55	.062	.0149	.029
P-408	J-119y	J-244	3322.186	.14	18.83	.062	.0149	.029
P-409	J-244	J-119va	3417.886	.13	19.38	.062	.0148	.030
P-41	J-15u	J-15s	95.700	.00	2.95	.063	.0263	.005
P-410	J-119va	W-181	3465.736	.15	19.66	.062	.0148	.030
P-411	W-181	J-119	3561.436	.20	20.21	.062	.0147	.031
P-412	J-119	J-119t	3609.286	.17	20.49	.062	.0147	.032
P-413	J-119t	W-180	3704.986	.15	21.04	.062	.0146	.032
P-414	J-125	J-245	47.850	.08	5.57	.062	.0267	.009
P-415	J-132	J-247	47.850	.08	5.56	.062	.0267	.009
P-416	J-133	J-152	47.850	.10	5.55	.062	.0267	.009
P-417	J-159i	J-159j	47.850	.10	5.54	.062	.0267	.009
P-418	J-159k	J-159l	47.850	.10	5.54	.062	.0267	.009
P-419	J-159m	J-159n	47.850	.09	5.53	.062	.0267	.009
P-42	J-57	J-151	-1001.111	.04	8.70	.063	.0179	.013
P-420	J-159o	J-159n	900.067	.15	14.11	.062	.0174	.022
P-421	J-159p	J-159l	47.850	.10	5.54	.062	.0267	.009
P-422	J-159n	J-159l	995.767	.18	15.61	.062	.0170	.024
P-423	J-159l	J-159j	1139.317	.23	17.87	.062	.0166	.027
P-424	J-159j	J-152	1235.017	.28	19.39	.062	.0164	.030
P-425	J-152	J-159q	1330.717	.35	20.91	.062	.0162	.032
P-426	J-159r	J-260	47.850	.07	5.53	.062	.0267	.009
P-427	J-141x	J-323	595.306	.07	9.33	.062	.0188	.014
P-428	J-158e	J-143f	143.550	.21	16.64	.062	.0209	.026
P-429	J-159x	J-141i	191.400	.34	22.21	.062	.0198	.034
P-43	J-15w	J-15z	47.850	.04	3.22	.063	.0285	.005
P-430	J-177	J-141x	95.700	.16	11.06	.062	.0228	.017
P-431	J-159z	J-102	95.700	.13	11.18	.062	.0228	.017
P-432	J-259	J-258	47.850	.10	5.53	.062	.0267	.009
P-433	J-159	J-159z	47.850	.08	5.59	.062	.0267	.009
P-434	J-258	J-141x	95.700	.17	11.06	.062	.0228	.017
P-435	J-251	J-286	47.850	.07	5.51	.063	.0267	.008
P-436	J-289	J-175	47.850	.07	5.51	.062	.0267	.008
P-437	J-175	J-84	95.700	.21	11.03	.062	.0228	.017
P-438	J-191	J-284	47.850	.07	5.52	.062	.0267	.008
P-439	J-280	J-282	47.850	.07	5.52	.062	.0267	.008

P-44	J-15y	J-15z	47.850	.02	3.22	.063	.0285	.005
P-440	J-141m	J-189	47.850	.07	5.51	.063	.0267	.008
P-441	J-186	J-248	47.850	.10	5.51	.063	.0267	.008
P-442	J-162	J-91	2682.148	.30	23.67	.062	.0150	.036
P-443	J-178	J-90	634.072	.08	9.93	.062	.0186	.015
P-444	J-184	J-248	-203.422	1.03	23.47	.062	.0196	.036
P-445	J-165	J-249	47.850	.07	5.50	.063	.0267	.008
P-446	J-188	J-141y	47.850	.07	5.51	.063	.0267	.008
P-447	J-141z	J-158i	370.578	.03	5.78	.063	.0208	.009
P-448	J-166	J-168	47.850	.07	5.51	.062	.0267	.008
P-449	J-141y	J-143aa	514.128	.05	8.02	.063	.0194	.012
P-45	J-15z	J-15x	95.700	.02	6.44	.063	.0241	.010
P-450	J-143aa	J-143k	406.406	.04	6.34	.063	.0204	.010
P-451	J-279	J-143h	884.906	.18	13.82	.062	.0174	.021
P-452	J-285	J-143g	1028.456	.20	16.08	.062	.0169	.025
P-453	J-143b	J-162	892.463	.09	13.99	.062	.0174	.022
P-454	J-273	J-143b	1363.406	.46	21.36	.062	.0161	.033
P-455	J-306	J-158e	47.850	.07	5.54	.062	.0267	.009
P-456	J-307	J-309	47.850	.09	5.57	.062	.0267	.009
P-457	J-180	J-178	538.372	.06	8.43	.062	.0192	.013
P-458	J-176	J-178	47.850	.10	5.53	.062	.0267	.009
P-459	J-180	J-182	-394.822	.03	6.18	.062	.0205	.010
P-46	k	J-63	95.700	.24	10.90	.063	.0228	.017
P-460	J-179	J-180	47.850	.10	5.53	.062	.0267	.009
P-461	J-182	J-184	-299.122	.09	9.33	.062	.0203	.014
P-462	J-181	J-182	47.850	.10	5.53	.062	.0267	.008
P-463	J-309	J-158c	95.700	.10	11.14	.062	.0228	.017
P-464	J-183	J-184	47.850	.09	5.53	.062	.0267	.008
P-465	J-185	J-180	47.850	.10	5.53	.062	.0267	.009
P-466	J-159w	J-141k	2358.199	.26	20.88	.062	.0153	.032
P-467	J-141k	J-141j	3784.615	.62	33.56	.062	.0142	.052
P-468	J-187	J-83	47.850	.07	5.51	.063	.0267	.008
P-469	J-141j	J-130	3928.165	.66	34.90	.062	.0141	.054
P-47	J-17	J-18	47.850	.02	3.22	.063	.0285	.005
P-470	J-190	J-331	1359.036	.08	11.93	.062	.0169	.018
P-471	J-158c	J-99	143.550	.39	16.73	.062	.0209	.026
P-472	J-192	J-190	143.550	.07	9.76	.062	.0220	.015
P-473	J-195	J-199	-480.922	.04	7.42	.063	.0197	.011
P-474	W-21E	J-144	47.850	.02	5.46	.063	.0267	.008
P-475	J-207	J-145	-1144.661	.07	9.95	.063	.0174	.015
P-476	J-138v	J-207	47.850	.01	5.46	.063	.0267	.008
P-477	J-210	J-68	95.700	.24	10.92	.063	.0228	.017
P-478	J-312	J-345	47.850	.05	5.56	.062	.0267	.009
P-479	J-313	J-345	47.850	.04	5.56	.062	.0267	.009
P-48	J-18	J-16	95.700	.07	6.44	.063	.0241	.010
P-480	J-345	J-158f	95.700	.29	11.12	.062	.0228	.017
P-481	J-245	J-246	95.700	.29	11.15	.062	.0228	.017
P-482	J-246	J-130	143.550	.27	16.74	.062	.0209	.026
P-483	J-247	J-134	95.700	.30	11.13	.062	.0228	.017
P-484	J-158f	J-326	191.400	.74	22.28	.062	.0198	.034
P-485	J-249	J-167	143.550	.53	16.51	.063	.0209	.025
P-486	J-314	J-158f	47.850	.05	5.56	.062	.0267	.009
P-487	J-315	J-158f	47.850	.04	5.56	.062	.0267	.009
P-488	J-124	J-324	47.850	.09	5.55	.062	.0267	.009
P-489	J-253	J-141r	-74.594	.00	1.17	.062	.0306	.002

P-49	k	J-139	-47.850	.07	5.45	.063	.0267	.008
P-490	J-254	J-255	212.506	.01	3.33	.062	.0235	.005
P-491	J-255	J-141x	403.906	.03	6.33	.062	.0204	.010
P-492	J-143g	J-273	1219.856	.27	19.09	.062	.0164	.029
P-493	J-288	J-143g	191.400	.14	13.04	.062	.0207	.020
P-494	J-143h	J-285	980.606	.15	15.33	.062	.0171	.024
P-495	J-282	J-143h	95.700	.13	11.04	.062	.0228	.017
P-496	J-260	J-159s	95.700	.27	11.07	.062	.0228	.017
P-497	J-143i	J-279	837.056	.12	13.07	.062	.0176	.020
P-498	J-262	J-159z	47.850	.03	5.59	.062	.0267	.009
P-499	J-168	J-143i	95.700	.11	11.03	.062	.0228	.017
P-5	W-36A	J-2g	47.850	.03	3.23	.063	.0285	.005
P-50	J-21	J-22	696.960	.10	10.76	.063	.0182	.017
P-500	J-264	J-265	47.850	.07	5.51	.063	.0267	.008
P-501	J-265	J-192	95.700	.20	11.02	.063	.0228	.017
P-502	J-266	J-192	47.850	.04	5.51	.063	.0267	.008
P-503	J-159o	J-143	-852.217	.08	13.35	.062	.0175	.021
P-504	J-342	J-318	-1454.735	.10	12.78	.062	.0167	.020
P-505	J-143	J-90	-681.922	.06	10.68	.062	.0183	.016
P-506	J-276	J-319	47.850	.09	5.52	.062	.0267	.008
P-507	J-87	J-320	-1598.286	.15	14.05	.062	.0164	.022
P-508	J-319	J-320	143.550	.08	9.77	.062	.0220	.015
P-509	J-277	J-319	47.850	.06	5.52	.062	.0267	.008
P-51	J-22	J-23	744.810	.09	11.50	.063	.0180	.018
P-510	J-278	J-319	47.850	.07	5.52	.062	.0267	.008
P-511	J-143j	J-143i	741.356	.11	11.57	.062	.0180	.018
P-512	J-167	J-143j	239.250	.31	16.26	.063	.0198	.025
P-513	J-143k	J-143j	502.106	.05	7.84	.062	.0195	.012
P-514	J-189	J-143k	95.700	.08	11.02	.063	.0228	.017
P-515	J-248	J-143aa	-107.722	.00	.95	.063	.0300	.001
P-516	J-141f	J-106	1730.296	.23	27.12	.062	.0155	.042
P-517	J-284	J-86	95.700	.27	11.05	.062	.0228	.017
P-518	J-286	J-287	95.700	.24	11.02	.062	.0228	.017
P-519	J-287	J-288	143.550	.52	16.56	.062	.0209	.025
P-52	J-20	J-24	47.850	.02	3.22	.063	.0285	.005
P-520	W-23K	W-23B	47.850	.07	5.48	.063	.0267	.008
P-521	J-290	J-321	47.850	.02	5.53	.062	.0267	.008
P-522	J-321	J-89	95.700	.19	11.06	.062	.0228	.017
P-523	J-291	J-321	47.850	.07	5.53	.062	.0267	.008
P-524	J-322	J-290	47.850	.02	5.53	.062	.0267	.008
P-525	W-23B	W-23C	95.700	.23	10.96	.063	.0228	.017
P-526	J-271	J-272	47.850	.07	5.52	.062	.0267	.008
P-527	J-84	J-331	-1359.036	.08	11.94	.062	.0169	.018
P-528	J-85	J-342	-1454.735	.05	12.79	.062	.0167	.020
P-529	J-341	J-86	1598.286	.07	14.06	.062	.0164	.022
P-53	J-24	J-26	191.400	.47	12.88	.063	.0207	.020
P-530	J-340	J-88	-1693.986	.09	14.92	.062	.0162	.023
P-531	J-339	J-338	1789.686	.12	15.78	.062	.0160	.024
P-532	J-337	J-92	2682.148	.24	23.70	.062	.0150	.036
P-533	J-336	J-94	2873.548	.13	16.28	.062	.0153	.025
P-534	J-96	J-335	-2969.248	.17	16.84	.062	.0152	.026
P-535	J-334	J-98	2969.248	.10	16.86	.062	.0152	.026
P-536	J-100	J-333	-3304.198	.16	18.80	.062	.0149	.029
P-537	J-332	J-102	3304.198	.11	18.82	.062	.0149	.029
P-538	J-338	J-162	1789.686	.08	15.78	.062	.0160	.024

P-539	J-272	J-273	95.700	.25	11.05	.062	.0228	.017
P-54	J-25	J-27	47.850	.06	5.46	.063	.0267	.008
P-540	W-23C	W-126A	143.550	.48	16.46	.063	.0209	.025
P-541	J-163	J-323	-691.006	.09	10.83	.062	.0183	.017
P-542	J-268	J-323	47.850	.05	5.53	.062	.0267	.009
P-543	J-269	J-163	47.850	.05	5.53	.062	.0267	.009
P-544	J-267	J-323	47.850	.05	5.53	.062	.0267	.009
P-545	J-127	J-2n	727.760	.03	9.14	.063	.0184	.014
P-546	J-270	J-163	47.850	.05	5.53	.062	.0267	.009
P-547	J-324	J-336	191.400	.16	13.12	.062	.0207	.020
P-548	PS-8	J-41ya	-2118.004	.19	26.84	.062	.0152	.041
P-549	J-131	R-1	2644.354	.24	23.58	.062	.0150	.036
P-55	J-28	J-29	47.850	.07	5.46	.063	.0267	.008
P-550	J-293	J-294	95.700	.25	11.07	.062	.0228	.017
P-551	J-156	J-119k	143.550	.35	16.55	.062	.0209	.025
P-552	J-296	J-297	47.850	.07	5.54	.062	.0267	.009
P-553	J-141z	J-158h	-1686.183	.52	26.29	.063	.0155	.040
P-554	J-301	J-302	47.850	.10	5.55	.062	.0267	.009
P-555	J-302	J-324	95.700	.17	11.11	.062	.0228	.017
P-556	W-126A	J-1431	18.708	.00	1.27	.063	.0352	.002
P-557	J-116	J-1431	47.850	.07	5.49	.063	.0267	.008
P-558	J-316	J-325	47.850	.01	3.28	.062	.0285	.005
P-559	W-126A	J-1431	172.693	.00	1.51	.063	.0266	.002
P-56	J-30	J-31	47.850	.07	5.47	.063	.0267	.008
P-560	J-317	J-325	47.850	.02	3.28	.062	.0285	.005
P-561	J-303	J-324	47.850	.08	5.55	.062	.0267	.009
P-562	J-325	J-335	95.700	.05	6.57	.062	.0241	.010
P-563	J-311	J-158g	47.850	.01	3.27	.062	.0285	.005
P-564	J-158g	J-143f	1783.999	.18	15.76	.062	.0161	.024
P-565	J-158g	J-299	-1736.148	.18	15.33	.062	.0161	.024
P-566	J-1431	W-127A	1443.196	.45	22.45	.063	.0160	.035
P-567	J-299	J-158a	-1592.598	.10	14.05	.062	.0164	.022
P-568	J-326	J-97	3160.648	.10	17.96	.062	.0150	.028
P-569	J-158a	J-294	-1401.198	.11	12.36	.062	.0168	.019
P-57	J-32	J-45n	47.850	.01	5.47	.063	.0267	.008
P-570	J-294	J-143b	-1257.648	.10	11.09	.062	.0171	.017
P-571	J-143f	J-308	1927.549	.17	17.03	.062	.0158	.026
P-572	J-308	J-158d	1975.399	.18	17.47	.062	.0158	.027
P-573	J-158d	J-159w	2166.799	.22	19.17	.062	.0155	.029
P-574	J-146g	J-141f	1682.446	.60	26.34	.062	.0155	.040
P-575	J-141a	J-106	191.400	.24	13.06	.062	.0207	.020
P-576	J-219	J-216	47.850	.05	5.54	.062	.0267	.009
P-577	W-177	J-158b	2065.246	1.37	32.55	.062	.0150	.050
P-578	J-158b	J-113	2304.496	.26	20.47	.062	.0154	.031
P-579	W-127A	W-134A	1491.046	.38	23.23	.063	.0159	.036
P-58	J-33	J-35	-82.995	.19	9.49	.063	.0235	.015
P-580	J-157	J-158b	239.250	.14	16.45	.062	.0198	.025
P-581	J-155	J-64	591.813	.01	5.14	.063	.0199	.008
P-582	J-106	J-216	1921.696	.55	30.16	.062	.0152	.046
P-583	J-216	W-177	2017.396	.49	31.71	.062	.0151	.049
P-584	J-349	W-178	191.400	.05	5.97	.062	.0224	.009
P-585	J-350	J-64	-831.063	.03	7.22	.063	.0186	.011
P-586	f	J-350	47.850	.01	3.22	.063	.0285	.005
P-587	J-238	J-158h	47.850	.04	5.50	.063	.0267	.008
P-588	J-143n	W-183	3226.487	.12	18.27	.062	.0150	.028

P-589	J-143	J-253	-170.294	.01	2.67	.062	.0248	.004
P-59	J-35	J-41c	-35.145	.01	4.02	.063	.0289	.006
P-590	W-119A	J-146	143.550	.29	16.45	.063	.0209	.025
P-591	J-147	J-146	1060.396	.14	16.47	.063	.0169	.025
P-592	J-355	J-45e	-1977.967	.09	17.35	.063	.0158	.027
P-593	J-362	J-241	-3082.937	.09	17.43	.062	.0151	.027
P-594	J-147	J-140	-2650.878	.16	23.15	.063	.0150	.036
P-595	J-237	J-358	95.700	.23	11.03	.062	.0228	.017
P-596	J-235	J-359	95.700	.18	11.05	.062	.0228	.017
P-597	J-234	J-1191	239.250	.37	16.32	.062	.0198	.025
P-598	J-347	J-150	47.850	.05	5.49	.063	.0267	.008
P-599	J-141h	J-156	47.850	.06	5.51	.062	.0267	.008
P-6	J-2g	J-2h	95.700	.07	6.45	.063	.0241	.010
P-60	J-36	W-46A	239.250	.25	27.24	.063	.0190	.042
P-600	J-119i	J-119j	47.850	.00	.42	.062	.0377	.001
P-601	J-154	J-158i	47.850	.02	5.51	.063	.0267	.008
P-602	J-119q	J-119r	47.850	.07	5.55	.062	.0267	.009
P-604	W-23J	J-366	47.850	.05	5.45	.063	.0267	.008
P-61	W-17	J-38	47.850	.01	3.24	.063	.0285	.005
P-62	J-38	J-40	47.850	.01	3.24	.063	.0285	.005
P-63	J-41a	J-41b	47.850	.01	5.45	.063	.0267	.008
P-64	J-41b	J-45k	143.550	.14	16.34	.063	.0209	.025
P-65	J-41c	J-37	204.860	.93	23.45	.063	.0195	.036
P-66	J-41d	W-16	47.850	.09	5.49	.063	.0267	.008
P-67	W-16	J-41f	95.700	.24	10.99	.063	.0228	.017
P-68	J-41g	J-41h	47.850	.07	5.50	.063	.0267	.008
P-69	J-41i	W-44	47.850	.08	5.50	.063	.0267	.008
P-7	W-9	J-2j	47.850	.07	5.47	.063	.0267	.008
P-70	W-44	J-41k	95.700	.28	11.01	.063	.0228	.017
P-71	J-74	J-2n	47.645	.02	5.45	.063	.0268	.008
P-72	J-228	J-41m	47.850	.06	5.53	.062	.0267	.009
P-73	J-141v	J-141u	47.850	.10	5.53	.062	.0267	.009
P-74	W-159	J-53	47.850	.02	5.53	.062	.0267	.009
P-75	J-229	J-41r	334.950	.07	10.46	.062	.0198	.016
P-76	J-230	J-41t	47.850	.11	5.54	.062	.0267	.009
P-77	J-231	J-41v	47.850	.04	5.55	.062	.0267	.009
P-78	J-41w	J-55	47.850	.02	5.56	.062	.0267	.009
P-79	J-41x	J-108	-2596.505	.50	33.12	.062	.0147	.051
P-8	J-15	J-350	-878.913	.03	7.63	.063	.0184	.012
P-80	J-41x	J-109	2644.354	.45	33.78	.062	.0146	.052
P-81	J-41v	J-41t	-2548.655	.46	32.43	.062	.0147	.050
P-82	J-41t	J-41r	-2500.804	.42	31.78	.062	.0148	.049
P-83	J-41r	J-41m	-2165.854	.41	27.49	.062	.0151	.042
P-84	J-70	J-129	-382.800	.02	5.90	.063	.0206	.009
P-85	J-41k	J-41h	-2022.304	.34	25.54	.063	.0153	.039
P-86	J-41k	J-45g	2118.004	.45	26.78	.062	.0152	.041
P-87	J-41h	J-41f	-1974.454	.40	24.91	.063	.0154	.038
P-88	J-41f	J-41	-1878.754	.21	23.68	.063	.0155	.036
P-89	J-42	J-76	1495.199	.13	18.79	.063	.0161	.029
P-9	W-110	J-74	95.700	.01	2.96	.063	.0263	.005
P-90	J-37	J-40	1830.904	.35	23.04	.063	.0156	.035
P-91	J-40	J-41	1878.754	.30	23.67	.063	.0155	.036
P-92	J-42	J-34	-1495.199	.19	18.78	.063	.0161	.029
P-93	J-34	J-43	-1399.499	.15	17.57	.063	.0163	.027
P-94	J-31	J-29	-1351.649	.28	16.95	.063	.0164	.026

P-95	J-31	J-43	1399.499	.13	17.56	.063	.0163	.027
P-96	J-29	J-27	-1303.799	.27	16.34	.063	.0165	.025
P-97	J-27	J-44	-1255.949	.11	15.73	.063	.0166	.024
P-98	J-23	J-16	-271.888	.00	2.36	.063	.0237	.004
P-99	J-23	J-47	1016.699	.11	12.72	.063	.0173	.020
R-1	R-1	R-1	-16603.950	.00	.07	.062	.0223	.000

JUNCTION NAME	NODE TITLE	DEMAND (USFU)	PRESSURE (USPU)	PRESSURE (PSIA)	PRESSURE (PSIG)	DENSITY #/CF
a		.00	-50.24	12.88	-1.81	.063
b	EW-	-47.85	-50.48	12.87	-1.82	.063
c	EW-	-47.85	-49.88	12.90	-1.80	.063
d	EW-	-47.85	-49.82	12.90	-1.80	.063
e	EW-	-47.85	-49.82	12.90	-1.80	.063
EW-	EW-	-47.85	-50.32	12.88	-1.82	.063
f	EW-	-47.85	-50.61	12.87	-1.83	.063
g	EW-	-47.85	-49.16	12.92	-1.77	.063
h	EW-	-47.85	-49.19	12.92	-1.77	.063
i	EW-	-47.85	-49.25	12.92	-1.78	.063
j	EW-	-47.85	-49.78	12.90	-1.80	.063
J-1	W-93A	-47.85	-51.28	12.85	-1.85	.063
J-10	W-91A	-47.85	-50.97	12.86	-1.84	.063
J-100		.00	-58.90	12.57	-2.13	.062
J-101		.00	-59.07	12.56	-2.13	.062
J-102		.00	-59.33	12.55	-2.14	.062
J-103	EW-	-47.85	-50.25	12.88	-1.81	.063
J-104		.00	-59.60	12.54	-2.15	.062
J-105		.00	-59.79	12.54	-2.16	.062
J-106		.00	-56.03	12.67	-2.02	.062
J-107		.00	-59.57	12.55	-2.15	.062
J-108		.00	-57.20	12.63	-2.06	.062
J-109		.00	-58.15	12.60	-2.10	.062
J-11	W-3A	-47.85	-50.84	12.86	-1.83	.063
J-110		.00	-58.85	12.57	-2.12	.062
J-111	W-100A	-47.85	-50.54	12.87	-1.82	.063
J-112	EW-	-47.85	-58.51	12.58	-2.11	.062
J-113		.00	-58.70	12.58	-2.12	.062
J-114	EW-	-47.85	-54.36	12.73	-1.96	.063
J-115		.00	-55.74	12.68	-2.01	.062
J-116	EW-	-47.85	-53.00	12.78	-1.91	.063
J-117	EW-	-47.85	-49.71	12.90	-1.79	.063
J-118	EW-	-47.85	-48.40	12.95	-1.75	.064
J-119		.00	-58.01	12.60	-2.09	.062
J-119a		.00	-54.69	12.72	-1.97	.062
J-119c		.00	-56.84	12.64	-2.05	.062
J-119d		.00	-56.48	12.66	-2.04	.062
J-119e		.00	-56.16	12.67	-2.03	.062
J-119f		.00	-55.60	12.69	-2.01	.062
J-119g		.00	-55.12	12.71	-1.99	.062
J-119h		.00	-54.40	12.73	-1.96	.063
J-119i	W-173	-47.85	-56.57	12.65	-2.04	.062

