BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of the Application of Elm Hills Utility Operating Company, Inc., for Authority to Acquire Certain Sewer Assets and for a Certificate of Convenience and Necessity as an Expansion of the Existing Service Area	))))))	File No. _____

APPLICATION AND MOTION FOR WAIVER

COMES NOW Elm Hills Utility Operating Company, Inc. ("Elm Hills"), and, and, pursuant to Sections 393.170 and 393.190, RSMo., 20 CSR 4240-2.060, 20 CSR 4240-3.305, and 20 CSR 4240-10.105, Elm Hills requests the Commission's authority to acquire all or substantially all of the assets Central Rivers Wastewater Utility, Inc. ("Central Rivers")uses to provide retail sewer utility services, including its certificates of convenience and necessity ("CCN"). Elm Hills also requests a new CCN to provide sewer service to a new subdivision located adjacent to Central Rivers' existing service area. Lastly, in accordance with 20 CSR 4240-4.017(1)(D), Elm Hills also moves the Commission for a waiver of the 60-day prefiling notice requirement of 4 CSR 240-4.017(1).

In support of the Application and Motion for Waiver, applicants state:

INTRODUCTION

1. Elm Hills is a Missouri corporation with its principal office and place of business at 500 Northwest Plaza Drive, Suite 500, St. Ann, MO, 63074. Elm Hills is a Missouri corporation in good standing. A certified copy of Elm Hills's certificate of good standing was filed in File No. SM-2017-0150 and is incorporated herein by reference.

2. Elm Hills provides water service to approximately 119 customers and sewer service to approximately 355 customers in Pettis and Johnson Counties, Missouri, pursuant to

certificates of convenience and necessity previously granted in Commission Files Nos. SM-2017-0150 and SA-2018-0313. Elm Hills is a "water corporation," a "sewer corporation," and a "public utility," as those terms are defined in Section 386.020, RSMo, and is subject to the jurisdiction and supervision of the Commission as provided by law.

3. Elm Hills has no overdue Commission annual reports or assessment fees. There is no pending action or final unsatisfied judgment or decision against Elm Hills from any state or federal agency or court which involves customer service or rates, which action, judgment or decision has occurred within three years of the date of this Application.

4. Central Rivers provides sewer service to approximately 295 customers in Ray, Clay, and Clinton Counties, Missouri, pursuant to certificates of convenience and necessity previously granted in Commission Cases Nos. SA-2005-0302, SA-2004-0470, SA-2001-304, SA-2000-105, SA-2000-248, SA-98-530, and SA-2014-0005. Central Rivers is a "sewer corporation" and a "public utility" as those terms are defined in Section 386.020, RSMo, and is subject to the jurisdiction and supervision of the Commission as provided by law.

5. Communications regarding this application should be addressed to the undersigned counsel and to:

Josiah Cox
Elm Hills Utility Operating Company, Inc.
500 Northwest Plaza Drive, Suite 500
St. Ann, MO 63074
Phone: (314) 736-4672
E-mail: jcox@cswrgroup.com

THE PROPOSED SALE TRANSACTION

6. Elm Hills proposes to acquire all or substantially all assets Central Rivers uses to provide sewer services to customers in its certificated service areas. Terms and conditions of that

transaction are set out in the August 13, 2019, *Agreement for Sale of Sewer System* ("Sale Agreement"), which is attached to this application as **Appendix A**. Under authority of, and in accordance with, 20 CSR 4240-2.135(2)(A)(3) and (6), that agreement has been designated "Confidential" because it contains market-specific information and information representing strategies employed in contract negotiations. Central States Water Resources, Inc. plans to assign its rights under the agreement to Elm Hills at closing.

7. **Appendix B** verifies the authority of Josiah Cox, the President of Elm Hills, to enter into the Sale Agreement with Central Rivers and to seek Commission approval of that transaction.

8. Elm Hills is a qualified operator and the transaction proposed in this application is not detrimental to the public interest. Indeed, Elm Hills believes granting the application will promote the public interest, particularly of those customers currently served by the systems Elm Hills seeks to acquire. As it has demonstrated to the Commission in past cases, Elm Hills, with the support and assistance of its affiliates, is fully qualified, in all respects, to own and operate the Central Rivers system. The successful operation of other water and sewer systems in Missouri demonstrates the ability of Elm Hills to provide safe and reliable service to customers and to comply with the Commission's rules, regulations, and decisions governing the ownership and operation of such systems. Elm Hills also has the financial strength and resources necessary to make expenditures and investments required to maintain Central River's systems.

9. In accordance with 20 CSR 4240-10.105(3, a balance sheet and income statement, with adjustments, showing the results the acquisition of the property would have on Elm Hills is not available at this time, but will be furnished when completed.

10. Central Rivers' sewer CCNs are among the assets Elm Hills would acquire under the Sale Agreement. Elm Hills therefore requests the Commission approve the transfer of those CCNs as part of that transaction. Alternatively, should the Commission choose not to approve such a transfer, Elm Hills requests new sewer CCNs be issued authorizing it to own, install, construct, operate, control, manage, and maintain the systems it proposes to acquire from Central Rivers.

11. If the Commission grants the approvals and authority requested in this application, Elm Hills proposes to adopt and continue Central Rivers' existing sewer rates and tariffs.

12. Because Elm Hills proposes to acquire all or substantially all of Central Rivers' assets, and also because Elm Hills proposes to continue Central Rivers' rates and tariffs, the transaction proposed for approval in this case should not have any material effect on the tax revenues of any political subdivision where Central Rivers' sewer systems are located.

CERTIFICATE OF CONVENIENCE AND NECESSITY

13. Elm Hills requests permission, approval and a Certificate of Convenience and Necessity to construct, install, own, operate, maintain, control and manage a sewer system for the public in an area of Clay County, Missouri, as an addition to Central Rivers' existing service territories. The area sought to be certificated is known as the Prairie Field Subdivision. A legal description of the area sought to be certificated is attached hereto as **Appendix C**. A map of the area sought to be certificated is attached to this Application as **Appendix D**.

14. Central Rivers holds a CCN for sewer service and provides sewer service in an area adjoining the service area being requested by this Application (Private Gardens). Central Rivers' existing certificated service areas (blue), in relation to the requested areas (red), is

identified in Appendix D. Sewer service is not currently offered in the area by any unregulated entity or other regulated entity.

15. The sole owner and developer of the Prairie Field Subdivision has requested sewer service from Elm Hills. A copy of the letter requesting such service is attached hereto as **Appendix E**.

16. In order to provide sewer service to the above-described areas, the collection system will be constructed by the developer and contributed to Elm Hills. Thus, Elm Hills will not need to install new facilities and will not need to engage in any construction, nor require any new financing. Attached hereto as **Appendix F** is a copy of the Plans and Specifications submitted by the developer.

17. Moreover, Central Rivers currently operates a wastewater plant for the Private Gardens service area with a Missouri Department of Natural Resources (DNR) design capacity of 18,000 gpd. The current actual flow, as reflected on the Private Gardens permit/, is 10,000 gpd. Thus, no treatment plant expansion would initially be necessary for the first stages of the Prairie Field addition. If additional capacity is needed, the owner of the Prairie Field development will be responsible for contributing an amount necessary to provide for such expansion.rs could be served within the design capacity of the existing treatment plant.

18. In accordance with 20 CSR 4240-3.305(2), an estimate of the number of additional customers, revenues and expenses associated with service in these areas for the following three years is not available at this time, but will be furnished when completed.

19. As stated above there is no estimated cost of construction, as Elm Hills will not be required to construct plant for purposes of this expansion. Further, there are no plans for

financing associated with the expansion. To the extent necessary, Elm Hills requests a waiver as to any additional information that might be required in a feasibility study.

20. Elm Hills proposes to use Central Rivers' rates and charges currently on file and approved by the Commission for service in its existing certificated territories and proposes to use the general terms and conditions of service found in the Central Rivers' Commission-approved tariff to govern its provision of sewer service to this territory. Customers will be billed the Central Rivers Sewer Service Charge.

21. The subject territory is not within the boundaries of an incorporated municipality. Elm Hills is not aware of any franchise (either city or county) that would be required in order for it to provide service in this territory. A permit for the operation of these facilities have been issued by the DNR, a copy of which is attached hereto as **Appendix G**. Elm Hills is not aware of any other governmental approval that it must obtain.

22. The territory Elm Hills proposes to certificate has a need for an operating sewer system and otherwise has no sewer service available. Elm Hills' experience in the operation of sewer systems and its existing facilities give it the ability to provide this service in an efficient manner. For these reasons, a grant of the application will further the public convenience and necessity.

MOTION FOR WAIVER

23. Commission Rule 20 CSR 4240-4.017(1) requires "[a]ny person that intends to file a case shall file a notice with the secretary of the commission a minimum of sixty (60) days prior to filing such case." Because it did not file such a notice within the time period prescribed by that rule, Elm Hills seeks a waiver of the 60-day pre-filing notice requirement.

24. Under 20 CSR 4240-4.017(1)(D), a waiver of the pre-filing notice requirement may be granted for good cause. In this regard, Applicant and Central Rivers declare, as verified below, that within the 150 days prior to this application neither Elm Hills nor Central Rivers has had communication with the Office of the Commission (as defined in 20 CSR 4240-4.015(10)) regarding any substantive issue likely to be in this case. Good cause for the requested waiver exists in accordance with Commission Rule 20 CSR 4240-4.017(1)(D) ("Good cause for waiver may include, among other things, a verified declaration from the filing party that it has had no communication with the office of the commission within the prior one hundred fifty (150) days regarding any substantive issue likely to be in the case . . . ."

25. Therefore, as authorized by 20 CSR 4240-4.017(1)(D), Elm Hills and Central Rivers move the Commission for a waiver of the 60-day notice requirement of 20 CSR 4240-4.017(1) and acceptance of this application at this time.

WHEREFORE, for the reasons previously stated, Elm Hills respectfully requests the Commission issue an order: authorizing Elm Hills to acquire and own the sewer systems currently owned by Central Rivers; authorizing the transfer to Elm Hills of Central Rivers' existing CCNs or, in the alternative, issue new CCNs so Elm Hills may lawfully own, install, construct, operate, control, manage, and maintain sewer systems for the public within the areas for which Central Rivers currently holds CCNs; grant Elm Hills a new CCN, as described herein; granting the motion for a waiver of the 60-day prefiling notice requirement of 20 CSR 4240-

4.017(1); and granting Elm Hills such further relief as is just and proper under the circumstances.

Respectfully submitted,

Dean L. Cooper MBE #36592
Jennifer L. Hernandez MBE #59814
BRYDON, SWEARENGEN & ENGLAND P.C.
312 E. Capitol Avenue
P.O. Box 456
Jefferson City, MO 65012
(573) 635-7166 telephone
dcooper@brydonlaw.com
jhernandez@brydonlaw.com

ATTORNEYS FOR ELM HILLS UTILITY OPERATING COMPANY, INC.

CERTIFICATE OF SERVICE

The undersigned certifies that a true and correct copy of the foregoing document was sent by electronic mail, on November 22, 2019, to the following:

Office of the General Counsel
Governor Office Building
Jefferson City, MO 65101
staffcounselservice@psc.mo.gov

Office of the Public Counsel
Governor Office Building
Jefferson City, MO 65101
opcservice@opc.mo.gov

AFFIDAVIT

State of Missouri)
) ss
County of St. Louis)

I, Josiah Cox, having been duly sworn upon my oath, state that I am the President of Elm Hills Utility Operating Company, Inc. (Elm Hills), that I am duly authorized to make this affidavit on behalf of Elm Hills, that the matters and things stated in the foregoing Application and appendices thereto are true and correct to the best of my information, knowledge and belief. Additionally, no representative of Elm Hills has had any communication with the office of the Missouri Public Service Commission as defined in Commission Rule 20 CSR 4240-4.015(10), within the immediately preceding 150 days regarding the subject matter of this Application.

Subscribed and sworn before me this 22 day of November, 2019

Notary Public

My Commission Expires: 01/31/2021

BRENDA EAVES
Notary Public, Notary Seal
State of Missouri
St Charles County
Commission # 13443468
My Commission Expires 01-31-2021

APPENDIX A

HAS BEEN IDENTIFIED

AS CONFIDENTIAL

IN ITS ENTIRETY

APPENDIX B

VERIFICATION OF AUTHORITY

COMES NOW the undersigned, the President of Elm Hills Utility Operating Company, Inc. ("Elm Hills") and Central States Water Resources, Inc. ("CSWR"), and does hereby verify that CSWR had and has the requisite authority to enter into the Agreement For Sale of Sewer System, dated August 13, 2019, by and between CSWR and Central Rivers Wastewater Utility, Inc. (the "Agreement") and to carry out all the obligations contained in the Agreement.

IN WITNESS WHEREOF, the undersigned has hereto set his hand the ___ day of November, 2019.

Josiah Cox, President
ELM HILLS UTILITY OPERATING
COMPANY, INC. and
CENTRAL STATES WATER RESOURCES, INC.

State of Missouri)
) ss
County of St. Louis)

On this 22nd day of November, 2019, before me the undersigned, a Notary Public, in and for the County and State aforesaid, personally appeared Josiah Cox, to me known to be the person described in and who executed the foregoing instrument, and acknowledged that he executed the same as his free act and deed.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal the day and year last above written.

Brenda Eaves
Notary Public

My Commission Expires:

01/31/2021

BRENDA EAVES
Notary Public, Notary Seal
State of Missouri
St Charles County
Commission # 13443468
My Commission Expires 01-31-2021

APPENDIX C

A portion of the West Half of Section 20, Township 52 North, Range 31 West of the 5th/ P.M., Clay County, Missouri, being described as follows:

Beginning at the Southwest Corner of said Section 20; thence N 00°01'53" W along the west line of said West Half and the centerline of Plattsburg Road, 2287.97 feet; thence departing said west line and continuing along said centerline, along a curve to the right having a radius of 1510.00 feet, an arc length of 436.67 feet and having a chord which bears N 08°15'12" E, 435.15 feet; thence continuing along said centerline N 16°32'16" E, 339.19 feet; thence continuing along said centerline along a curve to the left, having a radius of 1300.00 feet, an arc length of 239.41 feet and a chord which bears N 11°15'43" E, 239.08 feet; thence departing said centerline, N 89°44'49" E, 313.15 feet; thence N 06°14'46" E, 207.77 feet; thence N 89°45'55" E, 2101.77 feet to the east line of said West Half; thence S 00°04'54" W along said east line, 269.28 feet to the westerly right of way line of Interstate 35; thence along said westerly right of way line, along the following twelve courses; thence S 80°36'04" W, 29.17 feet; thence S 04°38'31" E, 224.96 feet; thence S 25°42'49" W, 701.03 feet; thence S 14°28'35" W, 353.55 feet; thence S 22°36'23" W, 600.00 feet; thence S 32°31'58" W, 203.04 feet; thence S 12°40'49" W, 203.04 feet; thence S 22°36'23" W, 500.00 feet; thence S 31°26'54" W, 227.71 feet; thence S 11°17'47" W, 178.47 feet; thence S 22°36'23' W, 200.00 feet; thence S 26°21'13" W, 84.15 feet to the south line of said West Half; thence departing said right of way line, S 89°39'03" W, along said south line, 1393.89 feet to the Point of Beginning, containing 163.11 acres, more or less.