J-119j		.00	-56.57	12.65	-2.04	.062
J-119k	W-129A	-47.85	-54.86	12.72	-1.98	.062
J-119l		-47.85	-55.88	12.68	-2.02	.062
J-119m	W-124	-47.85	-55.06	12.71	-1.99	.062
J-119n		-47.85	-55.38	12.70	-2.00	.062
J-119o		.00	-54.92	12.71	-1.98	.062
J-119p	EW-	-47.85	-54.52	12.73	-1.97	.062
J-119q	W-174	-47.85	-56.87	12.64	-2.05	.062
J-119r		.00	-56.94	12.64	-2.06	.062
J-119s	EW-	-47.85	-58.03	12.60	-2.09	.062
J-119t		.00	-58.18	12.60	-2.10	.062
J-119u	W-176	-47.85	-57.60	12.62	-2.08	.062
J-119va		.00	-57.67	12.61	-2.08	.062
J-119w	EW-	-47.85	-57.72	12.61	-2.08	.062
J-119x	W-175	-47.85	-57.33	12.63	-2.07	.062
J-119y		.00	-57.40	12.62	-2.07	.062
J-119z	EW-	-47.85	-57.92	12.61	-2.09	.062
J-12	W-32A	-47.85	-50.39	12.88	-1.82	.063
J-120	EW-	-47.85	-58.57	12.58	-2.11	.062
J-121	W-83	-47.85	-50.31	12.88	-1.82	.063
J-122	EW-	-47.85	-55.99	12.68	-2.02	.062
J-123	EW-	-47.85	-58.23	12.59	-2.10	.062
J-124	EW-	-47.85	-57.14	12.63	-2.06	.062
J-125	EW-	-47.85	-58.13	12.60	-2.10	.062
J-126	EW-	-47.85	-57.96	12.60	-2.09	.062
J-127		.00	-52.26	12.81	-1.89	.063
J-128	W-74	-47.85	-50.05	12.89	-1.81	.063
J-129		.00	-50.25	12.88	-1.81	.063
J-13		.00	-50.90	12.86	-1.84	.063
J-130		.00	-58.78	12.57	-2.12	.062
J-131		.00	-59.76	12.54	-2.16	.062
J-132	EW-	-47.85	-57.58	12.62	-2.08	.062
J-133	EW-	-47.85	-56.56	12.65	-2.04	.062
J-134	EW-	-47.85	-57.96	12.60	-2.09	.062
J-135		.00	-59.26	12.56	-2.14	.062
J-136	W-114	-47.85	-53.81	12.75	-1.94	.063
J-137	W-163	-47.85	-58.63	12.58	-2.12	.062
J-138		.00	-59.24	12.56	-2.14	.062
J-138b		.00	-50.72	12.87	-1.83	.063
J-138f	EW-	-47.85	-55.07	12.71	-1.99	.062
J-138o	W-171A	-47.85	-50.27	12.88	-1.81	.063
J-138s	EW-	-47.85	-50.77	12.86	-1.83	.063
J-138v	EW-	-47.85	-50.91	12.86	-1.84	.063
J-138w	EW-	-47.85	-50.57	12.87	-1.82	.063
J-139	EW-	-47.85	-50.28	12.88	-1.81	.063
J-14	W-57A	-47.85	-50.50	12.87	-1.82	.063
J-140		.00	-52.47	12.80	-1.89	.063
J-141		.00	-58.97	12.57	-2.13	.062
J-141a	EW-	-47.85	-55.79	12.68	-2.01	.062
J-141b	EW-	-47.85	-54.29	12.74	-1.96	.063
J-141c	EW-	-47.85	-57.82	12.61	-2.09	.062
J-141e	EW-	-47.85	-57.76	12.61	-2.08	.062
J-141f	EW-	-47.85	-55.80	12.68	-2.01	.062
J-141h	EW-	-47.85	-54.44	12.73	-1.96	.063
J-141i		.00	-57.09	12.64	-2.06	.062

J-141j		.00	-58.12	12.60	-2.10	.062
J-141k		.00	-57.51	12.62	-2.08	.062
J-141l	EW-	-47.85	-54.08	12.74	-1.95	.063
J-141m	EW-	-47.85	-54.29	12.74	-1.96	.063
J-141n	EW-	-47.85	-55.70	12.69	-2.01	.062
J-141o	EW-	-47.85	-55.70	12.69	-2.01	.062
J-141p	EW-	-47.85	-55.69	12.69	-2.01	.062
J-141q	EW-	-47.85	-55.70	12.69	-2.01	.062
J-141r		.00	-55.74	12.68	-2.01	.062
J-141s	EW-	-47.85	-55.49	12.69	-2.00	.062
J-141t	EW-	-47.85	-55.59	12.69	-2.01	.062
J-141u	EW-	-47.85	-55.58	12.69	-2.01	.062
J-141v	EW-	-47.85	-55.48	12.69	-2.00	.062
J-141x		.00	-55.78	12.68	-2.01	.062
J-141y		-47.85	-54.35	12.73	-1.96	.063
J-141z		.00	-54.29	12.74	-1.96	.063
J-142		.00	-52.24	12.81	-1.89	.063
J-143	HP-	.00	-55.75	12.68	-2.01	.062
J-143aa		.00	-54.41	12.73	-1.96	.063
J-143b		.00	-56.00	12.67	-2.02	.062
J-143f		.00	-56.68	12.65	-2.05	.062
J-143g		.00	-55.26	12.70	-1.99	.062
J-143h		.00	-54.90	12.71	-1.98	.062
J-143i		.00	-54.60	12.73	-1.97	.062
J-143j		.00	-54.49	12.73	-1.97	.062
J-143k		.00	-54.44	12.73	-1.96	.063
J-143l		.00	-53.07	12.78	-1.92	.063
J-143n		.00	-57.16	12.63	-2.06	.062
J-144		.00	-50.83	12.86	-1.83	.063
J-145		.00	-50.85	12.86	-1.84	.063
J-146		.00	-52.77	12.79	-1.90	.063
J-146a		.00	-50.55	12.87	-1.82	.063
J-146g	EW-	-47.85	-55.19	12.70	-1.99	.062
J-147		.00	-52.63	12.80	-1.90	.063
J-148		.00	-55.55	12.69	-2.00	.062
J-149		.00	-52.54	12.80	-1.90	.063
J-15		.00	-50.65	12.87	-1.83	.063
J-150		.00	-53.06	12.78	-1.91	.063
J-151		.00	-50.75	12.86	-1.83	.063
J-152	EW-	-47.85	-56.66	12.65	-2.05	.062
J-153		.00	-50.93	12.86	-1.84	.063
J-154	EW-	-47.85	-54.29	12.74	-1.96	.063
J-155	HP-	.00	-50.57	12.87	-1.83	.063
J-156		.00	-54.51	12.73	-1.97	.062
J-157	EW-	-47.85	-58.30	12.59	-2.10	.062
J-158a		.00	-56.22	12.67	-2.03	.062
J-158b		.00	-58.44	12.59	-2.11	.062
J-158c		.00	-58.25	12.59	-2.10	.062
J-158d		.00	-57.03	12.64	-2.06	.062
J-158e		.00	-56.47	12.66	-2.04	.062
J-158f		.00	-57.62	12.62	-2.08	.062
J-158g		.00	-56.50	12.66	-2.04	.062
J-158h		.00	-53.77	12.76	-1.94	.063
J-158i		.00	-54.32	12.74	-1.96	.063
J-159	EW-	-47.85	-59.12	12.56	-2.13	.062

J-159a	EW-	-47.85	-54.62	12.72	-1.97	.062
J-159c	EW-	-47.85	-55.04	12.71	-1.99	.062
J-159d	EW-	-47.85	-55.52	12.69	-2.00	.062
J-159e	EW-	-47.85	-56.08	12.67	-2.02	.062
J-159f	EW-	-47.85	-56.40	12.66	-2.04	.062
J-159g	EW-	-47.85	-56.77	12.65	-2.05	.062
J-159h	EW-	-47.85	-57.44	12.62	-2.07	.062
J-159i	EW-	-47.85	-56.28	12.66	-2.03	.062
J-159j	EW-	-47.85	-56.38	12.66	-2.03	.062
J-159k	EW-	-47.85	-56.06	12.67	-2.02	.062
J-159l	EW-	-47.85	-56.16	12.67	-2.03	.062
J-159m	EW-	-47.85	-55.89	12.68	-2.02	.062
J-159n	EW-	-47.85	-55.98	12.68	-2.02	.062
J-159o	EW-	-47.85	-55.83	12.68	-2.01	.062
J-159p	EW-	-47.85	-56.06	12.67	-2.02	.062
J-159q	EW-	-47.85	-57.01	12.64	-2.06	.062
J-159r	EW-	-47.85	-55.85	12.68	-2.02	.062
J-159s	EW-	-47.85	-56.19	12.67	-2.03	.062
J-159u	EW-	-47.85	-56.06	12.67	-2.02	.062
J-159v	EW-	-47.85	-56.33	12.66	-2.03	.062
J-159w		.00	-57.25	12.63	-2.07	.062
J-159x	EW-	-47.85	-56.75	12.65	-2.05	.062
J-159y	EW-	-47.85	-57.36	12.63	-2.07	.062
J-159z		.00	-59.20	12.56	-2.14	.062
J-15a		.00	-50.57	12.87	-1.82	.063
J-15c	W-2B	-47.85	-50.62	12.87	-1.83	.063
J-15d		.00	-50.84	12.86	-1.83	.063
J-15e	W-1	-47.85	-50.76	12.86	-1.83	.063
J-15f		.00	-50.80	12.86	-1.83	.063
J-15g	W-58B	-47.85	-50.66	12.87	-1.83	.063
J-15h	W-88A	-47.85	-50.68	12.87	-1.83	.063
J-15i		.00	-50.76	12.86	-1.83	.063
J-15j	W-56B	-47.85	-50.70	12.87	-1.83	.063
J-15k	W-31A	-47.85	-50.73	12.87	-1.83	.063
J-15l		.00	-50.74	12.86	-1.83	.063
J-15m	W-55A	-47.85	-50.63	12.87	-1.83	.063
J-15n	W-30B	-47.85	-50.65	12.87	-1.83	.063
J-15o		.00	-50.73	12.87	-1.83	.063
J-15p	W-54A	-47.85	-50.67	12.87	-1.83	.063
J-15q		.00	-50.73	12.87	-1.83	.063
J-15r	W-29	-47.85	-50.70	12.87	-1.83	.063
J-15s		.00	-50.71	12.87	-1.83	.063
J-15t	W-169	-47.85	-50.66	12.87	-1.83	.063
J-15u		.00	-50.71	12.87	-1.83	.063
J-15w	W-53	-47.85	-50.68	12.87	-1.83	.063
J-15x		.00	-50.74	12.87	-1.83	.063
J-15y	W-28	-47.85	-50.70	12.87	-1.83	.063
J-15z		.00	-50.72	12.87	-1.83	.063
J-16		.00	-50.74	12.87	-1.83	.063
J-162		.00	-56.09	12.67	-2.02	.062
J-163		.00	-55.94	12.68	-2.02	.062
J-165	EW-	-47.85	-53.58	12.76	-1.93	.063
J-166	EW-	-47.85	-54.42	12.73	-1.96	.063
J-167	EW-	-47.85	-54.18	12.74	-1.96	.063
J-168	HP-	-47.85	-54.49	12.73	-1.97	.062

J-169	EW-	-47.85	-55.59	12.69	-2.01	.062
J-17	W-52	-47.85	-50.65	12.87	-1.83	.063
J-171	EW-	-47.85	-55.52	12.69	-2.00	.062
J-174	EW-	-47.85	-55.48	12.69	-2.00	.062
J-175	EW-	-47.85	-54.49	12.73	-1.97	.062
J-176	EW-	-47.85	-55.52	12.69	-2.00	.062
J-177	EW-	-47.85	-55.62	12.69	-2.01	.062
J-178	EW-	-47.85	-55.61	12.69	-2.01	.062
J-179	EW-	-47.85	-55.46	12.69	-2.00	.062
J-18	W-27	-47.85	-50.67	12.87	-1.83	.063
J-180	EW-	-47.85	-55.56	12.69	-2.01	.062
J-181	EW-	-47.85	-55.43	12.70	-2.00	.062
J-182	EW-	-47.85	-55.53	12.69	-2.00	.062
J-183	EW-	-47.85	-55.34	12.70	-2.00	.062
J-184	EW-	-47.85	-55.44	12.70	-2.00	.062
J-185	EW-	-47.85	-55.46	12.69	-2.00	.062
J-186	EW-	-47.85	-54.31	12.74	-1.96	.063
J-187	EW-	-47.85	-54.39	12.73	-1.96	.063
J-188	EW-	-47.85	-54.28	12.74	-1.96	.063
J-189	EW-	-47.85	-54.36	12.73	-1.96	.063
J-19	EW-	-47.85	-50.18	12.89	-1.81	.063
J-190		.00	-54.54	12.73	-1.97	.062
J-191	EW-	-47.85	-54.95	12.71	-1.98	.062
J-192		.00	-54.47	12.73	-1.97	.062
J-193	W-66B	-47.85	-49.95	12.89	-1.80	.063
J-194	EW-	-47.85	-49.86	12.90	-1.80	.063
J-195	EW-	-47.85	-50.40	12.88	-1.82	.063
J-196	EW-	-47.85	-49.66	12.90	-1.79	.063
J-197	EW-	-47.85	-49.45	12.91	-1.78	.063
J-198	EW-	-47.85	-49.30	12.92	-1.78	.063
J-199	EW-	-47.85	-50.36	12.88	-1.82	.063
J-2		.00	-51.30	12.84	-1.85	.063
J-20	W-108	-47.85	-50.48	12.87	-1.82	.063
J-200	W-64	-47.85	-50.45	12.88	-1.82	.063
J-201	W-179	-47.85	-50.02	12.89	-1.80	.063
J-202	EW-	-47.85	-50.55	12.87	-1.82	.063
J-203	EW-	-47.85	-50.64	12.87	-1.83	.063
J-204	W-78	-47.85	-50.72	12.87	-1.83	.063
J-205	EW-	-47.85	-50.79	12.86	-1.83	.063
J-206	EW-	-47.85	-50.91	12.86	-1.84	.063
J-207		.00	-50.92	12.86	-1.84	.063
J-208	W-94A	-47.85	-51.29	12.84	-1.85	.063
J-209	EW-	-47.85	-50.89	12.86	-1.84	.063
J-21	W-51	-47.85	-50.55	12.87	-1.82	.063
J-210	EW-	-47.85	-50.96	12.86	-1.84	.063
J-211	EW-	-47.85	-51.53	12.84	-1.86	.063
J-212	W-39	-47.85	-51.07	12.85	-1.84	.063
J-213	W-10A	-47.85	-51.97	12.82	-1.88	.063
J-214	EW-	-47.85	-54.97	12.71	-1.98	.062
J-216	EW-	-47.85	-56.58	12.65	-2.04	.062
J-217	EW-	-47.85	-55.29	12.70	-2.00	.062
J-218	EW-	-47.85	-55.03	12.71	-1.99	.062
J-219	EW-	-47.85	-56.52	12.66	-2.04	.062
J-22	W-26	-47.85	-50.65	12.87	-1.83	.063
J-222	W-153	-47.85	-58.21	12.60	-2.10	.062

J-223	W-148	-47.85	-57.59	12.62	-2.08	.062
J-224	W-144	-47.85	-57.30	12.63	-2.07	.062
J-225	W-140	-47.85	-57.23	12.63	-2.07	.062
J-228	W-167	-47.85	-55.49	12.69	-2.00	.062
J-229	W-166	-47.85	-55.89	12.68	-2.02	.062
J-23		.00	-50.74	12.86	-1.83	.063
J-230	W-160	-47.85	-56.27	12.67	-2.03	.062
J-231	W-165	-47.85	-56.80	12.65	-2.05	.062
J-234	W-130	-47.85	-55.51	12.69	-2.00	.062
J-235	W-123	-47.85	-55.11	12.71	-1.99	.062
J-236	W-121A	-47.85	-54.58	12.73	-1.97	.062
J-237	W-122	-47.85	-54.63	12.72	-1.97	.062
J-238	W-115	-47.85	-53.73	12.76	-1.94	.063
J-24	W-50	-47.85	-50.50	12.87	-1.82	.063
J-240	EW-	.00	-55.25	12.70	-1.99	.062
J-241	EW-	-47.85	-56.66	12.65	-2.04	.062
J-242	EW-	-47.85	-57.04	12.64	-2.06	.062
J-244	EW-	-47.85	-57.54	12.62	-2.08	.062
J-245	EW-	-47.85	-58.22	12.59	-2.10	.062
J-246	EW-	-47.85	-58.51	12.58	-2.11	.062
J-247	EW-	-47.85	-57.66	12.62	-2.08	.062
J-248	EW-	-47.85	-54.41	12.73	-1.96	.063
J-249	EW-	-47.85	-53.65	12.76	-1.94	.063
J-25	W-23	-47.85	-51.14	12.85	-1.85	.063
J-250	EW-	-47.85	-53.55	12.76	-1.93	.063
J-251	EW-	-47.85	-54.29	12.74	-1.96	.063
J-252	EW-	-47.85	-55.49	12.69	-2.00	.062
J-253	EW-	.00	-55.74	12.68	-2.01	.062
J-254	EW-	.00	-55.74	12.68	-2.01	.062
J-255	EW-	.00	-55.75	12.68	-2.01	.062
J-257	EW-	-47.85	-55.57	12.69	-2.01	.062
J-258	EW-	-47.85	-55.61	12.69	-2.01	.062
J-259	EW-	-47.85	-55.51	12.69	-2.00	.062
J-26		.00	-50.97	12.86	-1.84	.063
J-260	EW-	-47.85	-55.92	12.68	-2.02	.062
J-261	EW-	-47.85	-55.28	12.70	-1.99	.062
J-262	EW-	-47.85	-59.17	12.56	-2.14	.062
J-263	EW-	-47.85	-56.89	12.64	-2.05	.062
J-264	EW-	-47.85	-54.19	12.74	-1.96	.063
J-265	EW-	-47.85	-54.26	12.74	-1.96	.063
J-266	EW-	-47.85	-54.42	12.73	-1.96	.063
J-267	EW-	-47.85	-55.80	12.68	-2.01	.062
J-268	EW-	-47.85	-55.80	12.68	-2.01	.062
J-269	EW-	-47.85	-55.89	12.68	-2.02	.062
J-27		.00	-51.20	12.85	-1.85	.063
J-270	EW-	-47.85	-55.89	12.68	-2.02	.062
J-271	EW-	-47.85	-55.22	12.70	-1.99	.062
J-272	EW-	-47.85	-55.29	12.70	-2.00	.062
J-273	EW-	-47.85	-55.54	12.69	-2.00	.062
J-276	EW-	-47.85	-54.81	12.72	-1.98	.062
J-277	EW-	-47.85	-54.84	12.72	-1.98	.062
J-278	EW-	-47.85	-54.83	12.72	-1.98	.062
J-279	EW-	-47.85	-54.73	12.72	-1.98	.062
J-28	W-22	-47.85	-51.40	12.84	-1.85	.063
J-280	EW-	-47.85	-54.70	12.72	-1.97	.062

J-282	EW-	-47.85	-54.77	12.72	-1.98	.062
J-284	EW-	-47.85	-55.02	12.71	-1.99	.062
J-285	EW-	-47.85	-55.06	12.71	-1.99	.062
J-286	EW-	-47.85	-54.36	12.73	-1.96	.063
J-287	EW-	-47.85	-54.60	12.73	-1.97	.062
J-288	EW-	-47.85	-55.12	12.71	-1.99	.062
J-289	EW-	-47.85	-54.41	12.73	-1.96	.063
J-29		.00	-51.47	12.84	-1.86	.063
J-290	EW-	.00	-55.49	12.69	-2.00	.062
J-291	EW-	-47.85	-55.43	12.70	-2.00	.062
J-292	EW-	-47.85	-55.79	12.68	-2.01	.062
J-293	EW-	-47.85	-55.85	12.68	-2.02	.062
J-294	EW-	-47.85	-56.10	12.67	-2.02	.062
J-295	EW-	-47.85	-55.34	12.70	-2.00	.062
J-296	EW-	-47.85	-56.02	12.67	-2.02	.062
J-297	EW-	-47.85	-56.09	12.67	-2.02	.062
J-298	EW-	-47.85	-55.59	12.69	-2.01	.062
J-299	EW-	-47.85	-56.32	12.66	-2.03	.062
J-2a	W-35A	-47.85	-51.30	12.84	-1.85	.063
J-2b	W-7A	-47.85	-51.32	12.84	-1.85	.063
J-2c		.00	-51.46	12.84	-1.86	.063
J-2d		.00	-51.35	12.84	-1.85	.063
J-2g	W-8A	-47.85	-51.67	12.83	-1.86	.063
J-2h		.00	-51.74	12.83	-1.87	.063
J-2j		.00	-52.02	12.82	-1.88	.063
J-2l		.00	-52.24	12.81	-1.89	.063
J-2n		.00	-52.29	12.81	-1.89	.063
J-2p	W-111	-47.85	-52.55	12.80	-1.90	.063
J-2q		.00	-52.55	12.80	-1.90	.063
J-2s	W-112	-47.85	-52.86	12.79	-1.91	.063
J-2t		.00	-52.86	12.79	-1.91	.063
J-2v	W-113	.00	-53.35	12.77	-1.93	.063
J-2w		.00	-53.35	12.77	-1.93	.063
J-2y		.00	-53.85	12.75	-1.94	.063
J-2z	W-34A	-47.85	-51.20	12.85	-1.85	.063
J-3	W-6A	-47.85	-51.23	12.85	-1.85	.063
J-30	W-21	-47.85	-51.68	12.83	-1.87	.063
J-300	EW-	-47.85	-56.09	12.67	-2.02	.062
J-301	EW-	-47.85	-56.95	12.64	-2.06	.062
J-302	EW-	-47.85	-57.06	12.64	-2.06	.062
J-303	EW-	-47.85	-57.15	12.63	-2.06	.062
J-304	EW-	-47.85	-56.23	12.67	-2.03	.062
J-305	EW-	-47.85	-56.33	12.66	-2.03	.062
J-306	EW-	-47.85	-56.39	12.66	-2.04	.062
J-307	EW-	-47.85	-58.07	12.60	-2.10	.062
J-308	EW-	-47.85	-56.85	12.64	-2.05	.062
J-309	EW-	-47.85	-58.15	12.60	-2.10	.062
J-31		.00	-51.75	12.83	-1.87	.063
J-310	EW-	-47.85	-58.18	12.60	-2.10	.062
J-311	EW-	-47.85	-56.49	12.66	-2.04	.062
J-312	EW-	-47.85	-57.28	12.63	-2.07	.062
J-313	EW-	-47.85	-57.28	12.63	-2.07	.062
J-314	EW-	-47.85	-57.57	12.62	-2.08	.062
J-315	EW-	-47.85	-57.57	12.62	-2.08	.062
J-316	EW-	-47.85	-57.69	12.61	-2.08	.062