LESS the following described tract:

All that part of the Southwest Quarter of Section 20, Township 52 North, Range 31 West of the 5th/ P.M., Clay County, Missouri, being described as follows:

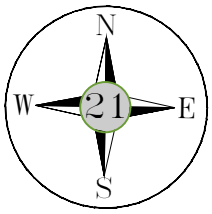
Commencing at the Southwest Corner of said Section 20; thence N 89°39'03" E along the south line of said Southwest Quarter, 1004.37 feet; thence departing said south line, N 00°20'57" W, 181.51 feet to the Point of Beginning; thence N 01°01'29" E, 354.26 feet; thence S 88°58'31" E, 354.26 feet; thence S 01°01'29" W, 354.26 feet; thence N 88°58'31" W, 354.26 feet to the Point of Beginning, containing 2.88 acres, more or less.

And LESS the following described tract:

All that part of the West Half of Section 20, Township 52 North, Range 31 West of the 5th/ P.M., Clay County, Missouri, being described as follows:

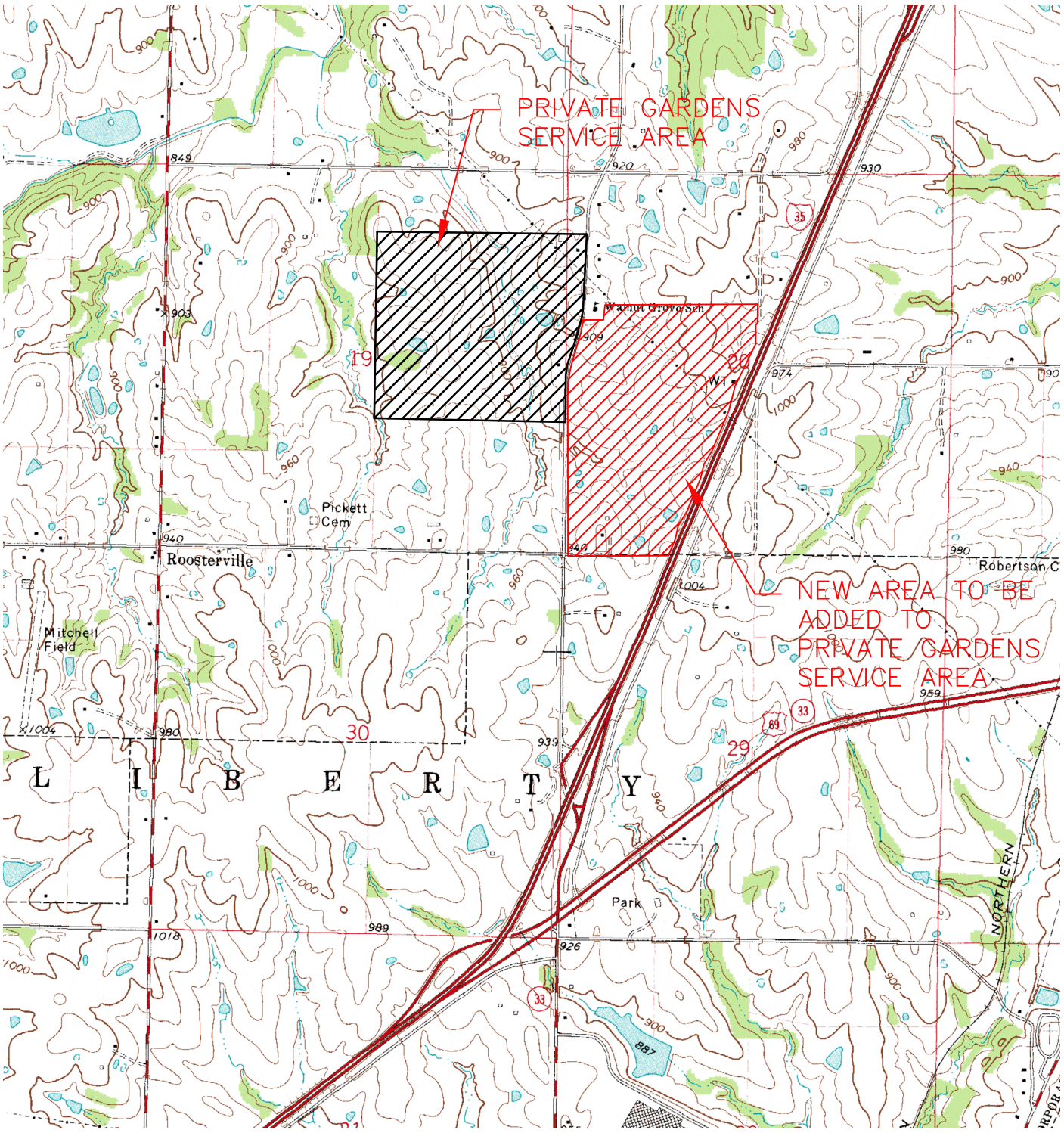
Commencing at the Northwest Corner of the Southwest Quarter of said Section 20; thence S 00°01'53” E along the west line of said Southwest Quarter, 288.15 feet; thence departing said west line, N 89°58'07” E, 2077.11 feet to the Point of Beginning; thence N 15°15'11" E, 128.70 feet; thence along a curve to the right having a radius of 60.00 feet, an arc length of 93.41 feet and a chord which bears N 59°51'20" E, 84.26 feet; thence S 75°32'40" E, 75.98 feet; thence along a curve to the left having a radius of 65.00 feet, an arc length of 24.04 feet and a chord which bears S 86°08'39" E, 23.90 feet; thence N 19°44'38" E, 22.63 feet; thence N 23°44'32" E, 97.22 feet; thence N 34°03'35" E, 129.89 feet; thence N 27°20'34" E, 184.65 feet; thence N 12°23'28" E, 191.60 feet; thence N 06°33'29" E, 114.41 feet; thence N 02°59'31" E, 271.58 feet; thence N 89°45'55" E, 75.77 feet to the east line of said West Half; thence S 00°04'54” W along said east line, 269.28 feet to the westerly right of way line of Interstate 35; thence along said westerly right of way line, along the following four courses; thence S 80°36'04” W, 29.17 feet; thence S 04°38'31” E, 224.96 feet; thence S 25°42'49” W, 701.03 feet; thence S 14°28'35” W, 57.48 feet; thence departing said right of way line, N 78°35'32" W, 241.42 feet to the Point of Beginning, containing 3.270 acres, more or less.

SERVICE AREA MAP
FOR PRIVATE GARDENS
LIBERTY, MO
(KEARNEY SW QUAD MAP)



0 2000' 4000'

SCALE: 1" = 2000'



Meridian Properties, LLC
22420 NW 112th
Liberty, MO 64069

Josiah Cox, President
Elm Hills Utility Operating Company, Inc.
500 Northwest Plaza Drive, Suite 500
St. Ann, MO 63074

Re: Prairie Field Subdivision, Clay County, Missouri

Dear Mr. Cox:

I write on behalf of Meridian Properties, LLC, which is the owner of certain real estate in Clay County, Missouri. This real estate adjoins the Private Gardens development, to which Central Rivers Wastewater Utility, Inc. ("Central Rivers") currently provides sewer service. We are in the process of developing the referenced real estate into single family lots. The resulting subdivision will be called "Prairie Field Subdivision."

It is our understanding that Elm Hills has an agreement to purchase the Central Rivers assets. It is further our understanding that Elm Hills is willing to serve the Prairie Field Subdivision if it is able to secure the appropriate approvals from the Missouri Public Service Commission ("Commission") to do so.

If Elm Hills provides service to the Prairie Field Subdivision, Meridian Properties will construct the collection system in accordance with the specifications found in the Commission-approved tariff and will contribute to Elm Hills that collection system and any required improvements to the treatment plant that are necessary due to the addition of the Prairie Field Subdivision.

We respectfully request that Elm Hills proceed with securing the appropriate approvals to provide service to Prairie Field Subdivision.

Sincerely,

Meridian Properties, LLC

By: Robert Sanders, Member
[Name, Title]

Sanitary Sewer Line Specifications

Prairie Field 1st and 2nd Plat
Clay County, MO
October 31, 2019

Prepared for:

Meridian Properties LLC

Renaissance Infrastructure Consulting
5015 NW Canal Street, Suite 100
Riverside, MO. 64150
816-800-0950

SECTION 02222

EXCAVATING, BACKFILLING, AND COMPACTING FOR UTILITIES

1. GENERAL

1.1 SUMMARY: This Section includes the excavation, bedding, and backfilling of utilities necessary to perform work indicated on Drawings and Contract Documents.

1.2 RELATED REQUIREMENTS:

1.2.1 Construction Drawings

1.2.2 SITE PREPARATION: Section 02110

1.2.3 EARTHWORK, BACKFILL, AND COMPACTION: Section 02200

1.3 SUBMITTALS:

1.3.1 Shop Drawings or details pertaining to Site Utilities are not required unless use of materials, methods, equipment, or procedures contrary to Drawings or these specifications are proposed. Do not perform work until required Shop Drawings have been accepted by Owner.

2. PRODUCTS

2.1 GRANULAR BEDDING MATERIAL: Processed sand and gravel free from clay lumps, organic, or other deleterious material, and complying with following gradation requirements:

U.S. Sieve Size	Percent Passing (by weight)
1 Inch	100
3/4 Inch	95 - 100
No. 4	0 - 5

2.2 STEEL CASING PIPE: Comply with AWWA C 201 or C 202, minimum grade B, size and wall thickness as indicated on Drawings.

2.3 Backfill under all paved surfaces shall be Type 1 Base as specified in Missouri Department of Transportation Standards or granular bedding material as specified herein.

3. EXECUTION

or cable. Cut trench banks as nearly vertical as practical and remove stones as necessary to avoid point-bearing. Over excavate wet or unstable soil, if encountered, from trench bottom as necessary to prove suitable base for continuous and uniform bedding.

3.3.2 All trench excavation side walls greater than five feet (5') in depth shall be sloped, shored, sheeted, braced or otherwise supported by means of the sufficient strength to protect the workmen within them in accordance with the applicable rules and regulations established for construction by the Department of Labor, Occupational Safety and Health Administration (OSHA), and by local ordinances. Lateral travel distance to an exit ladder or steps shall not be greater than twenty-five feet (25') In trenches four feet (4') or deeper.

3.3.3 Accurately grade trench bottom to provide uniform bearing and support for each section of pipe on bedding material at every point along entire length, except where necessary to excavate for bell holes, proper sealing of pipe joints, or other required connections. Dig bell holes and depressions for joints after trench bottom has been graded. Dig no deeper, longer, or wider than needed to make joint connection properly.

3.3.4 For utilities receiving select earth bedding trench width requirements below the top of the pipe shall not be less than twelve inches (12") nor more than eighteen inches (18") wider than outside surface of any pipe or conduit that is to be installed to designated elevations and grades. All other trench width requirements for pipe, conduit, or cable shall be least practical width that will allow for proper compaction of trench backfill.

3.3.5 Trench depth requirements measured from finished grade or paved surface shall meet the following requirements or applicable codes and ordinances:

3.3.5.1 WATER MAINS: Forty two inches (42") to top of pipe barrel.

3.3.5.2 SANITARY SEWER: Elevations and grades as indicated on Drawings.

3.3.5.3 STORM SEWER: Depth, elevations, and grades as shown on Drawings.

3.3.5.4 FORCEMAINS: Forty-two inches (42") to centerline of pipe.

3.3.5.5 ELECTRICAL CONDUITS: Twenty-four inches (24") minimum to top of conduit or as required by the NEC 300- 5,

Exercise proper caution when compacting immediately over top of pipes or conduits. Water jetting or flooding is not permitted as method of compaction.

3.7 BORINGS AND CASINGS UNDER ROADS, HIGHWAYS AND RAILROAD CROSSINGS:

3.7.1 When indicated by Drawings and Specifications, make certain street, road, highway, or railroad crossings for utility mains by jacking and boring method, and install utility pipe in accordance with AREA specifications.

3.7.2 Excavation of approach pits and trenches within right-of- way of street, road, highway, or railroad shall be of sufficient distance from paving or railroad tracks to permit traffic to pass without interference. Tamp backfill for approach pits and trenches within right-of-way in layers not greater than six inches (6") thick for entire length and depth of trench or pit. Compact backfill to ninety-five percent (95%) of maximum density as determined by ASTM D 698 (or 92% as determined by ASTM D 1557). Mechanical tampers may be used after cover of six inches (6") has been obtained over top of barrel of pipe.

3.7.3 Accomplish boring operation using commercial type boring rig and bored hole to proper alignment and grade and of a diameter no less than two inches (2") larger than the largest outside joint diameter of pipe installed. Install pipe in hole immediately after bore has been made, and in no instance shall hole be left open while unattended.

3.7.4 In event subsurface operations result in failure or damage to pavement within one year of construction, Contractor to make necessary repairs to pavement at no additional cost to Owner. In event paving cracks on either side of pipe line or is otherwise disturbed or broken due to construction operations, repair or replace disturbed or broken area without further compensation.

3.7.5 Clean and prime interior and exterior of casing pipe; and line with two (2) coats of asphalt in accordance with AREA specifications.

3.7.6 BUTT WELD STEEL CASING: Welds shall be full penetration single butt-welds in accordance with AWWA C 205 and AWS D 7- 0-62.

3.7.7 Install casing and utility pipe with end seals, vent pipe, and in accordance with other special requirements of AREA specifications and governing authorities.

END OF SECTION

2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

H. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.05 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

B. Locate existing structures and piping to be closed and abandoned.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer not less than two days in advance of proposed utility interruptions.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.02 PIPES AND FITTINGS

A. Ductile-Iron Pressure Pipe: AWWA C151.

1. Standard-Pattern, Ductile-Iron Fittings: AWWA C110, ductile or gray iron, buried or flooded pipe shall have mechanical joints, interior or exposed pipe shall have flanged unless otherwise indicated or specified.
2. Gaskets: AWWA C111, Rubber
3. Flanges: Ductile iron, conforming to ANSI B16.1 and shall be drilled class 125.
4. Flange Bolts: Bolts shall conform to ASTM A307 Grade B.
5. Flange Gaskets: Shall be 1/8" thick, full-faced synthetic rubber.

B. Ductile-Iron Sewer Pipe: ASTM A 746, for push-on joints.

C153. Include rating for 250-psig minimum working pressure and for expansion indicated. Include PE film, pipe encasement.

2.04 VALVES AND ACCESSORIES

A. Nonrising-Stem, Resilient-Seated Gate Valves, 3-Inch NPS (DN80) and Larger: AWWA C509, gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut. Include 200-psig minimum working-pressure design, interior coating according to AWWA C550, and buried valves shall be mechanical-joint with a 2-inch operating nut, exposed or interior valves shall have flanged ends and have hand wheel operators. Valves shall open counter clockwise. Valve stems shall use double "O" ring seals.