J-317	EW-	-47.85	-57.69	12.61	-2.08	.062
J-318		.00	-54.77	12.72	-1.98	.062
J-319		.00	-54.90	12.71	-1.98	.062
J-32	W-20	-47.85	-51.81	12.83	-1.87	.063
J-320		.00	-54.98	12.71	-1.98	.062
J-321		.00	-55.50	12.69	-2.00	.062
J-322		-47.85	-55.46	12.69	-2.00	.062
J-323		.00	-55.85	12.68	-2.02	.062
J-324		.00	-57.23	12.63	-2.07	.062
J-325		.00	-57.71	12.61	-2.08	.062
J-326		.00	-58.35	12.59	-2.11	.062
J-33	W-19A	-47.85	-51.90	12.82	-1.87	.063
J-331	CS-	.00	-54.62	12.72	-1.97	.062
J-332	HP-	.00	-59.22	12.56	-2.14	.062
J-333		.00	-58.74	12.58	-2.12	.062
J-334		.00	-58.16	12.60	-2.10	.062
J-335		.00	-57.76	12.61	-2.08	.062
J-336		.00	-57.39	12.62	-2.07	.062
J-337		.00	-56.62	12.65	-2.04	.062
J-338	HP-	.00	-56.01	12.67	-2.02	.062
J-339		.00	-55.89	12.68	-2.02	.062
J-34		.00	-52.04	12.82	-1.88	.063
J-340		.00	-55.57	12.69	-2.01	.062
J-341	HP-	.00	-55.22	12.70	-1.99	.062
J-342		.00	-54.87	12.72	-1.98	.062
J-344		.00	-50.71	12.87	-1.83	.063
J-345		.00	-57.33	12.63	-2.07	.062
J-347	EW-	-47.85	-53.00	12.78	-1.91	.063
J-349	EW-	-47.85	-55.66	12.69	-2.01	.062
J-35	W-	-47.85	-51.72	12.83	-1.87	.063
J-350		.00	-50.62	12.87	-1.83	.063
J-355		.00	-54.18	12.74	-1.96	.063
J-356		.00	-56.40	12.66	-2.04	.062
J-358		.00	-54.86	12.72	-1.98	.062
J-359		.00	-55.28	12.70	-2.00	.062
J-36	W-46A	-47.85	-50.04	12.89	-1.81	.063
J-362		.00	-56.75	12.65	-2.05	.062
J-366		.00	-50.49	12.87	-1.82	.063
J-37		.00	-52.64	12.80	-1.90	.063
J-38		.00	-52.99	12.78	-1.91	.063
J-39		-47.85	-56.24	12.67	-2.03	.062
J-4	W-5A	-47.85	-51.11	12.85	-1.84	.063
J-40		.00	-53.00	12.78	-1.91	.063
J-41		.00	-53.29	12.77	-1.92	.063
J-41a	W-47A	-47.85	-50.22	12.88	-1.81	.063
J-41b		.00	-50.23	12.88	-1.81	.063
J-41c		.00	-51.71	12.83	-1.87	.063
J-41d	W-45A	-47.85	-53.17	12.78	-1.92	.063
J-41f		.00	-53.50	12.77	-1.93	.063
J-41g	W-68	-47.85	-53.83	12.75	-1.94	.063
J-41h		.00	-53.90	12.75	-1.95	.063
J-41i	W-170A	-47.85	-53.88	12.75	-1.94	.063
J-41k		.00	-54.24	12.74	-1.96	.063
J-41m		.00	-55.55	12.69	-2.00	.062
J-41o		.00	-50.24	12.88	-1.81	.063

J-41r		.00	-55.96	12.68	-2.02	.062
J-41t		.00	-56.38	12.66	-2.03	.062
J-41v		.00	-56.84	12.64	-2.05	.062
J-41w	W-164	-47.85	-57.64	12.62	-2.08	.062
J-41x		.00	-57.70	12.61	-2.08	.062
J-41ya		.00	-55.16	12.71	-1.99	.062
J-41z		.00	-59.40	12.55	-2.14	.062
J-42		.00	-52.23	12.81	-1.88	.063
J-43		.00	-51.89	12.82	-1.87	.063
J-44		.00	-51.09	12.85	-1.84	.063
J-45		.00	-50.74	12.87	-1.83	.063
J-45a		.00	-50.79	12.86	-1.83	.063
J-45b		.00	-51.06	12.85	-1.84	.063
J-45ca		.00	-51.67	12.83	-1.86	.063
J-45d		.00	-53.03	12.78	-1.91	.063
J-45e		.00	-54.09	12.74	-1.95	.063
J-45g		.00	-54.69	12.72	-1.97	.062
J-45h		.00	-50.27	12.88	-1.81	.063
J-45j		.00	-50.36	12.88	-1.82	.063
J-45k		.00	-50.36	12.88	-1.82	.063
J-45l	HP-	.00	-50.45	12.88	-1.82	.063
J-45m	W-48	-47.85	-51.73	12.83	-1.87	.063
J-45n		.00	-51.82	12.83	-1.87	.063
J-46	W-25	-47.85	-50.83	12.86	-1.83	.063
J-47		.00	-50.85	12.86	-1.84	.063
J-48		.00	-50.73	12.87	-1.83	.063
J-49		.00	-50.74	12.87	-1.83	.063
J-5	W-33B	-47.85	-50.95	12.86	-1.84	.063
J-50		.00	-50.28	12.88	-1.81	.063
J-51		.00	-50.74	12.86	-1.83	.063
J-52		.00	-50.74	12.86	-1.83	.063
J-53		.00	-55.79	12.68	-2.01	.062
J-54		.00	-50.98	12.86	-1.84	.063
J-55		.00	-57.66	12.62	-2.08	.062
J-56		.00	-50.71	12.87	-1.83	.063
J-57		.00	-50.79	12.86	-1.83	.063
J-58		.00	-52.55	12.80	-1.90	.063
J-59		.00	-52.85	12.79	-1.91	.063
J-6		.00	-51.20	12.85	-1.85	.063
J-60		.00	-53.34	12.77	-1.93	.063
J-61	W-59B	-47.85	-50.86	12.86	-1.84	.063
J-62	EW-	-47.85	-51.06	12.85	-1.84	.063
J-63		.00	-50.59	12.87	-1.83	.063
J-64		.00	-50.59	12.87	-1.83	.063
J-65		.00	-50.56	12.87	-1.82	.063
J-66		.00	-50.29	12.88	-1.81	.063
J-66e		.00	-50.66	12.87	-1.83	.063
J-67		.00	-50.55	12.87	-1.82	.063
J-68	W-38R	-47.85	-51.20	12.85	-1.85	.063
J-69		.00	-51.60	12.83	-1.86	.063
J-7	W-4A	-47.85	-50.98	12.86	-1.84	.063
J-70		.00	-50.27	12.88	-1.81	.063
J-71	W-98B	-47.85	-50.39	12.88	-1.82	.063
J-72		.00	-50.55	12.87	-1.82	.063
J-73		.00	-52.13	12.81	-1.88	.063

J-74		.00	-52.26	12.81	-1.89	.063
J-75		.00	-50.50	12.87	-1.82	.063
J-76		.00	-52.36	12.81	-1.89	.063
J-77		.00	-53.53	12.76	-1.93	.063
J-78		.00	-52.25	12.81	-1.89	.063
J-78aa	EW-	-47.85	-50.71	12.87	-1.83	.063
J-78b		.00	-50.11	12.89	-1.81	.063
J-78d		.00	-51.34	12.84	-1.85	.063
J-78e		.00	-52.25	12.81	-1.89	.063
J-79		.00	-59.34	12.55	-2.14	.062
J-8		.00	-51.03	12.85	-1.84	.063
J-80		.00	-54.26	12.74	-1.96	.063
J-81	HP-	.00	-54.34	12.74	-1.96	.063
J-82		.00	-54.42	12.73	-1.96	.063
J-83		.00	-54.46	12.73	-1.97	.062
J-84		.00	-54.69	12.72	-1.97	.062
J-85		.00	-54.92	12.71	-1.98	.062
J-86		.00	-55.28	12.70	-2.00	.062
J-87		.00	-55.13	12.71	-1.99	.062
J-88	CS-	.00	-55.48	12.69	-2.00	.062
J-89		.00	-55.70	12.69	-2.01	.062
J-9		.00	-51.10	12.85	-1.84	.063
J-90	EW-	-47.85	-55.69	12.69	-2.01	.062
J-91		.00	-56.39	12.66	-2.03	.062
J-92		.00	-56.87	12.64	-2.05	.062
J-93	CS-	.00	-57.12	12.63	-2.06	.062
J-94		.00	-57.51	12.62	-2.08	.062
J-95		.00	-57.64	12.62	-2.08	.062
J-96	HP-	.00	-57.93	12.61	-2.09	.062
J-97	CS-	.00	-58.46	12.59	-2.11	.062
J-98		.00	-58.26	12.59	-2.10	.062
J-99		.00	-58.64	12.58	-2.12	.062
k	W-76B	-47.85	-50.35	12.88	-1.82	.063
l	EW-	-47.85	-49.65	12.90	-1.79	.063
m	EW-	-47.85	-49.73	12.90	-1.79	.063
n	EW-	-47.85	-49.90	12.90	-1.80	.063
o	EW-	-47.85	-49.90	12.90	-1.80	.063
p	EW-	-47.85	-49.95	12.89	-1.80	.063
PS-8		.00	-55.35	12.70	-2.00	.062
q	W-104R	-47.85	-50.27	12.88	-1.81	.063
r	EW-	-47.85	-49.79	12.90	-1.80	.063
R-1		.00	-60.00	12.53	-2.17	.062
s	EW-	-47.85	-49.73	12.90	-1.79	.063
t	EW-	-47.85	-50.42	12.88	-1.82	.063
u	EW-	-47.85	-49.84	12.90	-1.80	.063
v	EW-	-47.85	-49.92	12.89	-1.80	.063
w	EW-	-47.85	-48.43	12.95	-1.75	.064
W-110	W-110	-47.85	-52.25	12.81	-1.89	.063
W-116	W-116	-47.85	-53.34	12.77	-1.93	.063
W-117	W-117	-47.85	-52.82	12.79	-1.91	.063
W-118	W-118	-47.85	-52.53	12.80	-1.90	.063
W-119A	EW-	-47.85	-52.48	12.80	-1.89	.063
W-126A	EW-	-47.85	-53.06	12.78	-1.92	.063
W-127A	EW-	-47.85	-53.52	12.76	-1.93	.063
W-134A	EW-	-47.85	-53.90	12.75	-1.95	.063

W-135	EW-	-47.85	-54.30	12.74	-1.96	.063
W-142	EW-	-47.85	-54.74	12.72	-1.98	.062
W-150	W-150	-47.85	-57.98	12.60	-2.09	.062
W-158	W-156	-47.85	-58.05	12.60	-2.10	.062
W-159	W-159	-47.85	-55.76	12.68	-2.01	.062
W-16	W-16	-47.85	-53.26	12.77	-1.92	.063
W-168	EW-	-47.85	-50.57	12.87	-1.82	.063
W-17	W-17	-47.85	-52.97	12.78	-1.91	.063
W-177	EW-	-47.85	-57.07	12.64	-2.06	.062
W-178	EW-	-47.85	-55.71	12.69	-2.01	.062
W-179	EW-	-47.85	-58.56	12.58	-2.11	.062
W-180	EW-	-47.85	-58.33	12.59	-2.11	.062
W-181	EW-	-47.85	-57.82	12.61	-2.09	.062
W-183		-47.85	-57.28	12.63	-2.07	.062
W-186	EW-	.00	-56.33	12.66	-2.03	.062
W-187	EW-	.00	-55.75	12.68	-2.01	.062
W-189	EW-	.00	-54.80	12.72	-1.98	.062
W-21B		-47.85	-51.04	12.85	-1.84	.063
W-21E	EW-	-47.85	-50.81	12.86	-1.83	.063
W-21G	EW-	-47.85	-50.71	12.87	-1.83	.063
W-22D		-47.85	-50.39	12.88	-1.82	.063
W-22F		-47.85	-50.31	12.88	-1.82	.063
W-230	EW-	-47.85	-52.16	12.81	-1.88	.063
W-23AB	EW-	-47.85	-50.79	12.86	-1.83	.063
W-23AC	EW-	-47.85	-50.51	12.87	-1.82	.063
W-23AE	EW-	-47.85	-50.20	12.88	-1.81	.063
W-23AF	EW-	-47.85	-50.13	12.89	-1.81	.063
W-23B	EW-	-47.85	-52.35	12.81	-1.89	.063
W-23C	EW-	-47.85	-52.58	12.80	-1.90	.063
W-23D	EW-	-47.85	-52.24	12.81	-1.89	.063
W-23E	EW-	-47.85	-55.39	12.70	-2.00	.062
W-23F	EW-	-47.85	-55.14	12.71	-1.99	.062
W-23G	EW-	-47.85	-49.07	12.93	-1.77	.063
W-23I	EW-	-47.85	-49.00	12.93	-1.77	.063
W-23J	EW-	-47.85	-50.44	12.88	-1.82	.063
W-23K	EW-	-47.85	-52.28	12.81	-1.89	.063
W-23L	EW-	-47.85	-50.92	12.86	-1.84	.063
W-23N	EW-	-47.85	-50.92	12.86	-1.84	.063
W-23Q	EW-	-47.85	-51.43	12.84	-1.86	.063
W-23W	EW-	-47.85	-50.84	12.86	-1.83	.063
W-36A	W-36A	-47.85	-51.64	12.83	-1.86	.063
W-37A	W-37A	-47.85	-52.21	12.81	-1.88	.063
W-44	W-44	-47.85	-53.96	12.75	-1.95	.063
W-46A		-47.85	-50.30	12.88	-1.82	.063
W-67B	W-67B	-47.85	-50.09	12.89	-1.81	.063
W-89		-47.85	-50.22	12.88	-1.81	.063
W-9	W-9	-47.85	-51.95	12.82	-1.87	.063
x	EW-	-47.85	-48.50	12.95	-1.75	.064
y	EW-	-47.85	-49.09	12.92	-1.77	.063
z	W-22	-47.85	-49.97	12.89	-1.80	.063

* This designates the use of default density in a low pressure region

THE NET SYSTEM DEMAND (USFU) = -16603.890

SUMMARY OF INFLOWS(+).AND.OUTFLOWS(-) :

NAME	FLOW (USFU)	FPN TITLE
R-1	-16603.9	R-1

MAXIMUM MACH NUMBER = .04 IN LINE NO.P-300

SUMMARY OF MINIMUM.AND.MAXIMUM VELOCITIES (FT/S)

MINIMUM		MAXIMUM	
R-1	.07	P-300	37.02
P-305	.33	P-210	36.97
P-299	.42	P-352	36.30
P-600	.42	P-287	36.23
P-106	.55	P-469	34.90
P-176	.57	P-375	33.89
P-107	.70	P-372	33.83
P-104	.70	P-80	33.78
P-150	.74	P-467	33.56
P-303	.83	P-79	33.12
P-515	.95	P-353	33.08
P-180	1.09	P-577	32.55
P-489	1.17	P-81	32.43
P-556	1.27	P-82	31.78
P-148	1.47	P-583	31.71
P-151	1.48	P-582	30.16
P-14	1.48	P-83	27.49
P-152	1.48	P-135	27.39
P-15	1.48	P-60	27.24
P-11	1.49	P-516	27.12

SUMMARY OF MINIMUM.AND.MAXIMUM LOSS/1000. (PSI)

MINIMUM		MAXIMUM	
R-1	.00	P-135	.20
P-305	.00	P-60	.20
P-299	.00	P-65	.15
P-600	.00	P-444	.15
P-106	.00	P-484	.14
P-176	.00	P-429	.14
P-107	.00	P-374	.13
P-104	.00	P-181	.13
P-303	.00	P-170	.13
P-150	.00	P-193	.13
P-515	.00	P-577	.08
P-180	.00	P-482	.08

P-489	.00	P-377	.08
P-559	.00	P-471	.08
P-103	.00	P-164	.08
P-11	.00	P-231	.08
P-214	.00	P-315	.08
P-141	.00	P-428	.08
P-143	.00	P-238	.08
P-105	.00	P-227	.08

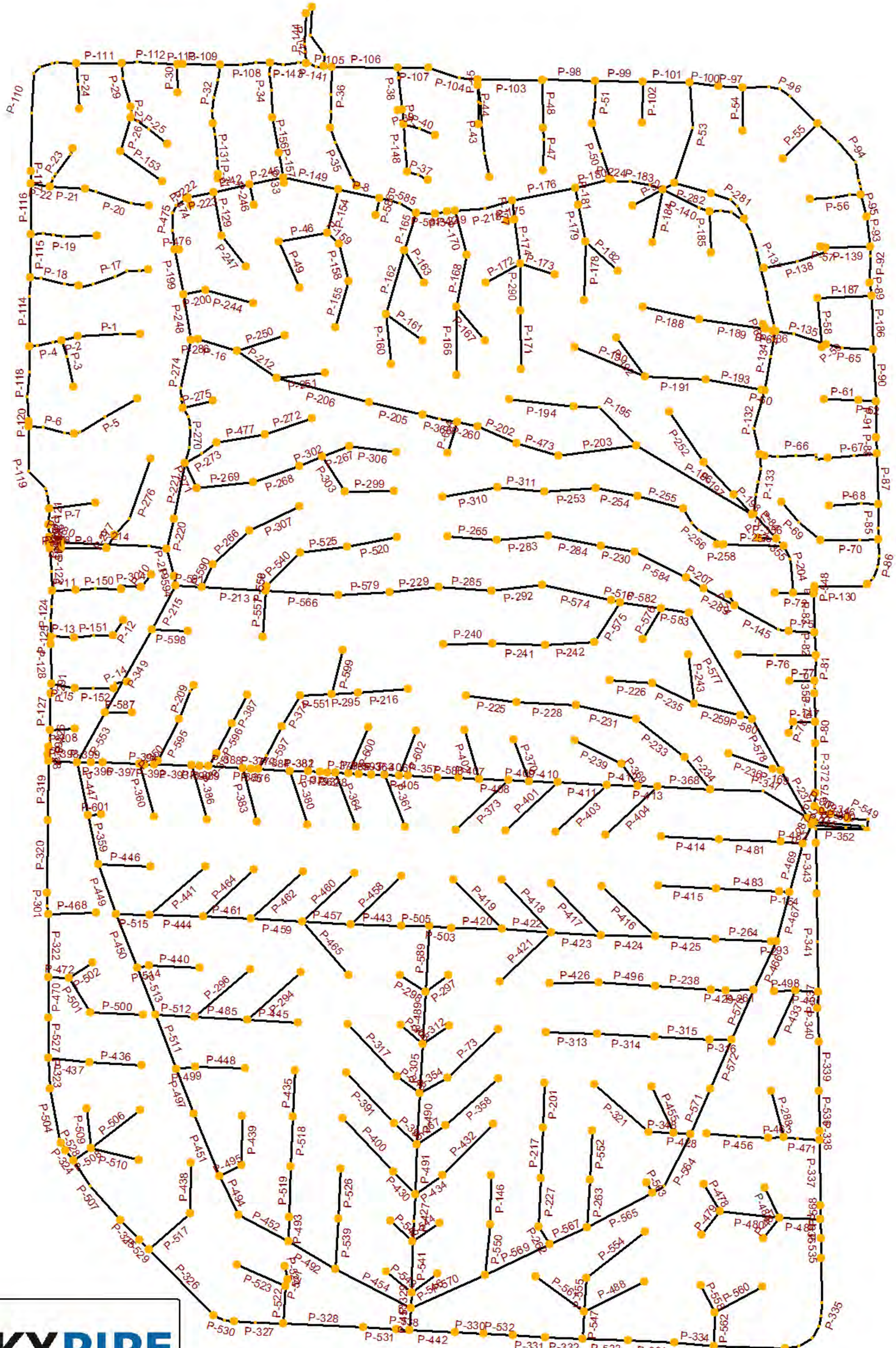
SUMMARY OF MINIMUM.AND.MAXIMUM PRESSURES (USPU)

MINIMUM		MAXIMUM	
R-1	-60.00	J-118	-48.40
J-105	-59.79	w	-48.43
J-131	-59.76	x	-48.50
J-104	-59.60	W-23I	-49.00
J-107	-59.57	W-23G	-49.07
J-41z	-59.40	y	-49.09
J-79	-59.34	g	-49.16
J-102	-59.33	h	-49.19
J-135	-59.26	i	-49.25
J-138	-59.24	J-198	-49.30
J-332	-59.22	J-197	-49.45
J-159z	-59.20	l	-49.65
J-262	-59.17	J-196	-49.66
J-159	-59.12	J-117	-49.71
J-101	-59.07	m	-49.73
J-141	-58.97	s	-49.73
J-100	-58.90	j	-49.78
J-110	-58.85	r	-49.79
J-130	-58.78	e	-49.82
J-333	-58.74	d	-49.82

************************* END OF KYGAS SIMULATION ************************

DATE FOR THIS COMPUTER RUN : 12-16-2022
START TIME FOR THIS COMPUTER RUN : 22:30:30:91

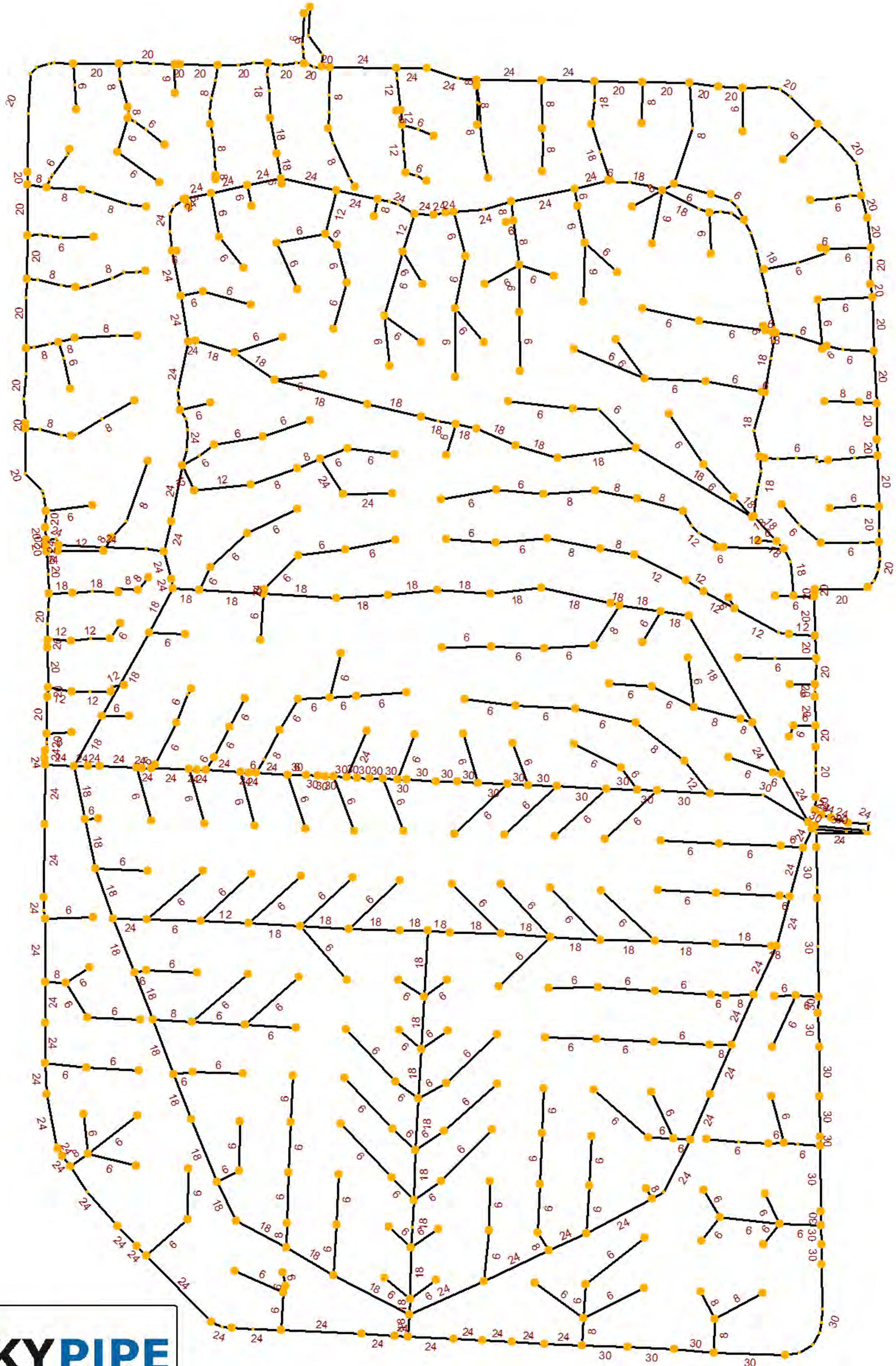
WOODLAND MEADOWS LANDFILL



PIPE NAMES

0 1000

WOODLAND MEADOWS LANDFILL

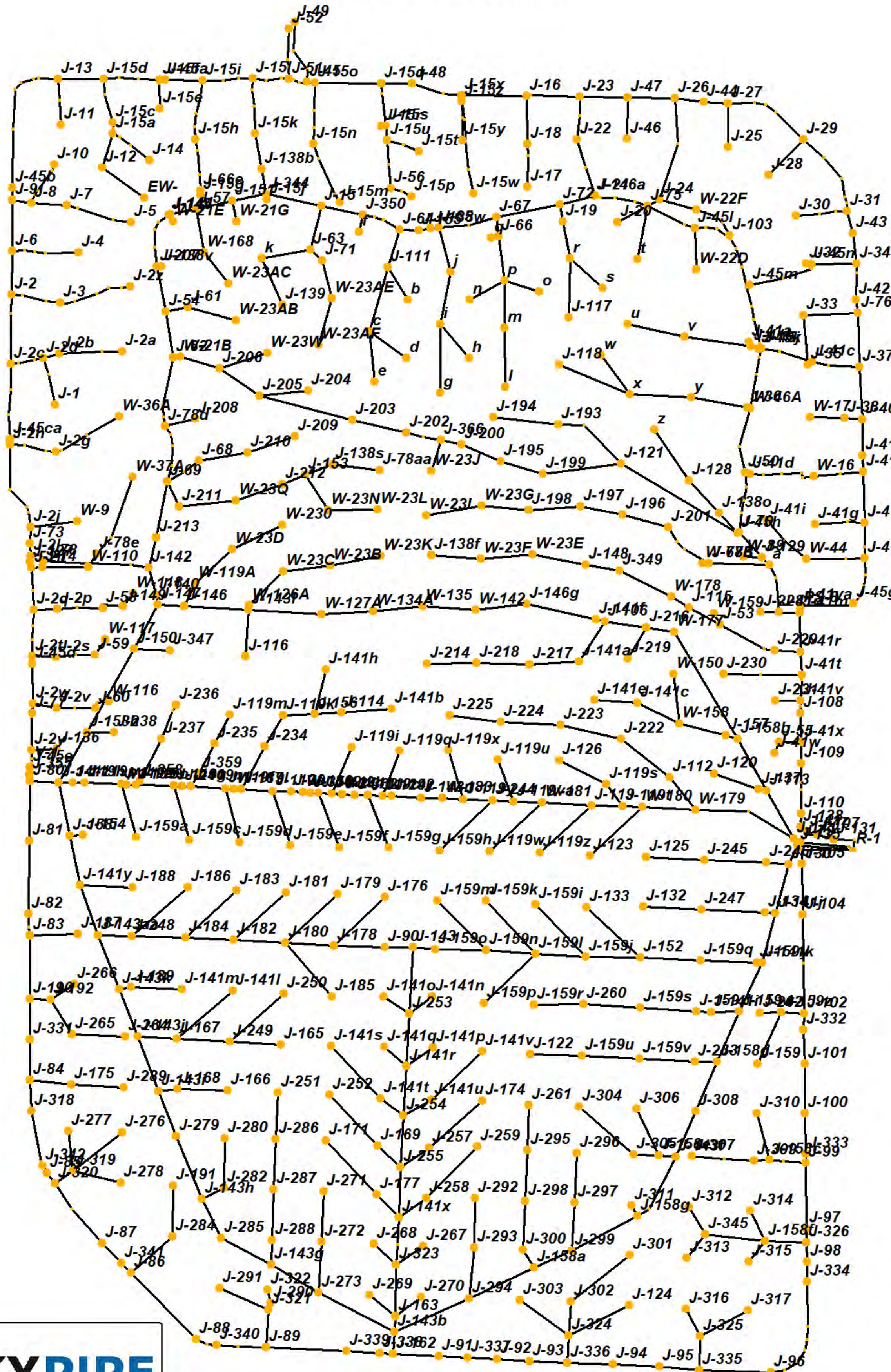


KYPIPE

PIPE DIAMETER (INCHES)

0 1000

WOODLAND MEADOWS LANDFILL

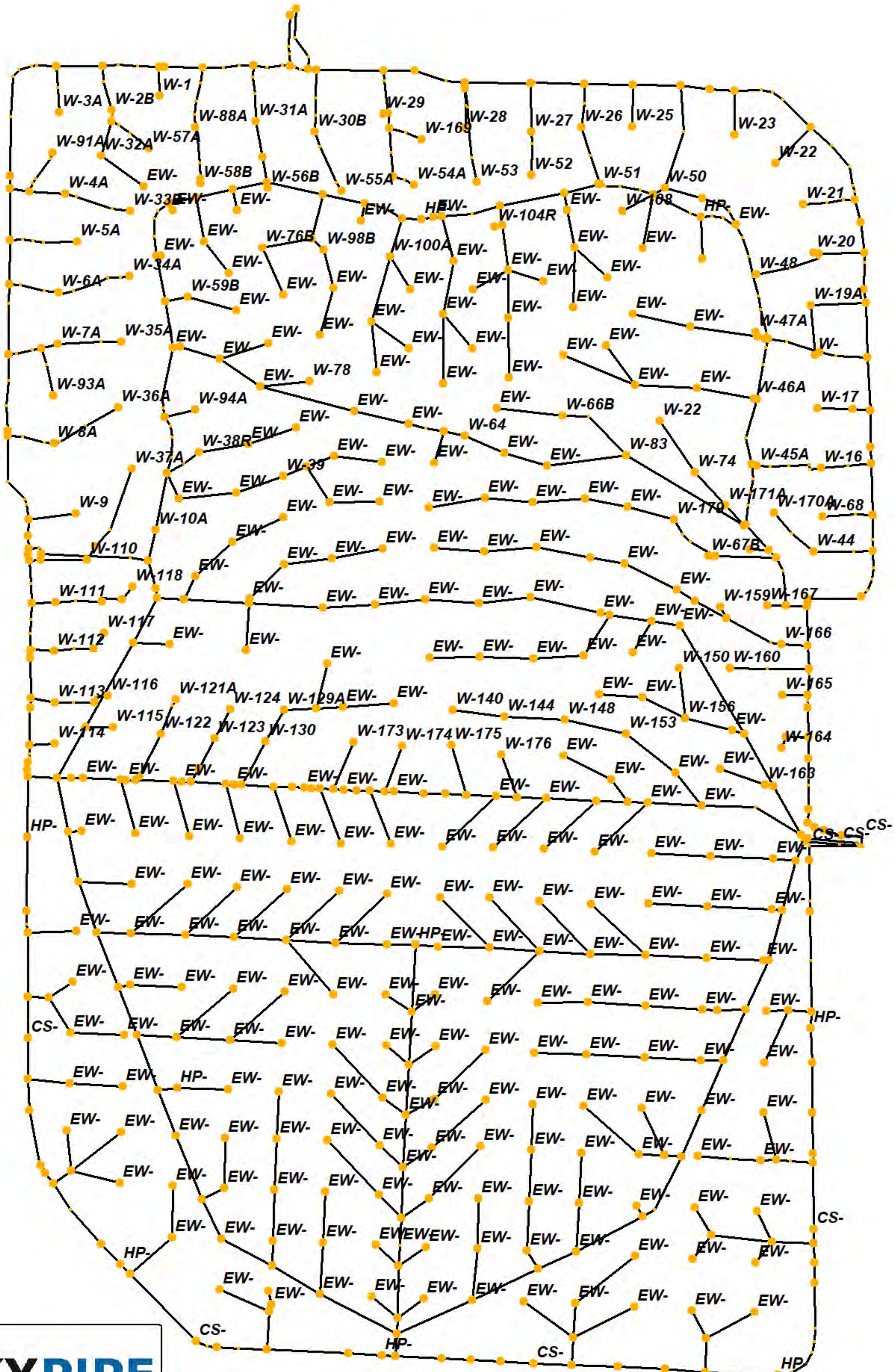


KYPIPE

NODE NAMES

0 1000

WOODLAND MEADOWS LANDFILL

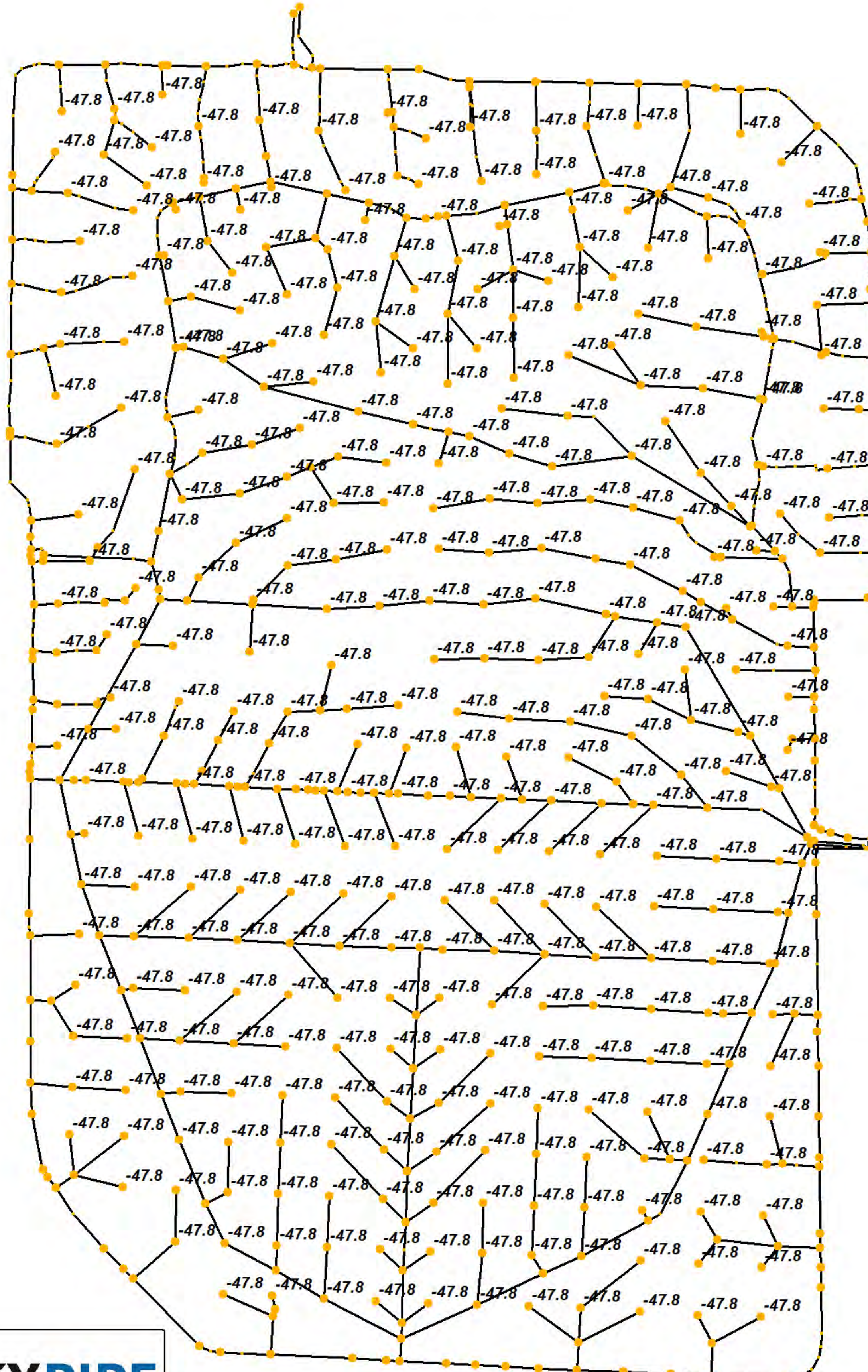


KYPIPE

WELL LOCATIONS

0 1000

WOODLAND MEADOWS LANDFILL

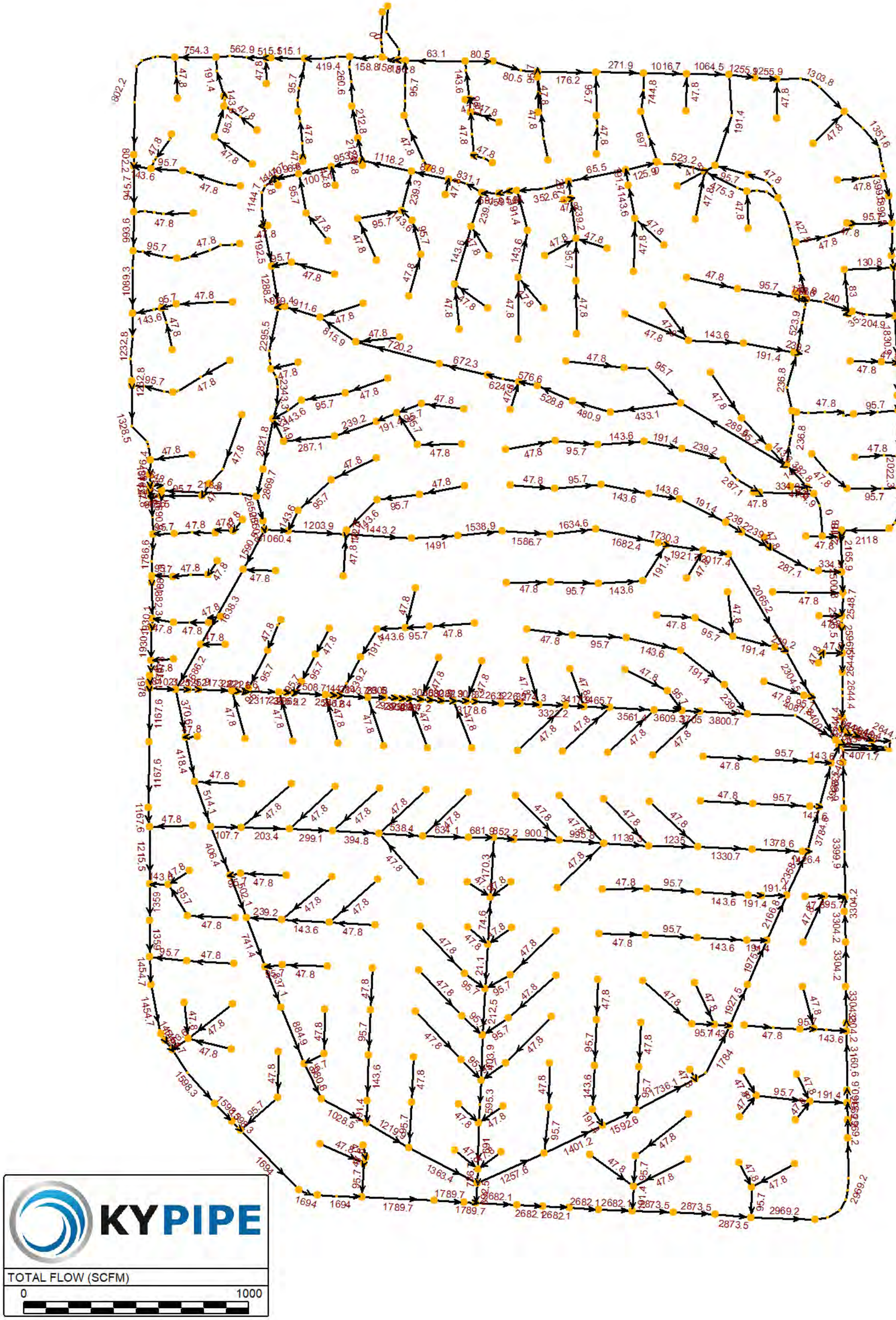


KYPIPE

FLOW DEMAND (SCFM)

0 1000

WOODLAND MEADOWS LANDFILL



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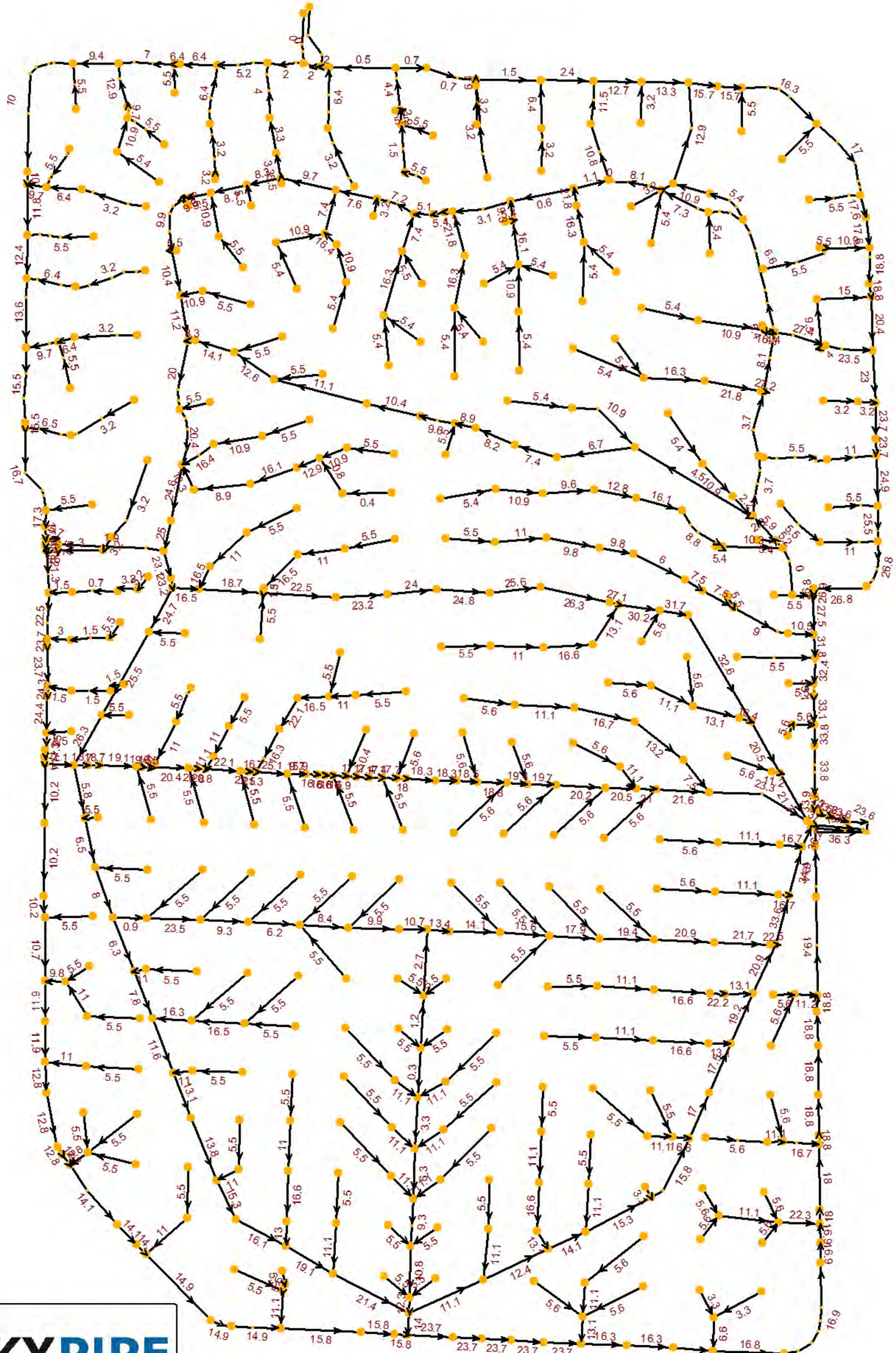
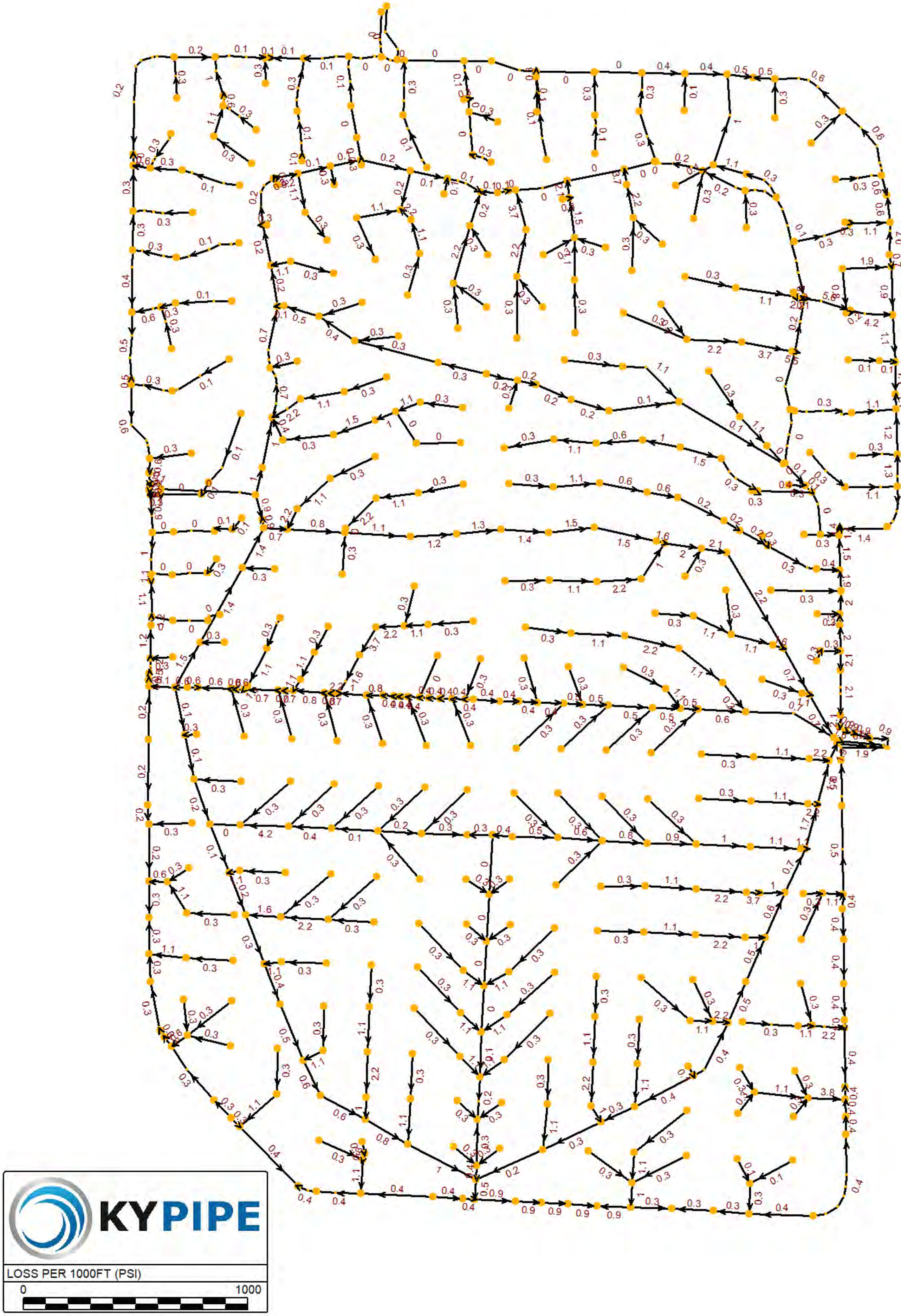