B. Check Valves: AWWA C508, with 175-psig working-pressure rating. Include interior coating according to AWWA C550. Valve hinge pins shall be stainless steel. Valve disc shall be full opening with a composition to metal seat. Valve shall be flanged unless noted otherwise on the Drawings. Valves shall be equipped with an external lever that is spring assisted. The spring tension shall be field adjustable by a hex nut. The lever arm shall be keyed to the valve hinge shaft.

C. Check Valves - Cushioned: AWWA C508, with 175-psig working-pressure rating, with addition of exterior cushion chamber. Include interior coating according to AWWA C550. Swing disc type with stainless steel shaft and flanged body. Flanges shall be ANSI B16.1, Class 125. Valve disc shall have external lever and adjustable counterweight to initiate closure. Valves shall have a metal to composition seat.

D. Eccentric Plug Valves:

1. Plug valves shall be quarter-turn non-lubricated eccentric type with resilient faced plug. Alternate seat and plug materials may be considered provided this specification is met and, in addition, the manufacturer must prove prior to approval that the valve meets AWWA C504 "proof of design tests" (10,000 cycles) in both directions. Flanged valve ends shall be faced and drilled to conform to ANSI B16.1, Class 150 for diameter and drilling. Mechanical or push-on type rubber-gasketed joint ends shall conform to AWWA C111. Port areas for valves smaller than 20-inch shall be at least 80 percent of full pipe area. Port areas for valves 24-inch and larger shall be at least 70 percent of full pipe area.
2. Materials and Construction:

    a. Bodies shall be of ASTM A126, Class B cast iron.
    b. Valve plug shall be ASTM A126, Class B cast iron or ASTM A536 ductile iron. Resilient plug facing shall be synthetic rubber, neoprene or Buna N compound suitable for use with water and wastewater applications.
    c. Seats shall be a raised welded overlay of 90% pure nickel, a minimum of .125" thick and 0.50" wide, conforming to AWWA C504. When the plug is in the closed position, the resilient plug facing shall contact only nickel. Sprayed or plated mating seat surfaces are not acceptable for resilient plugs.
    d. Bearings shall be replaceable. Sleeve bearings in the upper and lower journals shall be permanently lubricated 316 stainless steel per ASTM A743 Grade CF-8M. Nonmetallic journal bearings shall not be acceptable. Thrust bearings shall be teflon.
    e. Shaft seals shall be self-adjusting chevron-type conforming to AWWA C504. Valve shall be designed so it can be repacked while the valve is in line and under pressure without removing the actuator. O-ring seals shall not be acceptable in valves larger than 3".
    f. All exposed fastening hardware shall be zinc plated or stainless steel. Provide stainless steel bolting on buried service valves.

2. PVC Backwater Valves: Similar to ASME A112.14.1, horizontal type; with PVC body, PVC removable cover, and PVC swing check valve.

2.05 POLYETHYLENE PLASTIC (PE) FILM, PIPE ENCASEMENT

A. ASTM A 674 or AWWA C105; PE film, tube, or sheet; 8-mil thickness.

2.06 MANHOLES

A. Normal-Traffic Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.

1. Diameter: 48 inches minimum, unless otherwise indicated.
2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
4. Riser Sections: 5-inch minimum thickness, and lengths to provide depth indicated.
5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
6. Gaskets: ASTM C 443 rubber.
7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and cover.
8. Steps: ASTM C478 plastic steps, individual steps. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
9. Pipe Connectors: ASTM C 923 resilient, of size required, for each pipe connecting to base section. A-LOK manhole pipe connector, Link-Seal, or equal.

B. Heavy-Traffic Precast Concrete Manholes: ASTM C 913; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for rubber gasketed joints.

1. Ballast: Increase thickness of one or more precast concrete sections or add concrete to structure, as required to prevent flotation.
2. Gaskets: Rubber.
3. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and cover.
4. Steps: ASTM C478 plastic steps, individual steps. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
5. Pipe Connectors: ASTM C 923 resilient, of size required, for each pipe connecting to base section. A-LOK manhole pipe connector, Link-Seal, or equal.

C. Manhole Frames and Covers: ASTM A48-76, Class 35. Standard manhole frames and covers shall have a minimum weight of 300 pounds and shall be Neenah R-1780A or Deeter 1315 or equal. Include indented top design with lettering "SANITARY SEWER" cast into cover.

D. 2.07 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:

B. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

PART 3 - EXECUTION

3.01 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.02 IDENTIFICATION

A. Materials and their installation are specified in Division 2 Section "Earthwork." Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.03 PIPING APPLICATIONS

A. General: Include watertight joints.

B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.

C. Gravity-Flow Piping: As indicated on the Drawings:

1. NPS 4 and NPS 6 (DN100 and DN150): PVC sewer pipe and fittings, solvent-cemented joints, or gaskets and gasketed joints.
2. NPS 8 and NPS 10 (DN200 and DN250): PVC sewer pipe and fittings, or gaskets and gasketed joints.
3. NPS 12 and NPS 15 (DN300 and DN375): PVC sewer pipe and fittings, or gaskets and gasketed joints.

D. Force-Main Piping: As indicated on the Drawings:

1. NPS 4 to NPS 8 (DN100 to DN200): Ductile-iron sewer pipe; standard- or compact-pattern, ductile-iron fittings; gaskets; and gasketed joints.
2. NPS 4 to NPS 8 (DN100 to DN200): PVC pressure pipe, PVC pressure fittings, gaskets, and gasketed joints.

3.04 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.

1. Use the following pipe couplings for nonpressure applications:

a. Sleeve type to join piping, of same size, or with small difference in OD.
b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.
c. Bushing type to join piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

main. The sewer shall be constructed of ductile iron pipe for a distance of 10 feet on either side of the crossing, or other suitable protection as approved by the Missouri Department of Natural Resources shall be consulted as to the precautions to be taken to protect the public water supply.

4. Sewer Manholes: No water pipe shall pass through or come into contact with any part of a sewer or sewer manhole.

G. Install PVC force-main piping according to AWWA M23.

H. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.

3.06 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to installations indicated.

B. Ductile-Iron Sewer Pipe with Ductile-Iron Fittings: According to AWWA C600.

1. Install PE film, pipe encasement over ductile-iron sewer pipe and ductile-iron fittings according to ASTM A 674 or AWWA C105.

C. PVC Pressure Pipe and Fittings: Join and install according to AWWA M23.

D. PVC Sewer Pipe and Fittings: As follows:

1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.
2. Join profile sewer pipe fittings with gaskets according to ASTM D 2321 and manufacturer's written instructions.
3. Install according to ASTM D 2321.

E. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.

F. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

G. Install with top surfaces of components, except piping, flush with finished surface.

3.07 REACTION ANCHORAGE AND BLOCKING

A. All unlugged bell and spigot or all-bell tees, Y-branches and bends deflecting 11-1/4 degrees or more which are installed in piping subjected to internal hydrostatic heads in excess of 15 feet in exposed, or 30 feet in buried, piping shall be provided with suitable reaction blocking, struts, anchors, clamps, joint harness, or other adequate means for preventing any movement of the pipe caused by unbalanced internal liquid pressure.

B. Trench Installation: Where in trench, the foregoing designated fittings shall be provided with concrete thrust blocking between the fitting and solid, undisturbed ground in each case, except where solid ground blocking support is not available. At the tops of slopes vertical angle bends shall be anchored by means of steel strap or rod anchors securely embedded in or attached to a mass of concrete of sufficient weight to resist the hydraulic thrust at the maximum pressures to which the pipe will be subjected. All concrete blocking and anchors shall be installed in such a manner that all joints between pipe and fittings are accessible for repair.

C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.12 TAP CONNECTIONS

A. Make connections to existing piping and underground structures so finished Work complies as nearly as practical with requirements specified for new Work.

B. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

C. Make branch connections from side into existing piping, NPS 4 to NPS 20 (DN100 to DN500). Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

D. Make branch connections from side into existing piping, NPS 21 (DN525) or larger, or to underground structures by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall, unless otherwise indicated. On outside of pipe or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

1. Use concrete that will attain minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.
2. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

E. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.13 CLOSING ABANDONED SANITARY SEWERAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 8-inch- thick, brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Structures: Excavate around structure as required and use one procedure below:

1. Remove structure and close open ends of remaining piping.
2. Remove top of structure down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
2. Backfill to grade according to Division 2 Section "Earthwork."

3.14 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.

than ± 5 psi for the duration of the test. After two hours, additional water shall be drawn from a container of known volume. The amount of water required to return the system to the specified pressure shall not exceed the amount determined by the following formula:

$$Q = SD(P)^{1/2}/133200,$$

Where

Q - Total allowable leakage in gallons per hour.
S - Length of section tested, feet.
D - Nominal pipe diameter, inches.
P - Test pressure, psi

3. All exposed pipe, fittings, valves, and joints shall be inspected and all evidence of moisture appearing on the surface of the ground during the test shall be investigated by the Contractor by excavation where the pipe has been covered with backfill. Should the leakage test results exceed allowable leakage, the test pressure shall be maintained for an additional period of time as directed by the Engineer to facilitate location of leaks.
4. All pipe, fittings, valves, pipe joints, and other materials which are found to be defective when the pipe line is tested shall be removed from the line immediately and replaced with new and acceptable material by and at the expense of the Contractor. The pressure test shall be repeated after repairing leaks and other defective work until the pipe line installation conforms to specified requirements and is accepted by the Engineer.

D. Air Leakage Test:

1. Contractor may perform air tests for all pipe sizes.
4. Air leakage testing shall be performed on lines as specified and on the following lines:

a. Outfall line.
b. Drain lines.
d. Sanitary sewer lines.

5. Furnish all facilities required including necessary piping connections, test pumping equipment, pressure gauges, bulkheads, regulator to avoid over-pressurization, and all miscellaneous items required.

a. The pipe plug for introducing air to the line shall be equipped with two taps. One tap will be used to introduce air into the line being tested, through suitable valves and fittings, so that the input air may be regulated. The second tap will be fitted with valves and fittings to accept a pressure test gauge indicating internal pressure in the sewer pipe. An additional valve and fitting will be incorporated on the tap used to check internal pressure so that a second test gauge may be attached to the internal pressure tap. The pressure test gauge will also be used to indicate loss of air pressure due to leaks in the sewer line.
b. The pressure test gauge shall meet the following minimum specifications:

i.	Size (diameter)	4-1/2 Inches
ii.	Pressure Range	0-15 P.S.I.
iii.	Figure Intervals	1 P.S.I. Increments
iv.	Minor Subdivisions	0.05 P.S.I.
v.	Pressure Tube	Bourdon Tube or diaphragm
	Accuracy	+ 0.25% of maximum scale reading

E. Vacuum Testing of Manholes:

1. Each manhole shall be tested immediately after assembly and prior to backfilling.
2. All lift holes shall be plugged with an approved non-shrink grout.
3. All pipes entering the manhole shall be plugged, taking care to securely brace the plug from being drawn into the manhole.
4. The test head shall be placed at the inside of the top of the cone section and the seal inflated in accordance with the manufacturers' recommendations.
5. A vacuum of 10 inches of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to 9 inches. The manhole shall pass if the time for the vacuum reading to drop from 10 inches of mercury to 9 inches of mercury meets or exceeds the values indicated in the following table:

Minimum Test Times for Various Manhole Diameters in Seconds (ASTM C 1244, TABLE 1)

Depth (ft)	Diameter, in.								
	30	33	0 □≧42	42	48	54	60	66	72
	Time, in seconds								
8	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	46	51	57
16	22	24	29	34	40	46	52	58	67
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	53	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	36	42	51	59	64	78	87	97
26	36	39	46	55	64	75	85	94	105
28	39	42	49	59	69	81	91	101	113
30	42	45	53	63	74	87	98	108	121

7. If the manhole fails the initial test, necessary repairs shall be made with a non-shrink grout while the vacuum is still being drawn. Re-testing shall proceed until a satisfactory test is obtained.

F. Deflection Tests:

1. Deflection tests shall be performed on all flexible sewer pipe by the Contractor using a mandrel pull. The mandrel shall have not less than seven (7) arms. The mandrel pull cannot be performed any sooner than 30 days after the reach being tested has been installed and final backfill has been placed.
2. A section of sewer line reach shall be deemed as failed when the mandrel cannot be moved through it with reasonable force. The tests shall be performed without mechanical pulling devices.
3. At the conclusion of the mandrel pull, the Contractor, at his expense, shall be required to remove and replace all pipe which fails the test.
4. The mandrel diameter shall be based on 95% of the actual inside pipe diameter.

END OF SECTION

2. Manufactured in accordance with ASTM C 478.

3. The Minimum Compressive Strength of Concrete: 4,000 psi.

4. Casting methods must assure each unit to be very dense in structure and impervious to water.

5. Paint precast structure exterior with a heavy coat of bituminous paint.

6. Tongue and Groove:

   a. Formed of concrete so as to receive the gaskets.

   b. Sections shall be set so as to be vertical and in true alignment.

   c. Horizontal joints between sections of precast concrete barrels shall be of a type approved by the Engineer and shall, in general, depend on a mastic-like sealant for watertightness.

7. Pipe to Manhole Joints: Only as approved by the Engineer and, in general, will depend for water- tightness upon a rubber boot either cast-in-place or press-wedged in place.

8. All precast sections and bases shall have the date of manufacture and the name or trademark of the manufacturer impressed or indelibly marked on the inside wall.

9. Manhole Steps:

   a. Forged aluminum safety type, alloy 6061 temper T6 or ½ inch steel reinforced polypropylene plastic manufactured to ASTM D 246 Type II grade 16906 and ASTM C 478 standards.

   b. Cast into walls of the precast section so as to form a continuous ladder with a distance of 12" between steps.

   c. All aluminum in contact with concrete: Apply a heavy coat of bituminous paint.

10. Provide holes for the purpose of handling and laying. These holes shall be tapered and shall be plugged with non-shrink grout after installation.

11. Precast Base Sections: Cast holes for pipes in the base section so that there is a clear distance of 1½ inches minimum between the

A. Precast Manholes:

1. Place on a 6" layer of compacted bedding material.

2. Dewater excavation while placing bedding material and setting the base or pouring concrete.

3. Use waterstops at the horizontal joint of cast-in-place manhole bases.

4. Connect inlet and outlet stubs and seal in accordance with the manufacturer's recommended procedure, and as shown on the detail drawings.

5. Place barrel sections and risers of the appropriate combination of heights using manufacturer's recommended procedure for sealing the horizontal joints, and as shown on the standard details or the remaining barrel of the manhole shall be cast above the base.

6. Perform a leakage test as described herein.

7. Following satisfactory completion of the leakage test, place the cover on the top or otherwise prevent accidental entry by unauthorized person, children, animals, etc., until the Contractor is ready to make final adjustment to grade.

B. Drop Connections:

1. Construct drop connection if sewers have invert elevations 2.0 feet or more above the invert of the manhole discharge pipe.

C. Channels:

1. Build with care.

2. Raise the sides perpendicular by concrete construction from the spring line to the heights of the crown of the pipe.

3. Where changes in directions are made at manholes, shape in invert with as great a radius as possible, and to the complete satisfaction of the Engineer.

4. Finish concrete to provide smooth and even flow through the manholes.

to 25 feet in depth.