KYPIPE

FLOW VELOCITY (FT/S)

0 1000

WOODLAND MEADOWS LANDFILL



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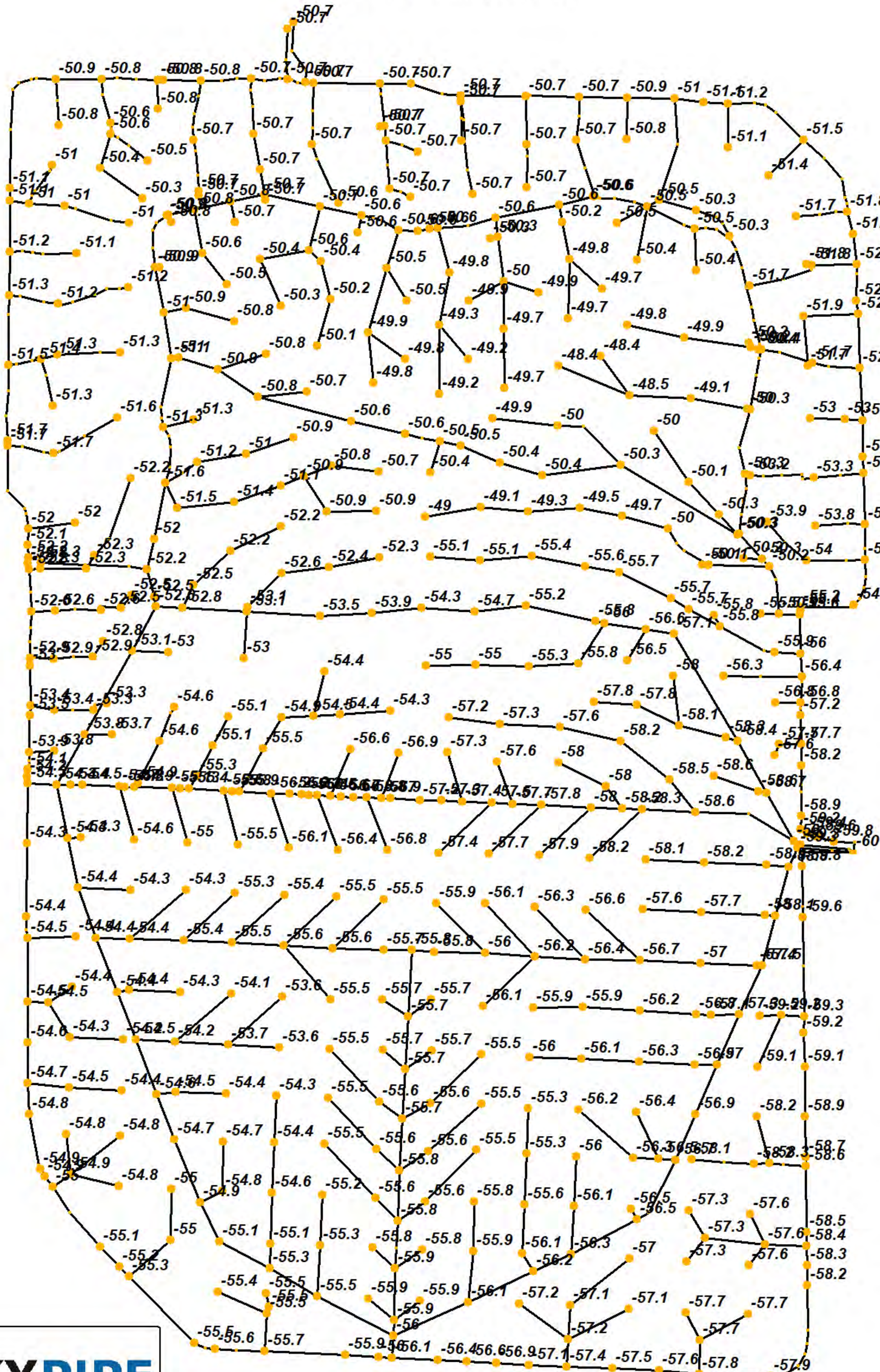


KYPIPE

PRESSURE (INCHES H2O)

0 1000

APPENDIX B

RADIUS OF INFLUENCE CALCULATIONS

Subject:	Radius of Influence Calculations				
Project:	Woodland Meadows Landfill (WML) GCCS Plan				
Project No:	2020.293; 2022.354	Page:	1	of	5
Completed By:	PTS		Date:	12/16/2022	
Checked By:	AML		Date:	12/16/2022	

Purpose:

The ROI is calculated in the design of an active gas extraction system to properly locate extraction wells. The location of the extraction well will dictate the well depth, once the waste depth is known. A detail of each well can then be created with respect to total well depth, depth to perforated pipe, applied vacuum and rate of extraction.

Although horizontal collectors and cap integrity collectors are not modeled directly by this analysis, the effected flow patterns developed by these collectors are analogous to those created by vertical extraction wells. The net results is that vertical well spacing criteria can be translated directly to collectors in a similar environment.

METHODOLOGY:

The following methods were used to estimate the theoretical ROI for an LFG extraction well.

A) EMCON Method (from *Methane Generation and Recovery from Landfills* , EMCON, 1982, page 81)

$$Q_w = \frac{k \pi R^2 t D r}{C}$$

Where:

Where:	Q_w =	individual extraction well LFG flow rate [L/s]
	k =	conversion factor (1.157×10^{-8})[(L/s)/(mL/day)]
	R =	radius of influence [m]
	t =	perforated pipe length [m]
	D =	in-place waste density [kg/m^3]
	r =	methane projection rate [mL/kg/day]
	C =	fractional methane concentration [-]

1. Noting that the methane production rate (r) divided by the fractional methane concentration (C) is equal to the LFG projection rate (G), and solving for the ROI yields:

$$R = \left[\frac{Q_w}{k \pi \ t D G} \right]^{1/2}$$

2. Converting from metric to English units yields the following conversion factors (allowing input in English units):

Subject:	Radius of Influence Calculations				
Project:	Woodland Meadows Landfill (WML) GCCS Plan				
Project No:	2020.293; 2022.354	Page:	2	of	5
Completed By:	PTS	Date:	12/16/2022		
Checked By:	AML	Date:	12/16/2022		

Q_w (from cfm to L/s):

$$\frac{1\ ft^3}{min} \times \frac{1\ min}{60\ sec} \times \frac{28.317\ L}{ft^3} = 0.47195$$

D (from lbs/cy to kg/m^3):

$$\frac{1\ lb}{1\ cy} \times \frac{0.4536\ kg}{1\ lb} \times \frac{1\ cy}{27\ ft^3} \times \left[\frac{1\ ft}{0.3048\ m}\right]^3 = 0.5932$$

In addition, converting G from flow per volume to flow per mass equals:

G (from cfm/cy to mL/kg/day):

$$\frac{1\ ft^3}{min\ yd^3} \times \left[\frac{1}{D} \times \frac{1\ cy}{1\ lb}\right] \times \frac{60\ min}{hr}$$

$$\times \frac{24\ hr}{day} \times \frac{28.317\ K}{cf} \times \frac{1\ lb}{0.4536\ kg} \times \frac{1000\ mL}{L} =$$

$$\frac{89{,}895{,}238}{D}$$

Therefore:

$$R = \left[\frac{0.47195 Q_w}{1.157\text{x}10^{-8}\ \pi\ (0.3048\ t)\ (0.5932\ D) \qquad (89{,}895{,}238/D \times G)}\right]^{1/2}$$

Where: R is in meters

Q_w is in cfm

t is in feet

D is in lb/cy

G is in cfm/cy

Then: $R = 0.8938 \left[\frac{Q_w}{tG}\right]^{1/2}$

Converting results from meters to feet (1 ft = 0.3048 m)

$$0.3048R = 0.8938 \left[\frac{Q_w}{tG} \right]^{1/2}$$

$$R = 2.932 \left[\frac{Q_w}{tG} \right]^{1/2}$$

B) NSPS Method (from EPA *NSPS Bid* , 1991, page G-1)

$$R = 2.932 \left[\frac{Q_w \, D\, C}{\pi \, L \, \rho \, Q_{gen} \, \eta} \right]^{1/2}$$

Where:

Q_w = LFG flow rate per well [m^3/s]
ρ = in-place waste density [kg/m3]
R = radius of influence [m]
DC = design capacity of landfill [kg]
L = perforated pipe length [m]
Q_{gen} = peak LFG generations rate [m^3/s]
η = system collection efficiency (%)

3. Converting from metric to English units yields the following conversion factors (allowing input in English units):

Q_w (from cfm to m^2/s):

$$\frac{1\ ft^3}{min} \times \frac{1\ min}{60\ sec} \times \left[\frac{0.3048\ m}{ft} \right]^3 = 4.719\text{x}10^{-4}$$

DC (from tons to kg)

$$1\ ton \times \frac{2{,}000\ lbs}{ton} \times \frac{0.4536\ kg}{lb} = 907.2$$

L (from ft to m):

$$1 \text{ ft} \times \left[\frac{0.3048 \text{ m}}{\text{ft}}\right] = 0.3048$$

ρ (from lb/cy to kg/m³)

$$\frac{1 \text{ lb}}{\text{cy}} \times \frac{0.4536 \text{ kg}}{\text{lb}} \times \frac{1 \text{ cy}}{27 \text{ cf}} \times \left[\frac{\text{ft}}{0.3048 \text{ m}}\right]^3$$

$$= 0.5933$$

Converting results from meters to feet (1 ft = 0.3048 m):

$$3048 R = \left[\frac{(4.719\text{x}10\text{-}4)\ Q_w\ (907.2\ DC)}{\pi\ (0.3048L)(0.5933\ \rho)\ (4.719\text{x}10^{-4}\ Q_{gen})\ \eta}\right]^{1/2}$$

$$R = \frac{1}{0.3048}\left[\frac{(4.719\text{x}10\text{-}4)\ Q_w\ (907.2\ DC)}{\pi\ (0.3048L)(0.5933\ \rho)\ (4.719\text{x}10^{-4}\ Q_{gen})\ \eta}\right]^{1/2}$$

Example Calculation:

Estimate the ROI for the following average LFG flow rate condition at the XYZ Landfill

Given:

Design Capacity	=	$2.5\text{x}10^7$	tons
Collection Efficiency	=	70	%
Average LFG Generation Rate	=	2,649	scfm
In-place Waste Density	=	1,400	lbs/cy
Depth of Well	=	100	ft
Well Flow Rate	=	26	scfm

EMCON Method

$$R = 2.\!\left[\frac{26 \text{ scfm}}{100 \text{ ft} \left[\frac{2{,}469 \text{ scfm x ton x } 1{,}400 \text{ lbs}}{2.5\text{x}10^7 \text{ tons x } 2{,}000 \text{ lbs x } 1 \text{ cy)}}\right]}\right]^{1/2}$$

R = 180 ft

NSPS Method:

$$R = \frac{1}{0.3048}\left[\frac{(4.719\times10^{-4})(26\text{ scfm})(907.2)(25{,}000{,}000\text{ tons})}{\pi(0.3048)(100\text{ ft})(0.5933)(1400\text{ lb/cy})(4.719\times10^{-4})(2469\text{ scfm})(.7)}\right]^{1/2}$$

R = 215 ft

Site Specific Calculations:

ROI calculations are showing on the attached spreadsheet (Table B), These calculations were performed for a series of typical well depths, ranging from 40 feet to 100 feet and will be utilized as a basis for determining well placement across the selected area of the project.

Landfill Gas Extraction Well Radii of Influence Based on Volume of Affected Waste
WOODLAND MEADOWS LANDFILL

Well Number	Well Depth (ft)	LFG Flow Rate Condition	LFG Flow Rate (scfm)	Radius of Influence (ft)[1, 2] NSPS	Radius of Influence (ft)[1, 2] EMCON
A	40	Low	10	140	121
		Average	15	171	148
		High	20	198	171
B	60	Low	20	162	140
		Average	25	181	156
		High	30	198	171
C	80	Low	30	171	148
		Average	40	198	171
		High	50	221	192
D	100	Low	50	198	171
		Average	60	217	188
		High	70	234	203

Design Capacity:	-	Mg	NSPS Collection Efficiency:	75	%
Design Tonnage:	122,133,837	tons	Maximum LFG Generation for Design Purposes:	16,604	scfm
Design Volume:	113,437,000	cy	Waste Density:	2,153	lb/cy

Average ROI of Shallow Wells (<45 feet in depth)	148	feet	Well Spacing > =	257	feet
Average ROI of Medium Wells (45-80 feet in depth)	171	feet	Well Spacing > =	296	feet
Average ROI of Deep Wells (>80 feet in depth)	188	feet	Well Spacing > =	325	feet

Based on the above calculations, the minimum well spacing for design purposes shall be: 257 and 325 feet

For the purposes of this design, to be conservative, the minimum spacing for future wells will be: 200 feet

Notes:

1. Radius of influence based on the estimated capacity of the facility and anticipated LFG generations rates.

2. Calculations assume 20 feet of solid well casing from ground surface to start of perforations.

Appendix C

Condensate Generation Rate & Knockout Pot Sizing

Subject:	Condensate Generation Estimates				
Project:	Woodland Meadows Landfill (WML) GCCS Plan				
Project No:	2020.293; 2022.354	Page:	1	of	2
Completed By:	PTS	Date:	7/29/2020		
Checked By:	AML	Date:	12/15/2022		

LANDFILL GAS FLOW CONDITIONS

Wellhead Conditions		
Pressure		Temperature
in. W.C.	PSIA	ºF
-25	13.80	110

Blower Inlet Conditions		
Pressure		Temperature
in. W.C.	PSIA	ºF
-60	12.53	50
	LFG_{FLow}	16,604 scfm

Assumptions:

1 Air is extracted at 100% relative humidity and remains at 100% relative humidity as it travels from the extraction well to the blower.

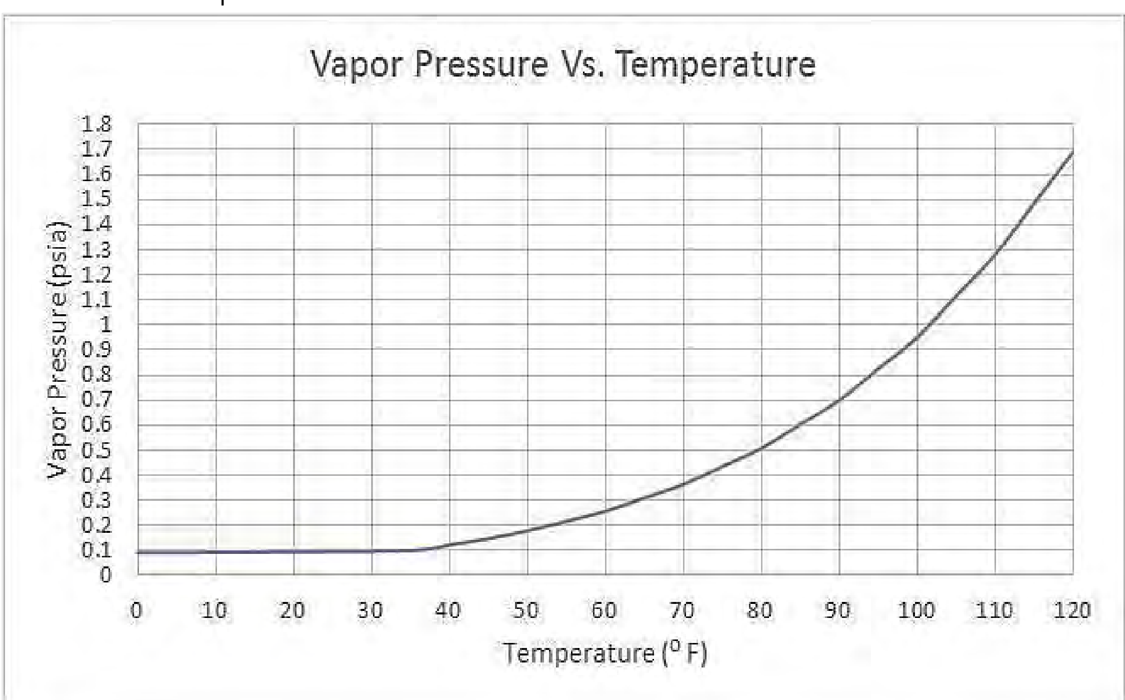
2 LFG temperature is at its maximum at the wellhead. Assumed to be 110º F.

3 LFG temperature will drop as it travels from the wellhead to the blower. The length of travel, location of the header pipe and ambient temperature will determine the magnitude of the temperature drop. Historical site data suggests suggest the LFG temperature to be a min. of 70º F at the blower inlet.

4 LFG header pipe is installed below frost depth.

5 Condensate generation as a result of temperature drop can be determined using psychochrometric charts for air.

6 Work at the blower compresses the LFG, but no additional condensate is generated due to the heat of compression.



Subject:	Condensate Generation Estimates				
Project:	Woodland Meadows Landfill (WML) GCCS Plan				
Project No:	2020.293; 2022.354	Page:	2	of	2
Completed By:	PTS		Date:	7/29/2020	
Checked By:	AML		Date:	12/15/2022	

Y (moles) = Vapor Pressure/ Pressure

Wellhead Conditions @ 110ºF		
P(psi)	VP (psia)	Y (moles)
13.80	1.28	0.093

Blower Conditions @ 70ºF		
P(psi)	VP (psia)	Y (moles)
12.53	0.363	0.029

Condensate Generation= ΔY x LFG $_{flow}$ ***x (18/(380 x 8.55)) x 60 min/hr x 24 hr/day***

ΔY = Moles (Wellhead) - Moles (Blower)

Condensate Generation = 8,452 Gallons per day

Summary:

The daily condensate generation rate was calculated using an assumed wellhead temperature of 110 ºF and historical blower inlet temperatures. Blower inlet temperatures ranged from 70 ºF to 100 ºF. In order to provide a conservative condensate generation estimate the blower inlet temperature was assumed to be 70 ºF.

Subject:	Knockout Pot Sizing				
Project:	Woodland Meadows Landfill (WML) GCCS Plan				
Project No:	2020.293; 2022.354	Page:	1	of	1
Completed By:	PTS	Date:	7/29/2020		
Checked By:	AML	Date:	8/24/2020		

An estimate of landfill gas (LFG) generation rates of the landfill were prepared under conditions described in the following sections. Because multiple 24" diameter pipes converge at the flare, the pipe containing the largest flow modeled in KYPIPE was used as an example.

Where:

Q =	maximum flow rate =	5,880	scfm
T =	temperature =	110	ºF
P_v =	vapor density =	0.072	lbs / ft^3 of water
P_l =	water density =	61.862	lbs / ft^{3}m of water
K =	constant =	0.35	ft/s at 100 psig
d =	knockout pot diameter =	48	inches

Note:

Knockout pot vertical pressure vessel to have a length-to-diameter ratio of approximately 3:4 and is sized to provide approximately 5 minutes of liquid inventory between the normal liquid level and the bottom of the vessel with the normal liquid level being at approximately the half-full level.

Equations:

Allowable Velocity V_a =

$$V_a = k\sqrt{\frac{\rho_L - \rho_V}{\rho_V}}$$

where,

V_a =	maximum allowable vapor velocity ft/s
K =	0.35 ft/s (when the drum includes a de-entraining mash pad)
P_L =	liquid density lb/ft^3
P_V =	vapor density lb/ft^3
d =	diameter in inches

Design Velocity V_d =

$$V_d = \frac{Q}{\pi d^2/4}$$

Calculation:

V_a=	10.25	ft/s	V_d=	9.75	ft/s
$V_d < V_a$	Pass		$V_d > V_a$	Fail	

Appendix D

GCCS Design Drawings

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LEGEND

- PERMITTED LIMITS OF WASTE
- EXISTING CELL LIMITS
- AREA OF CERTIFIED FINAL COVER
- 900 EXISTING 2019 AERIAL CONTOUR
- 800 PERMITTED TOP OF WASTE / TOP OF PROTECTIVE COVER - MJR
- PERMITTED TOP OF WASTE / TOP OF PROTECTIVE COVER - MNR
- 12" EXISTING LFG HEADER/LATERALS
- W-23 EXISTING LFG EXTRACTION WELL
- 12" PROPOSED LFG HEADER/LATERALS (SEE NOTE 7)
- PROPOSED LFG EXTRACTION WELL (SEE NOTE 7)
- PROPOSED CONDENSATE SUMP (SEE NOTE 8)
- H.P. PROPOSED HIGH POINT
- PROPOSED FLARE STATION
- PROPOSED VALVE (SEE NOTE 5)
- PROPOSED OPTIONAL VALVE (SEE NOTE 6)

NOTES:

1. AERIAL PHOTOGRAPHY DATED MARCH 26, 2019.
2. FINAL COVER GRADES PROVIDED BY GOLDER ASSOCIATES.
3. LIMITS OF EXPANSION AREA WERE APPROXIMATED BASED ON FINAL GRADES PROVIDED BY GOLDER ASSOCIATES.
4. AS-BUILT SURVEY PROVIDED BY WASTE MANAGEMENT, INC. DATED MAY 22, 2020.
5. PROPOSED VALVES, AT HIGH POINTS ON HEADER PIPING, TO REMAIN CLOSED TO LIMIT COUNTER-CURRENT VELOCITIES TO 20 FT/SEC OR LESS. PIPING CONNECTED AT THE POINTS TO ALLOW TEMPORARY ALTERNATE VACUUM SOURCES DURING PHASED CONSTRUCTION AND/OR DURING INTERMEDIATE OPERATIONAL STAGES.
6. PROPOSED OPTIONAL VALVE LOCATIONS RECOMMENDED, BUT NOT REQUIRED.
7. PROPOSED WELL LOCATIONS AND PIPING LAYOUT MAY VARY BASED ON FILLING SEQUENCE AND WASTE DEPTH AT THE TIME OF INSTALLATION. ALTERNATE WELL LOCATIONS AND/OR PIPE LAYOUT MAY BE APPROVED BY THE PROFESSIONAL ENGINEER AT THE TIME OF CONSTRUCTION. THESE ARE CONSIDERED IMMATERIAL AS LONG AS THE DESIGN RADIUS OF INFLUENCE AND PIPE SIZING ARE PROPERLY CONSIDERED.
8. PROPOSED CONDENSATE SUMP LOCATIONS ARE APPROXIMATE AND BASED ON A "CONSTRUCTED" GRADE CONSTRUCTED WITH THE LIMITS OF WASTE DURING LANDFILL DEVELOPMENT. EXISTING GRADE WAS NOT EXAMINED AND THEREFORE SUMP LOCATION WILL OR MAY CHANGE AS NEEDED.
9. HDPE PIPE MATERIAL MAY BE ALTERED UPON APPROVAL BY PROFESSIONAL ENGINEER AT TIME OF INSTALLATION BASED ON WASTE MASS CHARACTERISTICS ENCOUNTERED DURING CONSTRUCTION.