8. If leakage occurs fill those points with non-shrink grout, allow to set and retest.

9. Rejected Manholes: Disassemble, reconstruct or replace as directed by the Engineer.

3.03 WATER LEAKAGE TESTS:

A. General:

1. To be observed by the Engineer on each sanitary manhole.

2. An exfiltration test made as described below.

B. Preparation for Test:

1. After the manhole has been assembled in place, fill lifting holes and point with an approved non-shrinking mortar.

2. Perform test prior to filling and pointing the horizontal joints.

3. If the groundwater table has been allowed to rise above the bottom of the manhole, lower for the duration of the test.

4. Plug pipes and other openings into the manhole and the plugs braced to prevent blow out.

C. Test Procedure:

1. Fill manhole with water to the top of the cone section, and allow 20 minutes before proceeding.

2. If the excavation has not been backfilled and observation indicates no visible leakage, that is, no water visibly moving down the surface of the manhole, the manhole may be considered to be satisfactorily watertight.

3. If the test as described above is unsatisfactory as determined by the Engineer or if the manhole excavation has been backfilled, continue the test.

4. An additional period of time may be permitted if the Contractor so wishes, to allow for absorption.

SECTION 02610
SEWER LINES

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE:

A. Excavation, Backfill, and Compaction: Section 02200

B. Field Testing of Sewer Lines: Section 02650

1.02 DESCRIPTION:

A. Work Included: Furnish and install pipe materials and fittings of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein.

B. The extent of work is generally shown on the Drawings and shall be extended to accommodate changes which become necessary as a result of encountering unforeseen or changed conditions in the field.

1.03 SUBMITTALS:

A. Furnish the name of the pipe manufacturer to the Engineer prior to commencing work. For any given pipe material, use pipe of the same manufacturer throughout the project.

B. The Engineer may request the Contractor to submit manufacturer's certification that the product meets requirements of the Specification.

1.04 QUALITY ASSURANCE:

All materials shall conform to the standards designated in Part 2 for the appropriate material.

PART 2 - PRODUCTS

2.01 GENERAL:

A. Except where the type or class or use of pipe is explicitly indicated on plan or specified herein, the Contractor may provide any of the kinds of pipe specified. However, in the interest of future maintainability, only one type of pipe will be approved for a given utility for general use in all those areas

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Pipe Laying (General):

1. Begin at the pipe outlet and proceed upgradient.

2. Firmly support the pipe and fittings on bedding material as shown on the Drawings and as specified in the appropriate sections of these Specifications.

3. Do not permanently support the pipe or fittings on saddles, blocking stones, or any material which does not provide firm and uniform bearing along the outside length of the pipe.

4. Thoroughly compact the material under the pipe to obtain a substantial unyielding bed hand-shaped to fully support the pipe.

5. Excavate suitable holes for the joints so that only the barrel of the pipe receives bearing pressure from the supporting material after placement.

6. Lay each pipe length so it forms a close joint with the adjoining length and bring the inverts to the required grade.

7. Set the pipe true to line and grade.

8. Do not drive the pipe down to grade by striking it with a shovel handle, timber, rammer, or any other unyielding object.

9. When each pipe length has been properly set, place and compact enough of the bedding material between the pipe and the sides of the trench to hold the pipe in correct alignment.

10. After filling the sides of the trench, place and lightly tamp bedding material to complete the bedding as shown on the Drawings.

11. Take all necessary precautions to prevent flotation of the pipe in the trench.

12. When pipe laying is not in progress, close the open ends of the pipe with temporary watertight plugs. If water is in the trench when work is resumed, do not remove the plug until all danger of water entering

SECTION 02650

FIELD TESTING OF SEWER LINES

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE:

A. Excavation, Backfill, and Compaction: Section 02200

1.02 DESCRIPTION:

A. Vertical deflection test on all flexible conduit sewer pipe.

B. Low pressure air test.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.01 DEFLECTION TESTING FOR FLEXIBLE CONDUIT:

A. Test vertical deflection of the conduit by a rigid "Go-No-Go" device.

B. Prior to testing the pipe make sure the line is clean and free of debris that might cause the device to jam.

C. Pull the gauge by hand as mechanical equipment may result in jamming the device.

D. Test shall be conducted as late in the project as possible in order to minimize deflection occurring after testing, but no sooner than thirty days after backfilling.

E. Maximum Allowable Deflection: 5% of the pipe diameter.

3.02 SEWER LINE LOW PRESSURE AIR TESTS: Each reach of sewer shall meet the requirements of the following leakage and acceptance tests. All defects shall be repaired to the satisfaction of the Engineer.

A. Each block or section of sewer shall be cleaned, tested and inspected. All repairs shown necessary by the inspection shall be made. Broken or

Table II

D. **SPECIFICATION TIME REQUIRED FOR A 0.5 PSIG PRESSURE DROP FOR SIZE AND LENGTH OF PIPE INDICATED**

Pipe Diameter (In)	Length for Minimum Time (Min:sec)	Time for Longer Minimum Time (sec) (ft)	Length (L in ft)	Specific Time for Length (l) Shown (min:sec) 100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	1:52	597	.190 L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53
6	2:50	398	.427 L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12
8	3:47	298	.760 L	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10	4:43	239	1.187 L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54
12	5:40	199	1.709 L	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50
15	7:05	159	1.671 L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02
18	8:30	133	3.846 L	8:30	9:37	12:49	16:02	19:41	22:26	25:38	28:51
21	9:55	114	5.235 L	9:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16
24	11:20	99	6.837 L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17
27	12:45	88	8.653 L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	46:54

E. If for any reason the Contractor's air test fails to meet the above requirements, the Contractor shall immediately repair the section of sewer line in question. After repairs the section of line shall again be tested until a satisfactory result is obtained. Prior to acceptance, all constructed sewer line shall satisfactorily pass the low pressure air test.

END OF SECTION

Passing 1-1/2" Sieve Not less than 100%
Passing 1" Sieve Not less than 95%
Passing 3/4" Sieve 70 to 90%
Passing 1/2" Sieve 10 to 30%
Passing 1/4" Sieve Not over 5%

The maximum size of coarse aggregate shall, in any case, be not larger than one-fifth the narrowest dimensions between forms of the members to be poured, not larger than three-fourths of the clear distance between the reinforcing bars and imbedded items.

2.4 WATER: Mixing water shall be free from oil, acid, any injurious amount of vegetable matter, alkali or other salts.

2.5 ADMIXTURES: An air-entraining agent such as Darex shall be used in all concrete. All admixtures shall conform to ASTM C260. The amount of air shall be 4% to 6% by volume of concrete. Other admixtures such as plasticizers may be used if approved by the Engineer.

2.6 REINFORCING: Steel reinforcing shall conform to the American Society for Testing Materials specifications for reinforcement bars of intermediate grade billet steel (ASTM A615), or rail steel (ASTM A616),OR AXLE STEEL (ASTM A617), or for welded wire fabric (ASTM A185). Deformed bars shall be used throughout, unless specifically notes otherwise in the Plans. See also Paragraph 7, Reinforcing.

3. CONTROL OF CONCRETE MIXES

3.1 The Contractor shall be responsible for making and curing concrete test cylinders. Testing of concrete test cylinders taken from the concrete actually placed in the Work will be paid for by the Contractor. Four test cylinders, six inches in diameter by twelve inches in height shall be taken from a batch of concrete selected at random from each important pour, but in no case shall less than one set of cylinders for each fifty cubic yards of concrete, or each day's pour or for each concrete structure be taken. No water will be allowed to be added to the batch in the truck after the cylinders are taken. Concrete test cylinders shall be broken as follows: Two each at seven and at twenty-eight days, and the results of each test shall be delivered to the Engineer. Failure of test cylinders to meet the specified strength will result in the rejection of poured areas from which samples were taken and the Contractor will be required to remove and reconstruct any such condemned areas at his own expense.