12/15/22

WOODLAND MEADOWS LANDFILL

LANDFILL GAS COLLECTION AND CONTROL SYSTEM

GAS MANAGEMENT PLAN

SCALE IN FEET
0 250 500

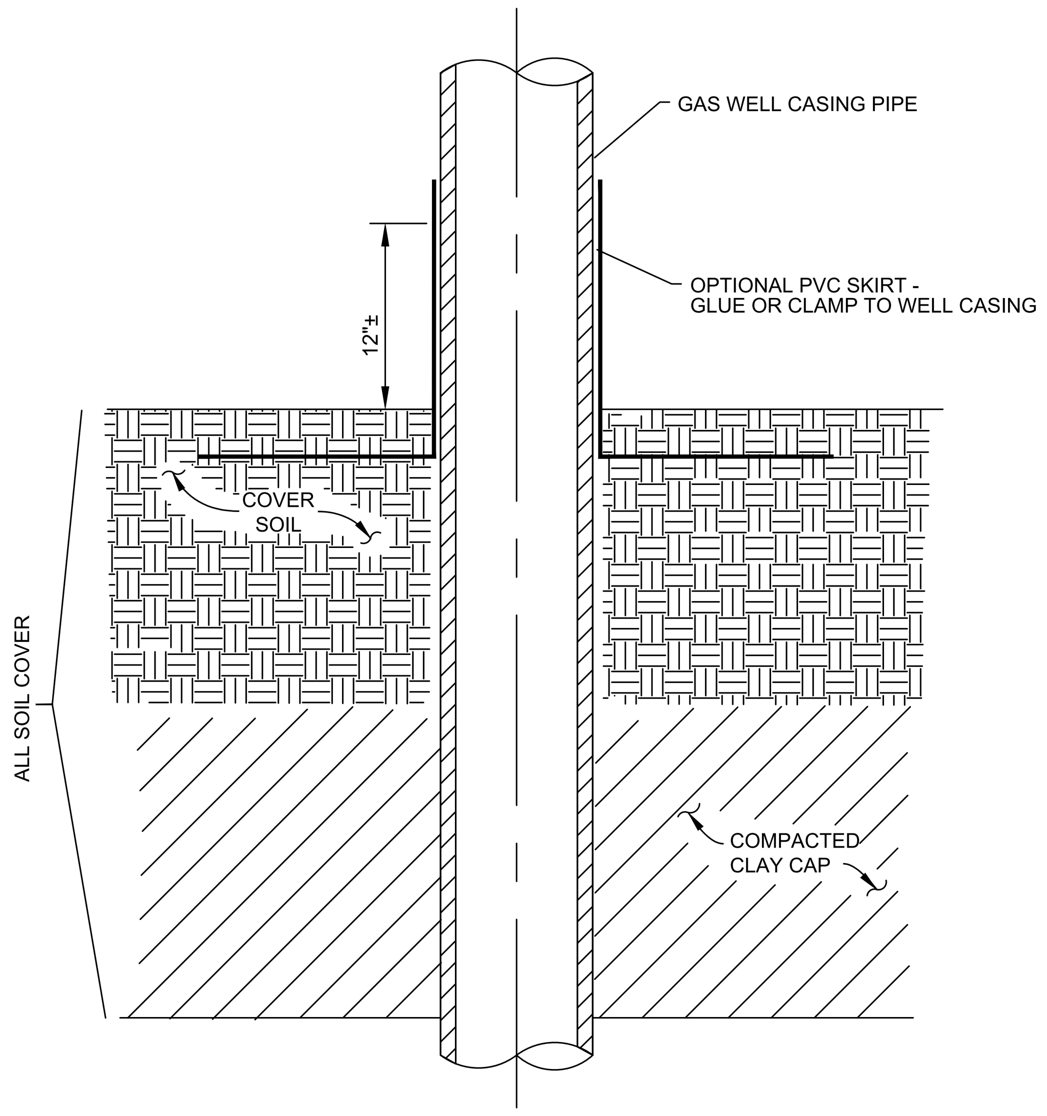
BEL ENVIRONMENTAL ENGINEERING

PROJECT NUMBER: 2022.354

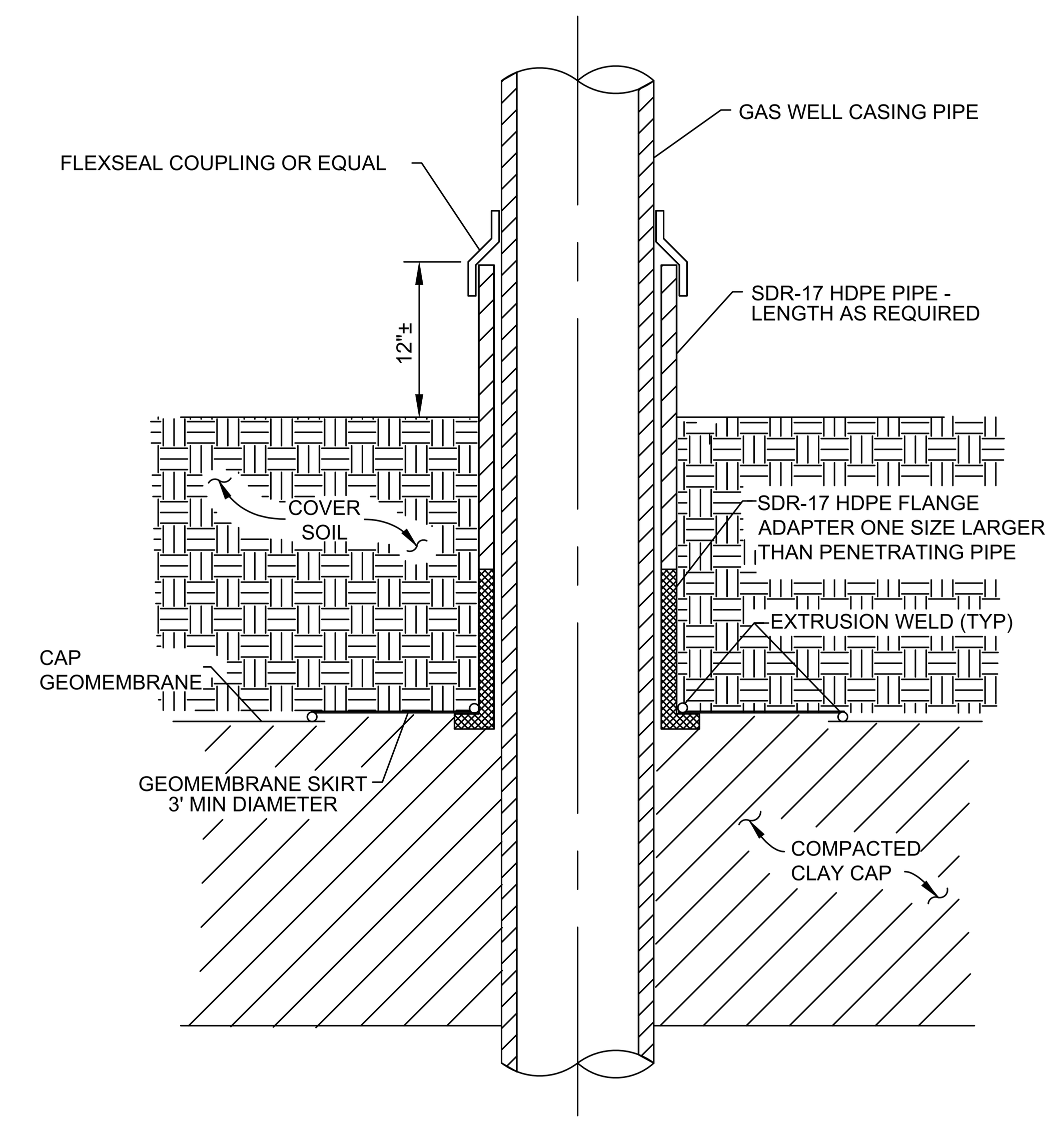
ENG:	BNV	
CAD:	BNV	SUBMITTAL DATE: 12/16/22
CHK:	JCS	PLOT DATE: 12/16/22
REV.	DATE	DESCRIPTION
1	2/1/2021	ADDED TIERED VERTICAL GAS WELL DETAIL
2	2/16/2021	RENUMBERED DETAILS
3	6/21/2021	ADJUSTED HEADER/SUBHEADER PATHWAY

DRAWING:

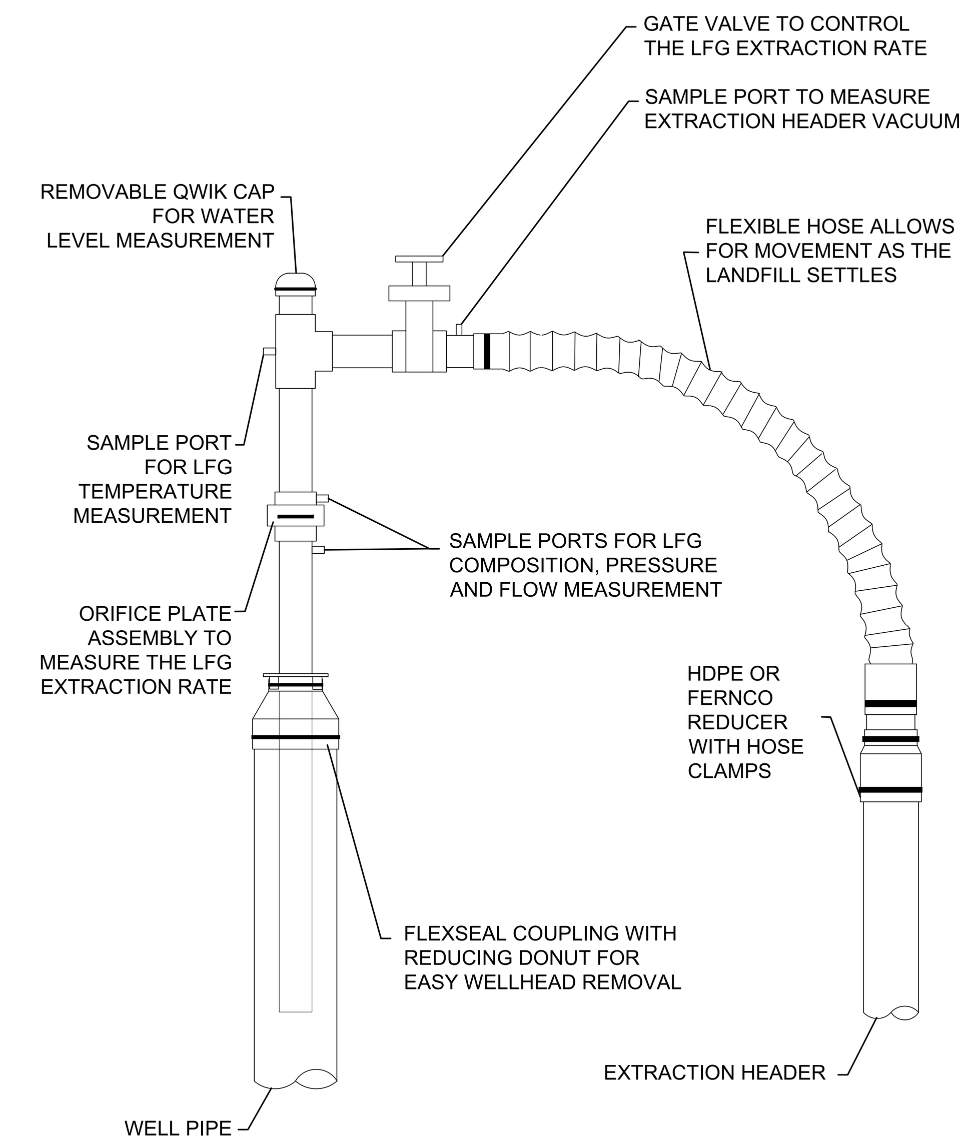
900-1



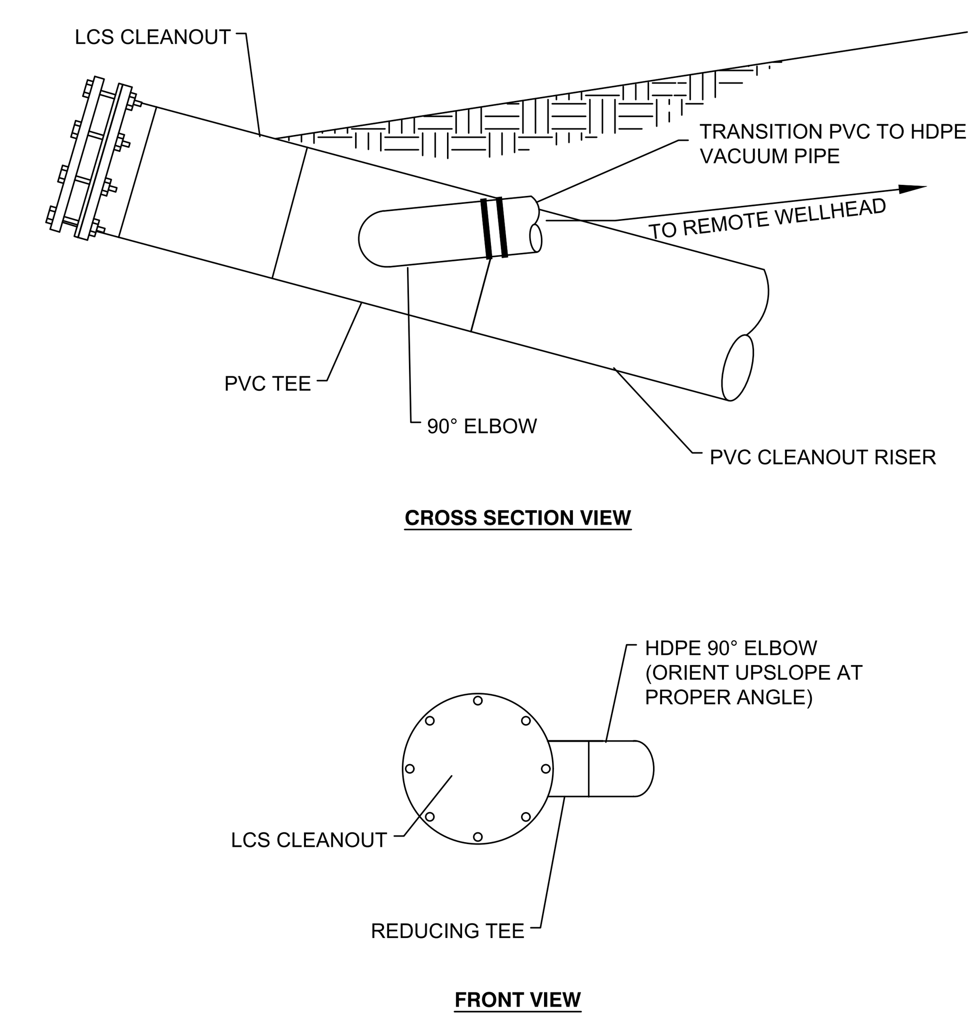
TYPICAL WELL CASING PENETRATION THROUGHT ALL SOIL COVER (1)
NOT TO SCALE



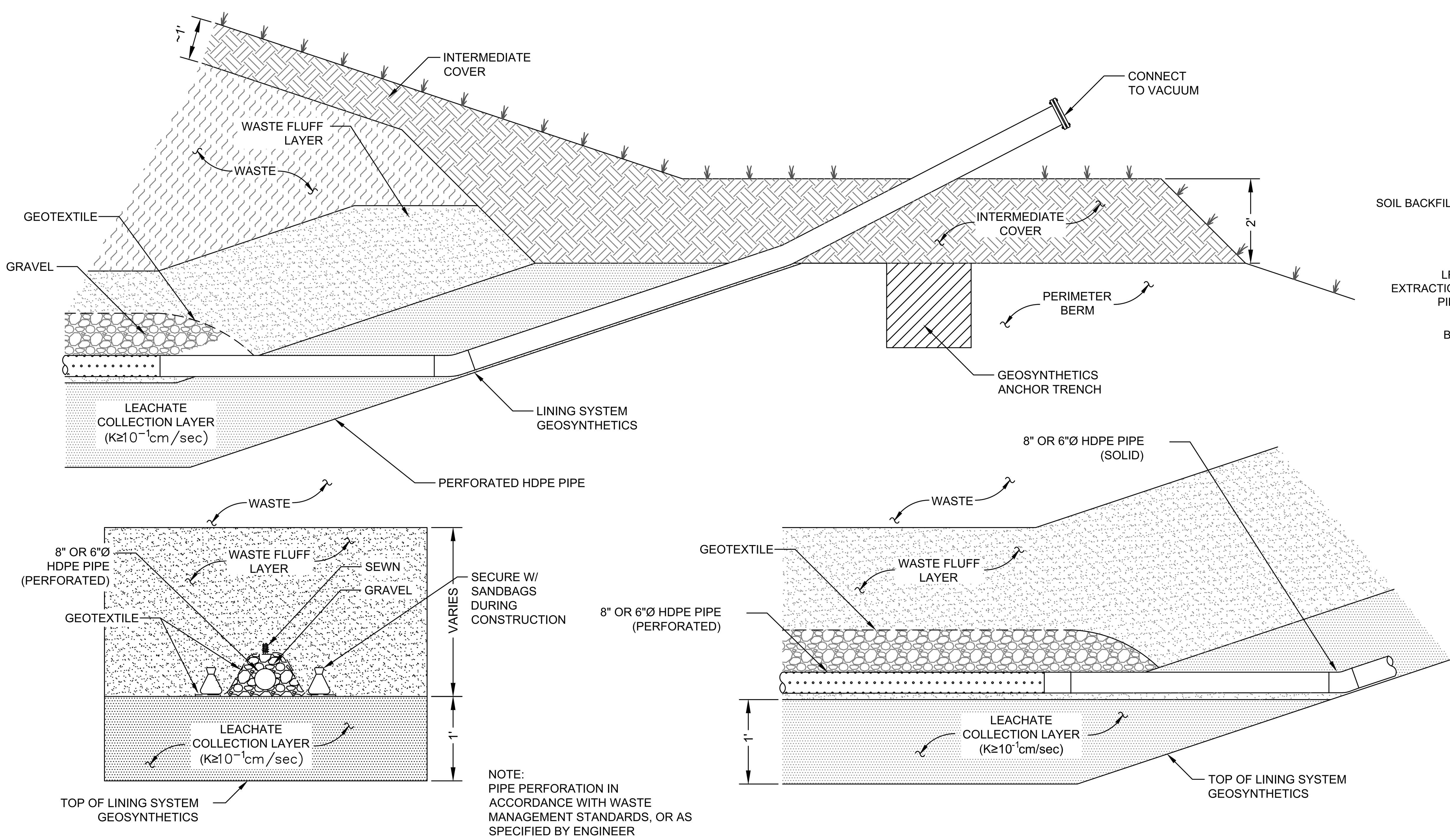
TYPICAL WELL CASING PENETRATION THROUGH GEOMEMBRANE LINER COVER (2)
NOT TO SCALE



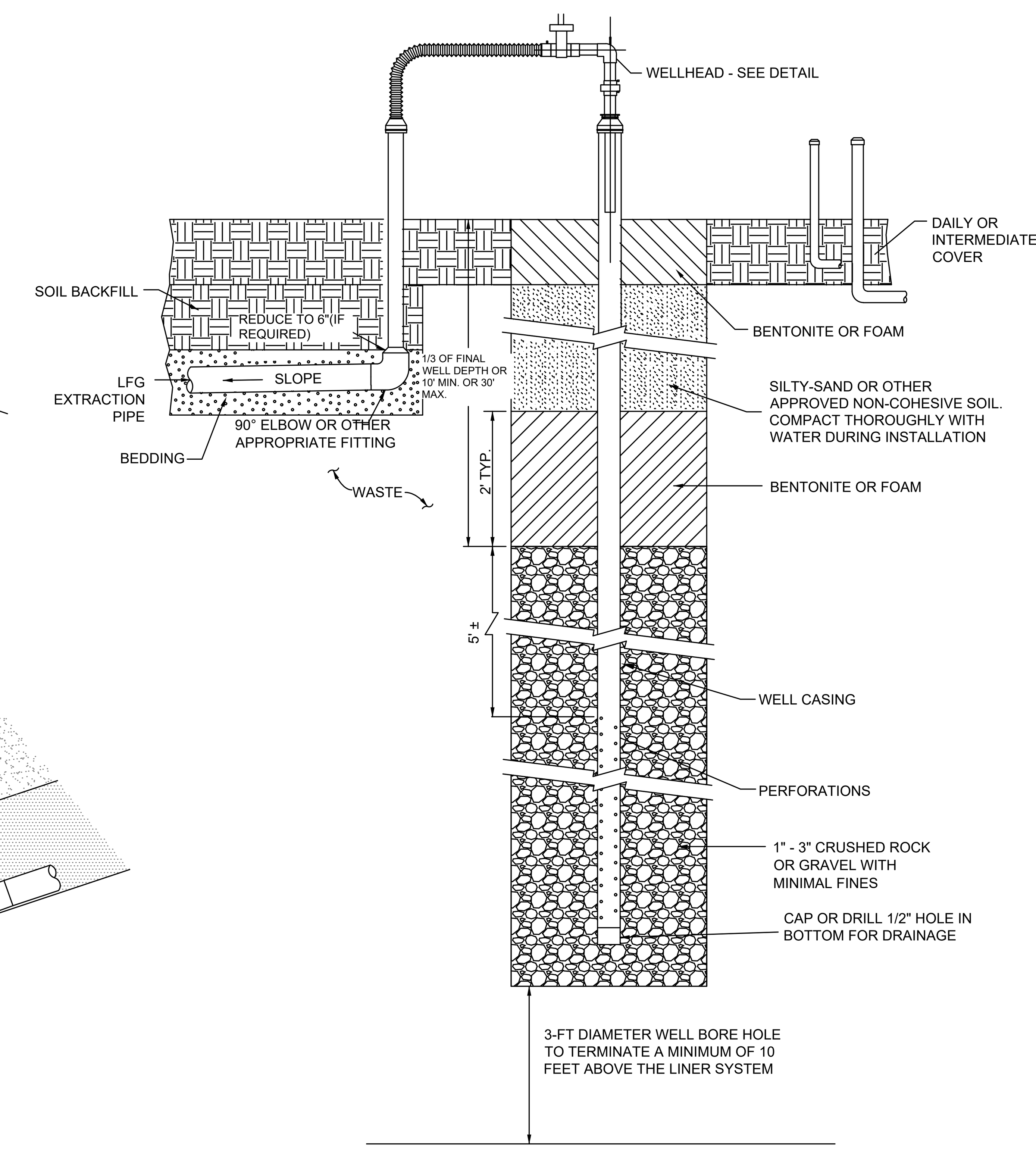
TYPICAL WELLHEAD (3)
NOT TO SCALE



TYPICAL VACUUM CONNECTION TO THE LCRS (4)
NOT TO SCALE



CELL BOTTOM COLLECTOR DETAIL (5)
NOT TO SCALE



LFG COLLECTION WELL (6)
NOT TO SCALE

WOODLAND MEADOWS LANDFILL

LANDFILL GAS COLLECTION AND CONTROL SYSTEM

GAS MANAGEMENT DETAILS - SHEET 1 OF 2

BEL ENVIRONMENTAL ENGINEERING

PROJECT NUMBER: 2020.293

ENG.	BNV			
CAD.	BNV		SUBMITTAL DATE:	9/10/20
CHK.	JCS		PLOT DATE:	12/15/22
REV.	DATE	DESCRIPTION		
1	2/1/2021	REVISED DETAILS 6 AND 7		
2	2/16/2021	REVISED DETAIL 6		

DRAWING: 900-2

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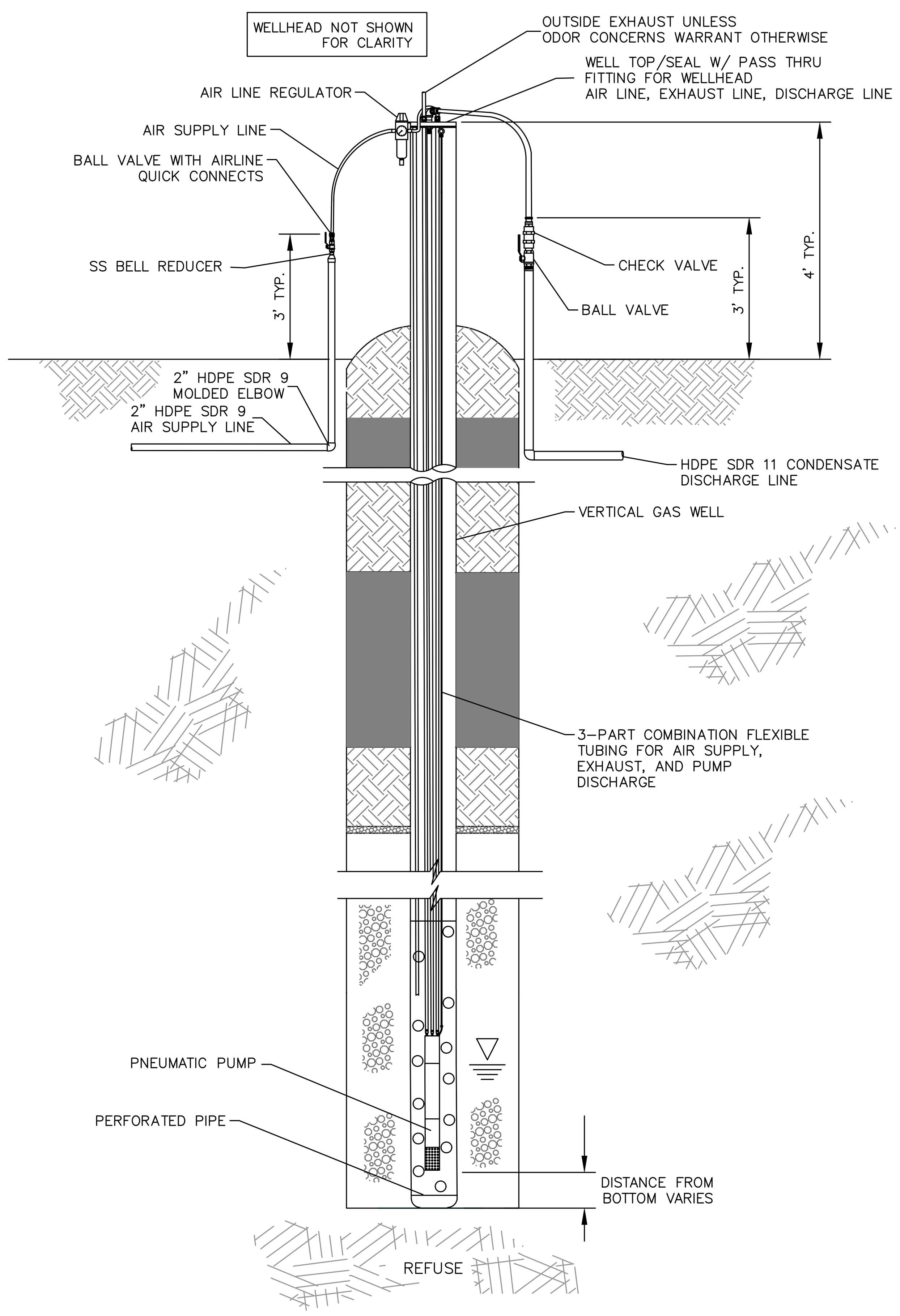
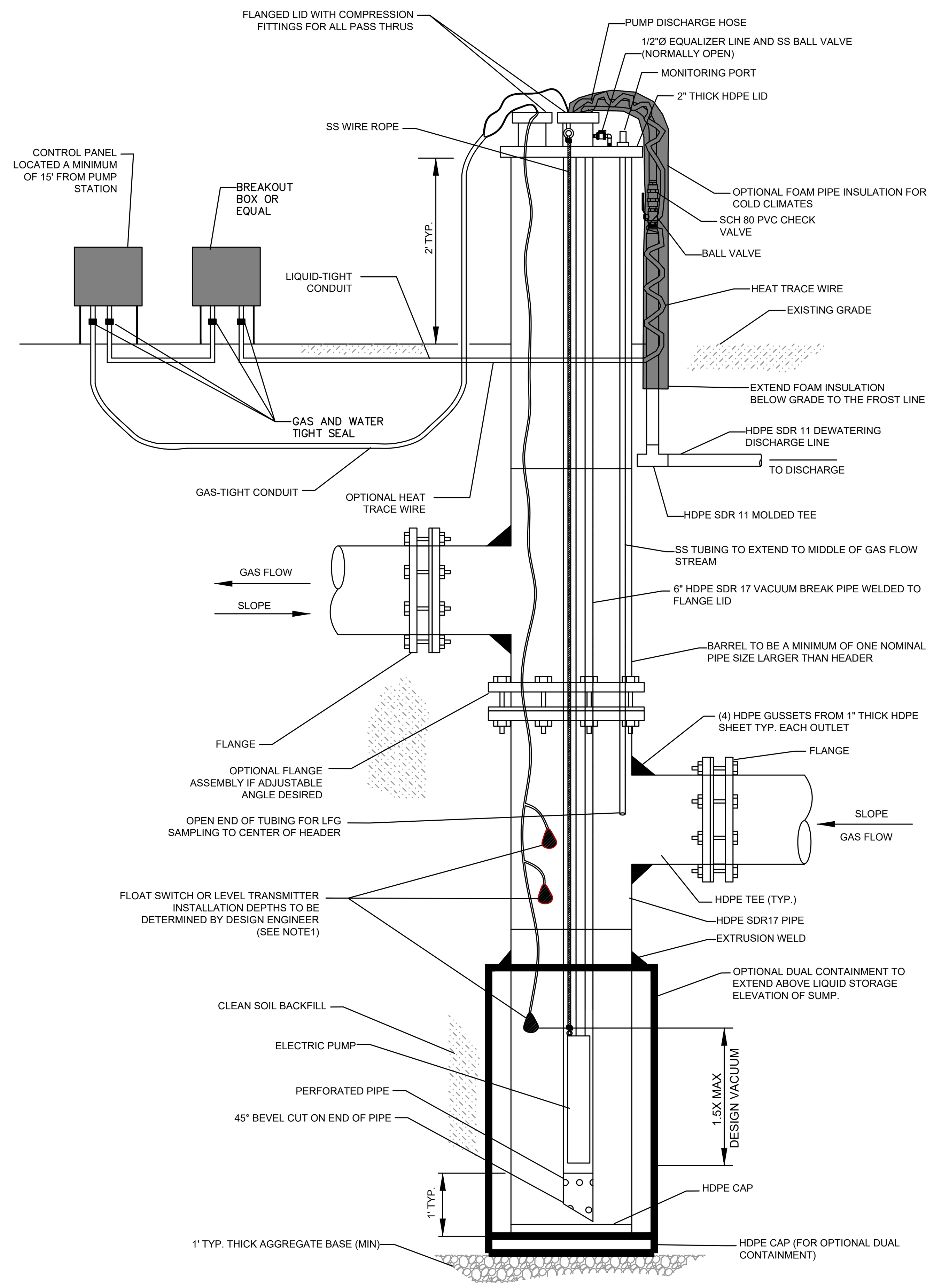
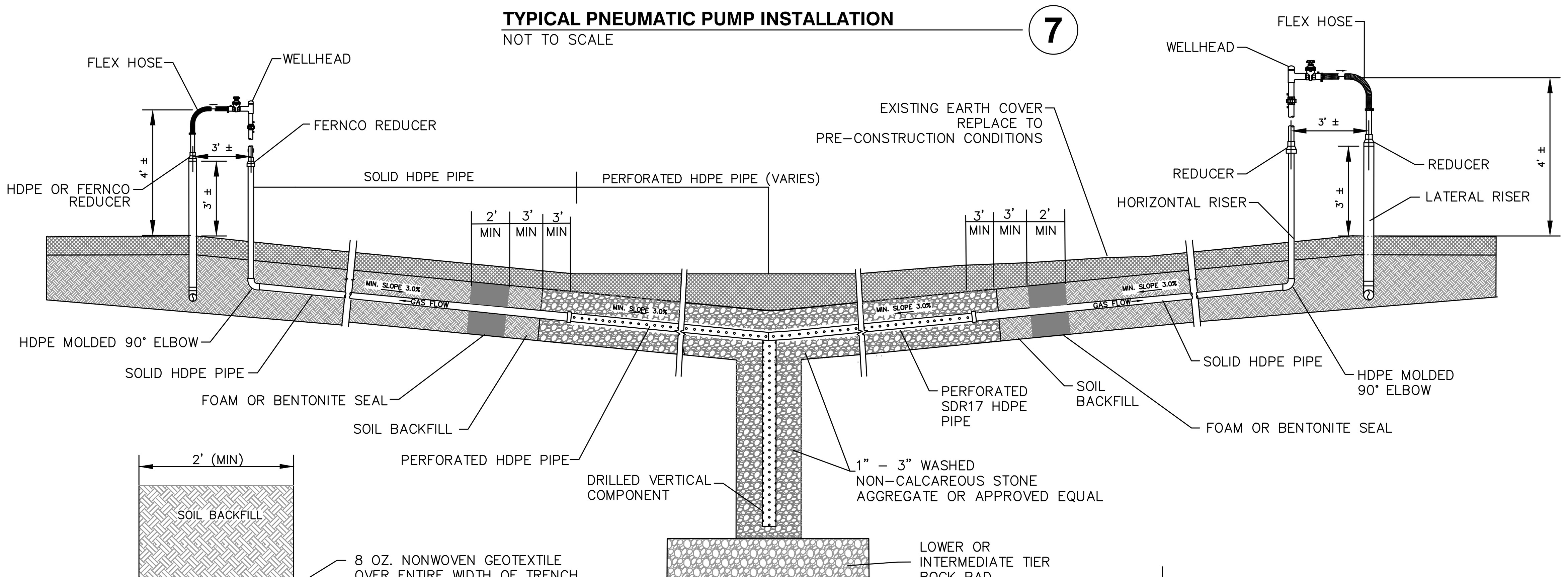


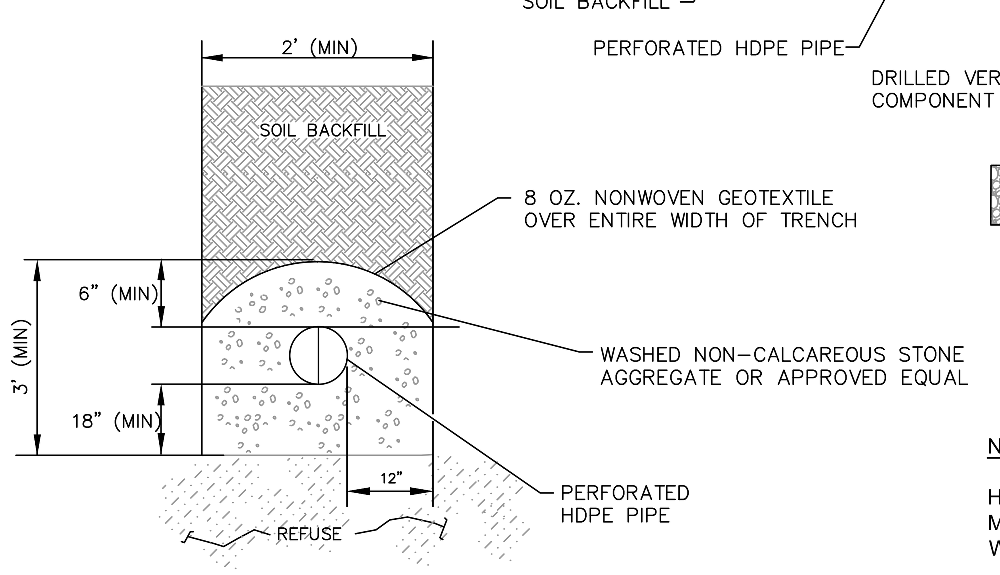
TYPICAL PNEUMATIC PUMP INSTALLATION (7)
NOT TO SCALE



NOTE:
1. LEVEL CONTROLS SHALL BE INSTALLED FOR "PUMP ON", "PUMP OFF", AND "HIGH LEVEL ALARM".

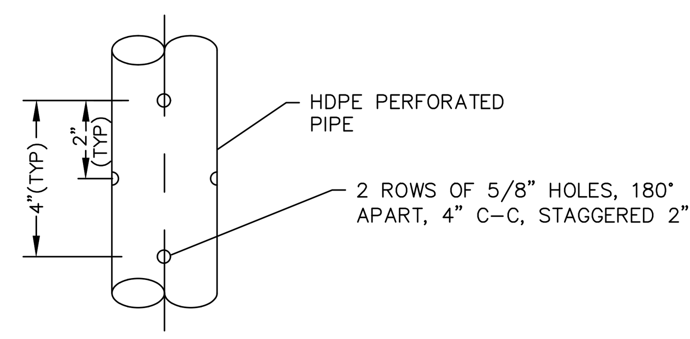
TYPICAL ELECTRIC CONDENSATE PUMP STATION (8)
NOT TO SCALE





CROSS SECTION

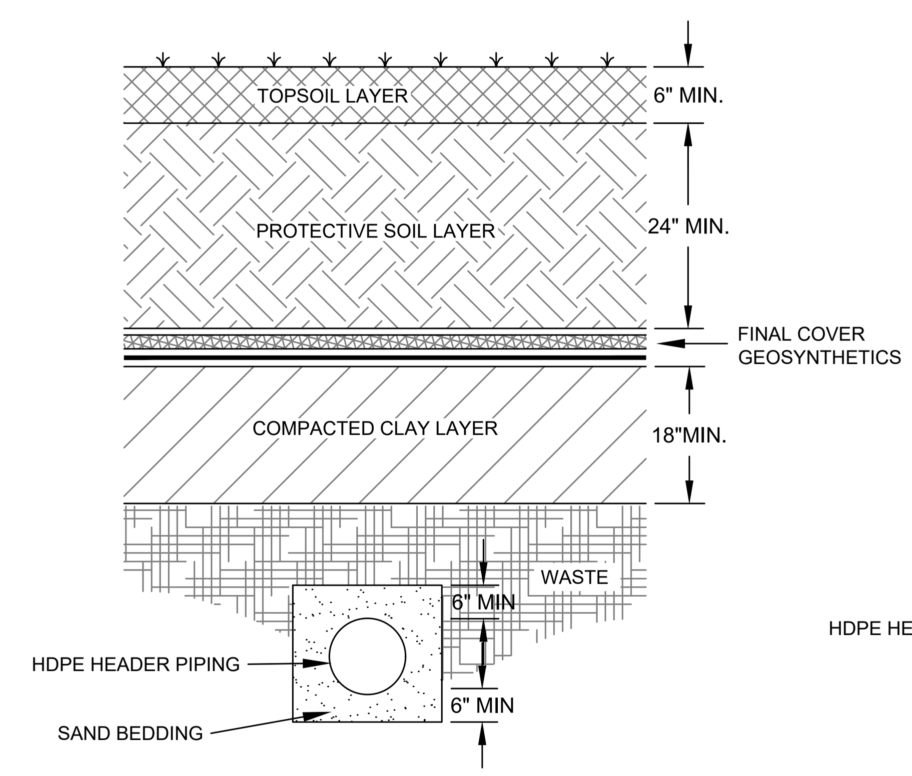
NOTE:
HORIZONTAL COLLECTOR MAY INCLUDE MULTIPLE VERTICAL COMPONENTS AND WELL HEAD AT ONE OR BOTH ENDS.



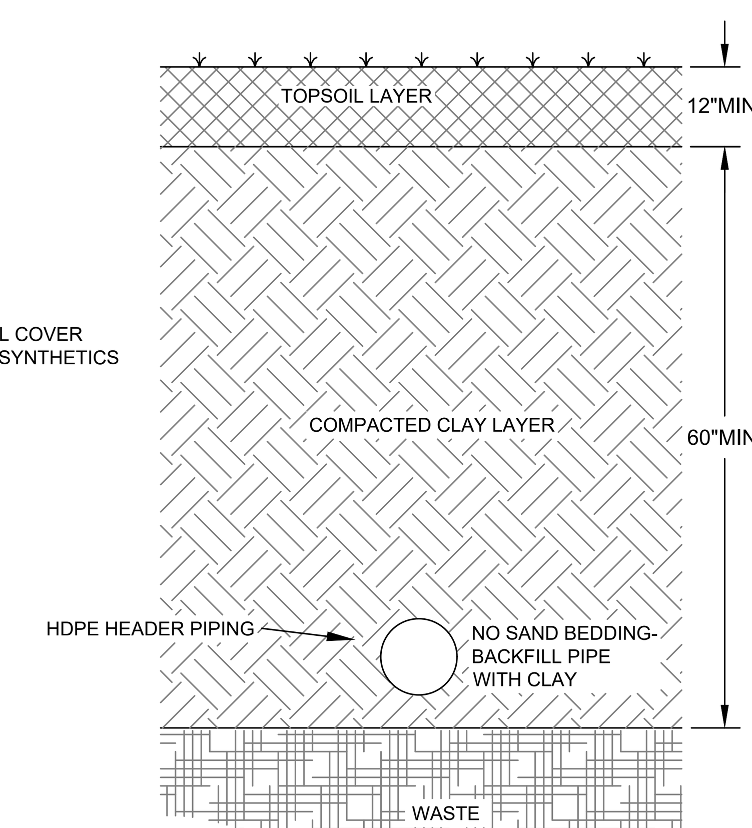
PERFORATED PIPE DETAIL

TYPICAL HORIZONTAL LFG COLLECTOR W/ VERTICAL FEATURE (9)
NOT TO SCALE

GEOSYNTHETIC FINAL COVER



ALL SOIL FINAL COVER



PIPE BEDDING DETAIL (10)
NOT TO SCALE

STATE OF MICHIGAN ANGELA LEONARD ENGINEER No. 52153 LICENSED PROFESSIONAL ENGINEER
12/15/22

WOODLAND MEADOWS LANDFILL

LANDFILL GAS COLLECTION AND CONTROL SYSTEM

GAS MANAGEMENT DETAILS - SHEET 2 OF 2

BEL ENVIRONMENTAL ENGINEERING

PROJECT NUMBER: 2020.293

ENG.	BNV			
CAD.	BNV		SUBMITTAL DATE:	9/10/20
CHK.	JCS		PLOT DATE:	12/15/22
REV.	DATE	DESCRIPTION		
1	2/1/2021	ADDED TIERED VERTICAL GAS WELL DETAIL		
2	2/16/2021	RENUMBERED DETAILS		

DRAWING: 900-3

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APPENDIX E

SURFACE EMISSIONS MONITORING PLAN

SURFACE EMISSIONS MONDITORING PLAN

I. INTRODUCTION

Per ***§60.763(d)***, as indicted in Section C.2 below, this appendix constitutes the formal "surface emissions monitoring (SEM) plan" for Woodland Meadows Landfill (Facility).

II. COMPLIANCE WITH SEM OPERATIONAL STANDARDS §60.763(d)

§60.763(d) *Operate the collection system so that the methane concentration is less than 500 parts per million above background at the surface of the landfill. To determine if this level is exceeded, the owner or operator must conduct surface testing using an organic vapor analyzer, flame ionization detector, or other portable monitor meeting the specification provided in §60.765(d). The owner or operator must conduct surface testing around the perimeter of the collection area and along a pattern that traverses the landfill at 30-meter intervals and where visual observations indicate elevated concentrations of landfill gas, such as distressed vegetation and cracks or seeps in the cover and all cover penetrations. Thus, the owner or operator must monitor any openings that are within an area of the landfill where waste has been placed and a gas collection system is required. The owner or operator may establish an alternative traversing pattern that ensures equivalent coverage. A surface monitoring design plan must be developed that includes a topographical map with the monitoring route and the rationale for any site-specific deviations from the 30-meter intervals. Areas with steep slopes or other dangerous areas may be excluded from the surface testing.*

As indicated above, this appendix constitutes the SEM plan. The drawing entitled SEM Map at the end of this Appendix shows the proposed route for surface emissions monitoring (including a background topographical map of proposed final cover) at landfill closure. Prior to each monitoring event, the Site or its consultant will conduct route planning where the best route for that round of monitoring will be decided. This will be decided based on Site operating conditions and topographical features at the time of each monitoring event.

As required by §60.763(d), the owner or operator will conduct surface testing using an organic vapor analyzer, flame ionization detector, or other portable monitor meeting the specification provided in §60.765(d). This quarterly surface testing will be performed to determine that the collection system is being operated so that the methane concentration is less than 500 parts per million (ppm) above background at the surface of the landfill.

The surface testing will be conducted around the perimeter of the required landfill gas (LFG) collection and control system (GCCS) collection area (e.g., areas with 5 year old refuse and/or areas with 2 year old refuse that are at final grade) and along a pattern that traverses the landfill at 30-meter intervals and where visual observations indicate elevated concentrations of landfill gas, such as distressed vegetation and cracks or seeps in the cover and all cover penetrations.

Openings (penetrations) that are within an area of the landfill where waste has been placed and a gas collection system is required will be monitored. "Penetration and opening" under this GCCS Design Plan will be defined as any LFG collection well or LFG collection device included in the GCCS Design Plan that completely passes through the landfill cover into waste and is located within an area of the landfill where waste has been placed and a gas collection system is required. Examples of what is not a penetration for purposes of this subpart include, but are not limited to: survey stakes, fencing, including litter fences; flags, valve supports, signage, utility posts, manholes, barriers, trees, grass, and weeds.

Excluded areas from surface monitoring will include dangerous areas with roads, truck traffic areas, paved areas excluding cracks, steep slopes, areas covered with snow or ice, and active filling areas of the landfill due to the health and safety risk of working around heavy equipment traffic. Prior to each monitoring event, the Facility will complete route planning where excluded areas will be delineated and any modifications to the route will be recorded. Any deviations to the proposed plan will be recorded and included in the NSPS reports.

III. COMPLIANCE WITH SEM COMPLIANCE PROVISIONS §60.765(c) AND (d)

§60.765(c) The following procedures must be used for compliance with the surface methane operational standard as provided in § 60.763(d).

(1) After installation and startup of the gas collection system, the owner or operator must monitor surface concentrations of methane along the entire perimeter of the collection area and along a pattern that traverses the landfill at 30 meter intervals (or a site specific established spacing) for each collection area on a quarterly basis using an organic vapor analyzer, flame ionization detector, or other portable monitor meeting the specifications provided in paragraph (d) of this section.

(2) The background concentration must be determined by moving the probe inlet upwind and downwind outside the boundary of the landfill at a distance of at least 30 meters from the perimeter wells.

(3) Surface emission monitoring must be performed in accordance with section 8.3.1 of Method 21 of appendix A of this part, except that the probe inlet must be placed within 5 to 10 centimeters of the ground. Monitoring must be performed during typical meteorological conditions.

(4) Any reading of 500 parts per million or more above background at any location must be recorded as a monitored exceedance and the actions specified in paragraphs (c)(4)(i) through (v) of this section must be taken. As long as the specified actions are taken, the exceedance is not a violation of the operational requirements of § 60.763(d).

(i) The location of each monitored exceedance must be marked, and the location and concentration recorded.