Slump tests and/or air-entrainment tests may be requested by the Engineer and if so, shall be conducted in his presence. Testing will be paid for by Contractor.

5. METHODS OF MIXING CONCRETE

5.1 READY-MIX CONCRETE: The use of plant-mix concrete delivered to the job in revolving drum mixture trucks will be approved if evidence is submitted to establish the adequacy of the proposed concrete plant's equipment and facilities. Plant- mixed concrete shall conform to ASTM C94. No water shall be added to the ready-mix concrete at the job site without the specific approval of the Inspector.

5.2 JOB MIXED CONCRETE: Job-mixed concrete shall be thoroughly mixed in a batch mixer of an approved type. The mixture shall be equipped with a suitable charging hopper. A water storage and water measuring device shall be provided. The equipment shall be so constructed that all materials entering the drum can be accurately proportioned and under control. The entire batch shall be discharged before recharging.

The volume of concrete to be mixed shall not exceed the manufacturer's rated capacity of the mixer. Mixing shall not continue for less than one and one-half minutes after all of the materials are in the mixer drum provided that all of the mixing water shall be added before one-forth of the mixing time has elapsed. The mixer shall be provided with a timing device, including a lock on the discharge lever, to guarantee mixing time. Mixing time shall be extended if necessary to obtain thorough mixing and uniform consistency. The accurately and measurement will be shown in gallons on the gauge.

6. CONSTRUCTION METHODS

6.1 DEPOSITING CONCRETE: Concrete shall be placed from the mixture, or in the case of ready-mixed concrete, from the transporting vehicle to the place of final deposit as rapidly as practicable by methods approved by the Engineer, which shall prevent the separation or loss of ingredients. Under no circumstances shall concrete that has partially hardened be deposited in its final position to avoid rehandling. It shall be so deposited as to maintain, until completion of the unit, a plastic surface approximately horizontal. Concrete shall be dropped no more than nine (9') feet without the use of an approved tremies.

6.2 EXPANSION AND CONTRACTION JOINTS: Expansion and contraction joints plus joint filler materials shall be as shown on the Drawings. If not detailed, place contraction (control) joints at not more than twenty-five (25) feet each way in slabs.

6.3 PLACING: Place in compliance with Chapter 8, ACI 301 as required to obtain dense concrete with a minimum of honeycombing and segregation of aggregate in the mix. Clean all forms of all debris immediately prior to pours. Place all inserts, sleeves, screens, reglets, etc., well ahead of pours. Notify Inspector and all affected trades when concrete will be placed to allow

drying caused by the hot sun, drying winds, or other causes. Freshly placed concrete shall be protected from damage from rain. The concrete shall be kept continuously wet for a period of not less than five (5) days after pouring. Curing compounds or other methods of curing may be considered by the Engineer.

If concrete is placed while the air temperature is less than 40° F, or when freezing is probable within forty-eight (48) hours, all sand, aggregate, and water shall be heated, and the concrete, when being placed, shall have a temperature of not less than 50° F nor more than 100° F. Care must be taken to prevent too rapid drying of the concrete when it is heated. During freezing weather suitable means shall be provided for maintaining the temperature of the concrete at not less than 50° F for a period of five (5) days for normal concrete curing.

Before placing concrete during cold weather, forms shall be free from frost, snow and ice. After the concrete is placed, it shall be protected on all exposed sides by tarpaulins or other suitable means. The methods of heating the materials protecting the concrete shall be approved by the Engineer. Salts, chemicals or other materials shall not be used in the concrete for the purposes orf preventing freezing or for lowering the freezing point of the concrete.

6.10 FINISHING: Exposed concrete wall surfaces shall be finished by thoroughly rubbing with a Carborundum brick, and rinsing with water. Floor and top of wall finishes shall be finished by floating with a wood float in a manner that will thoroughly compact the concrete and will provide a smooth, even surface. Final floor finish will be attained with a steel trowel unless noted otherwise on the Drawings.

6.11 PATCHING: If, after the removal of the forms, voids or other blemishes exist in any concrete surface, the Contractor shall remove all loose material and cut back at least one inch into solid concrete with square edges, after which he shall thoroughly moisten the surface with clean water, apply a coat of neat cement and fill the openings with grout of the same proportions as the original mix. This shall be done immediately upon removal of the forms. Tie holes, left by the withdrawal of tie rods, or holes left by the removal of ends of ties shall be filled solid with mortar. Patch all defective or uneven floor areas.

6.12 CONSTRUCTION JOINTS: Concrete shall be poured in units as large as possible in order to lessen the number of construction joints. The location of all joints not shown on the Plans shall be approved by the Engineer. Where joints are to be made, the surface of the concrete shall be thoroughly cleaned and all surface film removed. In addition to the foregoing, vertical joints shall be thoroughly wetted but not saturated, immediately before the placing of new concrete. Unless noted otherwise, construction joints shall be keyed and reinforcement shall be continuous through the joint.

7.2 BENDING REINFORCING AND CONCRETE PROTECTION FOR REINFORCEMENT: The ends of all reinforcing bars shall be hooked unless specifically noted to the contrary on the Drawings or in places where hooks are not feasible because of other construction conditions.

The metal reinforcement shall be protected by the thickness of concrete indicated in The Plans. Where not otherwise shown, the thickness of concrete over the reinforcement shall be as follows:

Where concrete is exposed to the weather, or exposed to the ground but placed in forms, not less than two inches (2") for bars more than five-eighth inch (5/8") in diameter and one and one-half inches (1 ½") for bars five-eighth inch (5/8") or less in diameter.

In slabs and walls not exposed to the ground or to the weather, not less than three-fourth inch(3/4"). In beams, girders and columns not exposed to the ground or to the weather, not less than one and one-half inches (1 ½").

Exposed reinforcement bars intended for bonding with future extensions shall be protected from corrosion by concrete or other adequate covering.

Wire mesh reinforcing shall be welded wire fabric conforming to ASTM A185 except minimum tensile strength of wire may be reduced to 55,00 psi. Wire fabric shall be clean, free from oil and excessive rust.

7.3 CHAIR, SPACERS AND SUPPORTS: Except as otherwise specified, items shall be of standard manufacture, approved steel types and sizes.

7.4 CLEANING AND PLACING REINFORCING: All reinforcement shall be free from rust, scale or other coatings that will destroy or reduce the bond of the concrete to the steel. Where there may be a delay in depositing concrete, the reinforcement shall be reinspected and when necessary, cleaned to the satisfaction of the Engineer. All reinforcing bars shall be tied at alternating intersections both ways. Continuous bars shall be lapped not less than thirty-six (36) unless noted otherwise on the Drawings.

7.5 ANCHOR BOLTS, DOWELS AND CORNER BARS: Anchor bolts for all equipment shall be provided and placed in the concrete in accordance with the manufacturer's directions. Unless otherwise noted, dowels or continuous reinforcements, shall be provided at all construction joints. The dowels shall be of the same size as the largest reinforcing bar and shall provide a minimum lap of thirty-six (36")inches. Corner bars shall be used at the outside of all corners. Corner bars shall be lapped a minimum of (36"). All dowels and anchor bolts must be positioned before concrete is placed. Pushing dowels and anchor bolts into fresh concrete is prohibited.

Addendum

These specifications below shall be in addition to or supersede current specifications

1. **Contractor shall not allow debris, frozen material, large clods, stones, organic matter, or other unstable materials to be used for final backfill within two feet (2') (0.6 m) of the top of the pipe.**

2. **A mandrel must have nine (9) or more odd number of flutes or points.**