(ii) Cover maintenance or adjustments to the vacuum of the adjacent wells to increase the gas collection in the vicinity of each exceedance must be made and the location must be remonitored within 10 calendar days of detecting the exceedance.

(iii) If the re-monitoring of the location shows a second exceedance, additional corrective action must be taken, and the location must be monitored again within 10 days of the second exceedance. If the re-monitoring shows a third exceedance for the same location, the action specified in paragraph (c)(4)(v) of this section must be taken, and no further monitoring of that location is required until the action specified in paragraph (c)(4)(v) of this section has been taken.

(iv) Any location that initially showed an exceedance but has a methane concentration less than 500 ppm methane above background at the 10-day re-monitoring specified in paragraph (c)(4)(ii) or (iii) of this section must be re-monitored 1 month from the initial exceedance. If the 1-month remonitoring shows a concentration less than 500 parts per million above background, no further monitoring of that location is required until the next quarterly monitoring period. If the 1-month re-monitoring shows an exceedance, the actions specified in paragraph (c)(4)(iii) or (v) of this section must be taken.

(v) For any location where monitored methane concentration equals or exceeds 500 parts per million above background three times within a quarterly period, a new well or other collection device must be installed within 120 calendar days of the initial exceedance. An alternative remedy to the exceedance, such as upgrading the blower, header pipes or control device, and a corresponding timeline for installation may be submitted to the Administrator for approval.

(5) The owner or operator must implement a program to monitor for cover integrity and implement cover repairs as necessary on a monthly basis.

§60.765(c)(1) requires quarterly monitoring of the surface of the NSPS-required GCCS area for methane. Quarterly monitoring will take place along the entire perimeter of the required collection area and along a serpentine pattern spaced 30 meters apart for each collection area on a quarterly basis. This monitoring will be performed using an organic vapor analyzer, flame ionization detector, or other portable monitor meeting the specifications provided in paragraph (d) of this section and detailed below.

Per §60.765(c)(2), the background concentration will be determined immediately prior to conducting the survey. The background concentration shall be determined by moving the probe inlet upwind and downwind outside the boundary of the landfill at least 30 meters from the outermost perimeter wells. The background concentration, measurement location, basic meteorological conditions, and any other factors that could affect the background concentration may also be noted.

Per §60.765(c)(3) and Section 8.3.1 of Method 21, the surface monitoring shall be performed by moving the probe along the landfill surface (using the mapped serpentine route) while observing the instrument readout. The probe must be placed within 5 to 10 centimeters of the ground. If the maximum observed meter reading is greater than 500 ppm, record and report the result. As previously mentioned, monitoring will not be performed during extreme meteorological conditions. Monitoring will be rescheduled as soon as practicable if it cannot be conducted because conditions are outside of what could reasonably be considered as typical.

If a reading in excess of 500 ppm is recorded, the following actions shall be taken (As long as these actions are taken, the exceedance is not a violation of the operational requirements of 60§ 60.763(d)):

1.) The location of the monitored exceedance shall be marked, the concentration measured, and the location recorded. The location must be noted with latitude and longitude coordinates using an instrument with an accuracy of at least 4 meters, the coordinates must be in decimal degrees with at least 5 decimal places.

2.) Cover maintenance or adjustments to the vacuum of the adjacent wells will be performed to increase gas collection in the vicinity of each exceedance. The location will then be re-monitored within 10 calendar days of detecting the exceedance.

3.) If the re-monitoring of the location shows a second exceedance, additional corrective action will be taken, and the location will be monitored again within 10 days of the second exceedance. If the re-monitoring shows a third exceedance for the same location, the action specified in item (5) to follow will be taken, and no further monitoring of that location is required until the action specified in item (5) is taken.

4.) Any location that initially showed an exceedance but has a methane content less than 500 ppm methane above background at the 10-day re-monitoring will also be monitored 1 month from the initial exceedance. If the 1-month re-monitoring shows a concentration less than 500 ppm above background, no further monitoring of the location is required until the next quarterly monitoring period. If the 1-month re-monitoring shows an exceedance, the actions specified in item (5) to follow will be taken.

5.) For any location where the monitored methane concentration equals or exceeds 500 parts per million above background three times in a quarterly period, a new well or other collection device will be installed within 120 calendar days of the initial exceedance. An alternative remedy to the exceedance, such as upgrading the landfill cover or cap, blower, header pipes, or control device, and a corresponding timeline for installation may be submitted to the administrator for approval.

§60.765(c)(5) requires a program to monitor for cover integrity and implement cover repairs as necessary on a monthly basis. This may be performed during surface scan events quarterly to cover those months. During surface scan events, the monitoring technician will look for signs of compromised cover integrity such as stressed vegetation, cracks, and erosion. The inspection will be documented in the surface scan monitoring form and appropriate facility personnel will be notified so that appropriate actions can be taken.

§60.765(d) Each owner or operator seeking to comply with the provisions in paragraph (c) of this section or § 60.764(a)(6) must comply with the following instrumentation specifications and procedures for surface emission monitoring devices:

(1) The portable analyzer must meet the instrument specifications provided in section 6 of Method 21 of appendix A of this part, except that "methane" replaces all references to "VOC".

(2) The calibration gas must be methane, diluted to a nominal concentration of 500 parts per million in air.

(3) To meet the performance evaluation requirements in section 8.1 of Method 21 of appendix A of this part, the instrument evaluation procedures of section 8.1 of Method 21 of appendix A of this part must be used.

(4) The calibration procedures provided in sections 8 and 10 of Method 21 of appendix A of this part must be followed immediately before commencing a surface monitoring survey.

The monitoring will be conducted with an organic vapor analyzer, flame ionization detector, or other portable monitor meeting the specifications located in 40 CFR §60.765(d):

> The portable analyzer must meet the instrument specifications provided in Section 6 of Method 21 of Appendix A of this part, except that "methane" shall replace all references to "VOC."

To meet the performance evaluation requirements in Section 6 of Method 21, the instrument evaluation procedures of Section 8.1 of Method 21 will be used. Also, the calibration procedures provided in sections 8 and 10 of Method 21 of Appendix A of this part will be followed immediately before commencing a surface monitoring survey. The performance evaluation results include response factor, calibration precision, and response time. The calibration gas shall be methane, diluted to a concentration of 500 parts per million in air. These results will be documented for each monitoring event.

IV. COMPLIANCE WITH SEM MONITORING PROVISIONS §60.766(f)

§60.766(f) *Each owner or operator seeking to demonstrate compliance with the 500 parts per million surface methane operational standard in § 60.763(d) must monitor surface concentrations of methane according to the procedures in § 60.765(c) and the instrument specifications in § 60.765(d). Any closed landfill that has no monitored exceedances of the operational standard in three consecutive quarterly monitoring periods may skip to annual monitoring. Any methane reading of 500 ppm or more above background detected during the annual monitoring returns the frequency for that landfill to quarterly monitoring.*

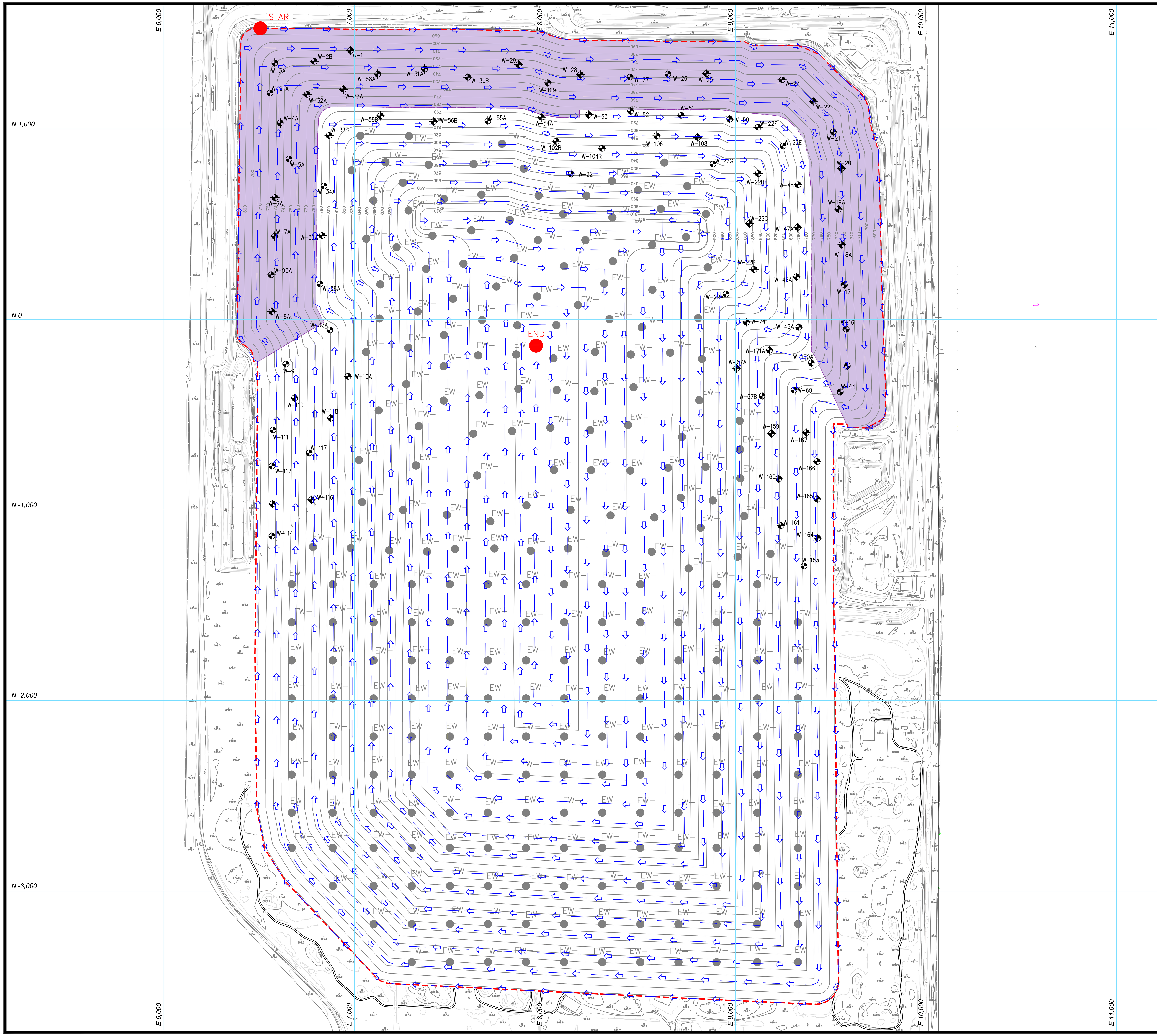
Sections C.2 and C.3 of this Plan discuss the operational standards, monitoring requirements, and instrument specifications cited in §60.766(f).

40 CFR §60.766(f) also allows for any closed landfill that has no monitored exceedances of the 500-ppm limit above background in three consecutive quarterly monitored periods after landfill closure to reduce the monitoring frequency to annually. Any methane reading of 500 ppm or more above the background detected during an annual monitoring event shall automatically return the frequency back to a quarterly frequency. This provision may be exercised if the surface scans meet these criteria after landfill closure.

V. COMPLIANCE WITH SEM REPORTING REQUIREMENTS §60.767(g)(5)

§60.765(g)(5) *The location of each exceedance of the 500 parts per million methane concentration as provided in § 60.763(d) and the concentration recorded at each location for which an exceedance was* *recorded in the previous month. For location, you must determine the latitude and longitude coordinates using an instrument with an accuracy of at least 4 meters. The coordinates must be in decimal degrees with at least five decimal places.*

As provided in Section C.3 of this Plan, the location of each monitored exceedance of the 500 parts per million methane concentration will be marked and the location recorded. The location will be noted with latitude and longitude coordinates using an instrument with an accuracy of at least 4 meters, the coordinates must be in decimal degrees with at least 5 decimal places.



LEGEND

- PERMITTED LIMITS OF WASTE
- CONSTRUCTED LIMITS OF WASTE
- AREA OF CERTIFIED FINAL COVER
- 900 EXISTING AERIAL CONTOUR
- PROPOSED SEM PATHWAY
- EW PROPOSED LFG EXTRACTION WELL
- START SEM PATHWAY START
- END SEM PATHWAY END

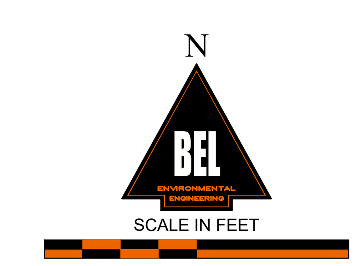
NOTES:

1. SURFACE EMISSIONS MONITORING PATHWAY REPRESENTS FINAL GRADE CONDITIONS. INTERIM PATHWAYS WILL BE MONITORED BASED UPON WASTE PLACEMENT AND GCCS DEVELOPMENT, IN ACCORDANCE WITH NSPS REGULATIONS.

2. TYPICAL SPACING FOR THE MONITORING PATH IS APPROXIMATELY 30 METERS (100 FT). LOCAL VARIATIONS MAY OCCUR TO ACCOMMODATE LANDFILL PHASING, FIELD CONDITIONS, AND SAFETY CONCERNS AT THE TIME OF MONITORING.

3. MONITORING TO BE PERFORMED IN ACCORDANCE WITH 40 CFR 63.1960(c).

4. EXISTING PROPERTY INFORMATION AND PERMIT CONTOURS OBTAINED FROM WOODLAND MEADOWS LANDFILL.



WOODLAND MEADOWS LANDFILL

LANDFILL GAS COLLECTION AND CONTROL SYSTEM

SEM MAP

BEL ENVIRONMENTAL ENGINEERING

PROJECT NUMBER: 2022.354			
ENG:	TFS	AERIAL SURVEY DATE:	-
CAD:	TFS	SUBMITTAL DATE:	-
CHK:	PTS	PLOT DATE:	12/15/22
REV.	DATE	DESCRIPTION	
-	-	-	

DRAWING: 1 OF 1

APPENDIX F

GCCS PLAN DATA SHEET & LIST OF ASSUMPTIONS

BEL ENVIRONMENTAL ENGINEERING

GCCS PLAN DATA SHEET AND LIIST OF ASSUMPTIONS

WOODLAND MEADOWS LANDFILL

August 2020, partial update December 2022

Project Information:

1	Project Name:	Woodland Meadows Landfill (WML) GCCS Plan	Completed by	PTS	Date:	7/27/2020
2	Project Number:	2020.293; 2022.354	Reviewed by:	AML	Date:	8/24/20; 12/15/22
3	Facility Name:	Woodland Meadows Landfill (WML)				

Section 1 - Site Information & Data (To Be Obtained From Owner and/or Representative Thereof):

1	Permitted Design Capacity			122,133,837	tons	Calculated based on permitted cy using 3 year average density proved below
2	Permitted Design Capacity			113,437,000	cy	Provided by WM Manager (rev. 2022)
3	Facility Opened:			1975	Year	Provided by WM Manager
4	Facility Closure:			2041	(1) Year	Provided by WM Manager (rev. 2022)
5	Future Annual Methanogenic Tonnages to be used in LandGEM modeling			1,277,732	tons / yr	Used same methanogenic tonnage from most current year, 2021 (rev. 2022)
6	Annual Growth To Be Assumed After Most Current Year:			0	%	assumed to be 0
7	Annual Density, if available:	Year	pcy	Average PCY		Provided by WM Manager
		2019	2180			
		2018	2160	2,153	lb_m/cy	
		2017	2120			
8	Average Projected Waste Density:			2,153	3-yr ave. lb_m/cy	
9	Blower Inlet Pressure			-60	inch w.c.	per Facility Engineer email dated 8/24/20
10	Blower Outlet Pressure			10	inch w.c.	assumed
11	Total Flare Capacity and Information			13,050	scfm	South Flares 1-4 (2500 ea) + North Open (650) + Van Buren Enclosed (2400) = 13,050 scfm total (rev. 2022)
12	Total Blower Capacity and Information				scfm	
13	Available Vacuum to the Field			-60	inch w.c.	Provided by WM Manager in email dated 8/24/20
14	LFGTE Rating if applicable			6,500	scfm	Assumed based on Plant Flare capacity (rev. 2022)
15	Solid Waste Permit Number					
16	Title V ROP Permit			MI-ROP-M4449-2012		Provided by WM Manager in email dated 8/24/20
17	Title V ROP Permit Expiration Date					
18	PTIs Incorporated into previous ROPs			NA		
19	AQD Agency Contact			Detroit District		Air Quality Division of EGLE (rev. 2022)
20	LFG Temperate Range at Blower Inlet			50	ºF (min.)	
				100	ºF (max.)	

GCCS PLAN DATA SHEET AND LIIST OF ASSUMPTIONS

WOODLAND MEADOWS LANDFILL

August 2020, partial update December 2022

Section 2 - BEL Assumptions in GCCS Plan:

1	Methane Concentration:	50	%	Industry standard for Type II facilities (rev. 2022)
2	Methane Generation Potential (Lo):	100	m^3/Mg	AP-42 default Inventory Conventional used for Midwest Area (rev. 2022)
3	Methane Generation Rate Constant (k):	0.04	per year	
4	Average Projected Airspace Utilization Factor:	1.076667	ton/cy	Calculated based on projected waste density
5	NSPS Collection Efficiency	75	%	Industry standard
6	Typical Temperature at Wellhead	110	ºF	Industry standard
7	Solid Well Casing From Ground to Top of Perforations	20	feet	ROIC Table (Note 2) Assumes 20'
8	NMOC Concentration	238.9	ppmv as hexane	Provided by facility (rev. 2022)
9	LFG Specific Gravity	1.036		Assumed values for head loss calculations
10	LFG Ratio of Specific Heats	1.303		Assumed values for head loss calculations
11	LFG Absolute Viscosity	2.82E-07	lb-sec/sf	Assumed values for head loss calculations
12	Maximum Con-Current Velocity	Unlimited	fps	Assumed values for head loss calculations
13	Maximum Counter-Current Velocity	20	fps	Assumed values for head loss calculations
14	Maximum Pressure Drop	1	" w.c. / 100 ft of pipe	Assumed values for head loss calculations
15	LFG Reference Density	7.20E-02	lbs/cf	Assumed values for head loss calculations
16	LFG Molecular Weight	30.01	g/mole	Assumed values for head loss calculations
17	Gas Constant	51.49		Assumed values for head loss calculations
18	Permitted Design Capacity		Mg/year	
19	Typical Pressure at Wellhead	-25	inch w.c.	
20	GCCS Plan & Above Cross Checked with Title V Permit for Consistency	No		
21	Site Specific NMOC Test Results Provided	Yes	Yes or No	Back data provided by Facility (rev. 2022)
22	Initial Performance Testing Provided	No	Yes or No	To be provided by Facility (rev. 2022)

Section 3 - Notes

1	This GCCS Plan Data Sheet & List of Assumptions was originally completed in August 2002 & partially updated in December of 2022 at noted
2	Data and information has been provided by Facility or representative thereof as noted
3	BEL calculations in and assumptions in all Sections are based on generally accepted industry standards
4	
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BEL
ENVIRONMENTAL ENGINEERING

GCCS PLAN DATA SHEET AND LIIST OF ASSUMPTIONS

WOODLAND MEADOWS LANDFILL

August 2020, partial update December 2022

Section 4 - Annual Total LFG Flow Collected Normalized to 50% Methane & Calculated Collection Efficiency (rev. 2022)

Control Device (as identified in GHG reports) provided by Facility	2021 Total Flow		2020 Total Flow		2019 Total Flow		2018 Total Flow		2017 Total Flow		Comments
	Collected (scfm)	Monthly Ave. % CH4	Total Flow (scfm)	Monthly Ave. CH4	Total Flow (scfm)	Monthly Ave. CH4	Total Flow (scfm)	Monthly Ave. CH4	Total Flow (scfm)	Monthly Ave. CH4	
South Enclosed 1:	1,339	56.70%	823	55.90%	667	56.90%	698	55.30%	1,955	55.10%	Ameresco/Ford assumed to have same CH4 content as North Control
South Enclosed 2:	300	56.70%	1,021	55.90%	412	56.90%	802	55.30%	1,902	55.10%	
South Enclosed 3:	258	56.70%	445	55.90%	1,461	56.90%	1,496	55.30%	1,804	55.10%	
South Enclosed 4:	239	56.70%	335	55.90%	874	56.90%	631	55.30%	1,826	55.10%	
North Stick:	196	57.90%	340	54.60%	150	51.60%	87.6	55.80%	1	53.20%	
North Enclosed:	1,197	53.00%	312	57.20%	25	51.60%	-	55.80%	191	53.20%	
Ford/Ameresco	5,313	53.00%	5,135	57.20%	4,828	51.60%	4,139	55.80%	1	53.20%	
South Enclosed 1:	1,518		920		759		772		2,154		SCFM Normalized to 50% methane = Total scfm collected * Monthly Ave. methane content / 50%
South Enclosed 2:	340		1,141		469		887		2,096		
South Enclosed 3:	293		498		1,663		1,655		1,987		
South Enclosed 4:	271		375		994		698		2,012		
North Stick:	227		371		155		98		1		
North Enclosed:	1,269		357		26		0		203		
Ford/Ameresco:	5,632		5,874		4,982		4,619		1		
Normalized Total Collected Flow	9,550		9,536		9,048		8,728		8,455		Normalized to 50% CH4
WML LandGEM 1975 to 2006	4,717		4,910		5,110		5,319		5,536		Total Annual Flow Rate from LandGEM LFG Generations Rate Modeling
WML LandGEM 2007 to 2027	4,279		3,934		3,601		3,359		3,091		
WML LandGEM 2028 to 2052	0		0		0		0		0		
Total LandGEM (SCFM)	8,996		8,844		8,711		8,678		8,627		
Calculated Collection Efficiency (CE)	106%		108%		104%		101%		98%		Total Collected Flow / Total LandGEM Flow

BEL ENVIRONMENTAL ENGINEERING

GCCS PLAN DATA SHEET AND LIIST OF ASSUMPTIONS

WOODLAND MEADOWS LANDFILL

August 2020, partial update December 2022

Section 5 - Adjustment Factor (AF) Analysis, where applicable (rev. 2022)

Industry Standard Average Collection Efficiency (CE) =	75%	Compared to calculated CE to determine if LandGEM Adjustment Factor is appropriate	
Average Calculated Collection Efficiency (CE) =	103%	If average is > 85%	Maximum Assumed CE (MACE), then Adjustment Factor analysis to be completed
Analysis Need to be Completed:	Yes	Yes / No	

The following calculates an adjustment factor to be applied to the LandGEM maximum peak flow rate for GCCS design purposes only. An annual calculated adjustment factor was determined based on an Industrial Standard CE and a maximum assumed CE, by diving those values into the annual calculated CE. This determined provided an Industry Standard Adjustment Factor (ISAF) and a Maximum Assumed Factor Adjustment (MAFA) for each respective year. The calculated overall adjustment factor was determined by averaging the MAFAs and ISAFs over the period analyzed.

Year	2021		2020		2019		2018		2017		Calculated Overall Adjustment Factor
Annual Calculated Adjustment Factor	MAFA	ISAF	MAFA	ISAF	MAFA	ISAF	MAFA	ISAF	MAFA	ISAF	
	1.25	1.42	1.27	1.44	1.22	1.38	1.18	1.34	1.15	1.31	1.30

Maximum Landfill Gas Generation Rate per LandGEM Generation Rate Modeling:	12,772	scfm	2022 LandGEM Results in 2041 (rev. 2022)
LandGEM Model Adjustment Factor (AF) Based on Calculated Collection Efficiency	1.30		If 1, no AF applied. If > 1, see AF analysis below (rev. 2022)
Maximum Landfill Gas Generation Rate for Design Purposes:	16,604	scfm	2022 LandGEM Results in 2041 (rev. 2022)