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**UNITED STATES  
SECURITIES AND EXCHANGE COMMISSION  
Washington, D.C. 20549**

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**FORM 8-K**

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**CURRENT REPORT  
Pursuant to Section 13 or 15(d)  
of the Securities Exchange Act of 1934**

Date of Report (Date of earliest event reported): **December 6, 2022**

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**X4 PHARMACEUTICALS, INC.**

(Exact name of registrant as specified in its charter)

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**Delaware**  
(State or other jurisdiction of incorporation)

**001-38295**  
(Commission File Number)

**27-3181608**  
(IRS Employer Identification No.)

**61 North Beacon Street, 4th Floor**  
**Boston, Massachusetts**  
(Address of principal executive offices)

**02134**  
(Zip Code)

**(857) 529-8300**  
(Registrant's telephone number, including area code)

**Not applicable**  
(Former name or former address, if changed since last report)

Check the appropriate box below if the Form 8-K filing is intended to simultaneously satisfy the filing obligation of the registrant under any of the following provisions:

- Written communications pursuant to Rule 425 under the Securities Act (17 CFR 230.425)
- Soliciting material pursuant to Rule 14a-12 under the Exchange Act (17 CFR 240.14a-12)
- Pre-commencement communications pursuant to Rule 14d-2(b) under the Exchange Act (17 CFR 240.14d-2(b))
- Pre-commencement communications pursuant to Rule 13e-4(c) under the Exchange Act (17 CFR 240.13e-4(c))

**Securities registered pursuant to Section 12(b) of the Act:**

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Common Stock, par value \$0.001 per share	XFOR	The Nasdaq Stock Market LLC

Indicate by check mark whether the registrant is an emerging growth company as defined in Rule 405 of the Securities Act of 1933 (§230.405 of this chapter) or Rule 12b-2 of the Securities Exchange Act of 1934 (§240.12b-2 of this chapter). Emerging growth company

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act.

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**Item 1.01 Entry into a Material Definitive Agreement.**

On December 7, 2022, X4 Pharmaceuticals, Inc. (the “Company”) entered into an underwriting agreement (the “Underwriting Agreement”) with Piper Sandler & Co., Stifel, Nicolaus & Company, Incorporated and Cantor Fitzgerald & Co., as representatives of the several underwriters named therein (collectively, the “Underwriters”), relating to the issuance and sale (the “Offering”) of 52,300,000 shares of the Company’s common stock, pre-funded warrants to purchase 6,800,000 shares of the Company’s common stock (the “Pre-Funded Warrants”) and Class C warrants to purchase 29,550,000 shares of the Company’s common stock or Pre-Funded Warrants (the “Class C Warrants”) at a price to the public of \$1.10 per share for common stock and accompanying Class C Warrant and \$1.099 per Pre-Funded Warrant and accompanying Class C Warrant.

The Company also granted the Underwriters an option for a period of 30 days to purchase up to 8,865,000 additional shares of the Company’s common stock and/or Class C Warrants to purchase up to 4,432,500 additional shares of the Company’s common stock at the public offering price less underwriting discounts and commissions.

The net proceeds to the Company from the Offering are expected to be approximately \$59.8 million after deducting underwriting discounts and estimated offering expenses and assuming no exercise of the Underwriters’ option to purchase additional shares and/or Class C Warrants. All of the securities in the Offering are being sold by the Company. The Offering is expected to close on or about December 9, 2022, subject to satisfaction of customary closing conditions.

Each Pre-Funded Warrant will have an exercise price per share of common stock equal to \$0.001 per share, subject to certain adjustments. The Pre-Funded Warrants are exercisable at any time after their original issuance and will not expire. Under the Pre-Funded Warrants, the Company may not effect the exercise of any Pre-Funded Warrant, and a holder will not be entitled to exercise any portion of any Pre-Funded Warrant, which, upon giving effect to such exercise, would cause (i) the aggregate number of shares of the Company’s common stock beneficially owned by the holder of the Pre-Funded Warrant (together with its affiliates) to exceed 9.99% of the number of shares of the Company’s common stock outstanding immediately after giving effect to the exercise, or (ii) the combined voting power of the Company’s securities beneficially owned by the holder of the Pre-Funded Warrant (together with its affiliates) to exceed 9.99% of the combined voting power of all of the Company’s securities then outstanding immediately after giving effect to the exercise, as such percentage ownership is determined in accordance with the terms of the Pre-Funded Warrants. However, any holder may increase or decrease such percentage to any other percentage not in excess of 19.99% (if exceeding such percentage would result in a change of control under Nasdaq Listing Rule 5636(b) or any successor rule) upon at least 61 days’ prior notice from the holder to the Company subject to the terms of the Pre-Funded Warrants.

Each Class C Warrant will have an exercise price per share of common stock equal to \$1.50, subject to certain adjustments, and require the exercise of two Class C Warrants per share of common stock. Each Class C Warrant will be immediately exercisable and will expire on December 9, 2027 (the “Expiration Date”), provided that the holder will be prohibited, subject to certain exceptions, from exercising the Class C Warrant for shares of the Company’s common stock to the extent that immediately after giving effect to such exercise, the holder, together with its affiliates and other attribution parties, would own more than 4.99% of the total number of shares of the Company’s common stock then issued and outstanding, which percentage may be changed at the holder’s election to a higher or lower percentage not in excess of 9.99% upon 61 days’ prior notice from the holder to the Company subject to the terms of the Class C Warrants. If the holder is not permitted to exercise a Class C Warrant for shares of the Company’s common stock due to the foregoing limitation, then the holder may exercise the Class C Warrant for an equivalent number of Pre-Funded Warrants with an exercise price of \$0.001 in substantially the same form of Pre-Funded Warrant to purchase shares of common stock described above. If there is no effective registration statement at the time of exercise the Class C Warrants may be exercised cashlessly.

The securities will be issued pursuant to the Company’s effective shelf registration statement on Form S-3 (File No. 333-249544), including the base prospectus therein, originally filed with the Securities and Exchange Commission (the “Commission”) on October 19, 2020 and declared effective by the Commission on October 26, 2020, as supplemented by the prospectus supplement dated December 7, 2022 filed with the Commission.

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The Underwriting Agreement contains customary representations, warranties and agreements by the Company, customary conditions to closing, indemnification obligations of the Company and the Underwriters, including for liabilities arising under the Securities Act of 1933, as amended, other obligations of the parties and termination provisions. The representations, warranties and covenants contained in the Underwriting Agreement were made only for the purposes of such agreement and as of specific dates, and were solely for the benefit of the parties to such agreement.

The foregoing descriptions of the terms of the Underwriting Agreement, Pre-Funded Warrants and Class C Warrants are each qualified in their entirety by reference to the Underwriting Agreement, form of Pre-Funded Warrant and form of Class C Warrant, respectively, which are attached as Exhibit 1.1, Exhibit 4.1, and Exhibit 4.2 hereto, respectively, and incorporated by reference herein.

A copy of the legal opinion of Cooley LLP relating to the validity of the issuance and sale of the securities in the Offering is attached as Exhibit 5.1 hereto.

#### **Item 8.01 Other Events.**

##### *Offering Press Releases*

On December 6, 2022 and December 7, 2022 the Company issued press releases announcing the launch and pricing, respectively, of the Offering. Copies of the press releases are attached hereto as Exhibits 99.1 and 99.2 and incorporated herein by reference.

#### **Item 9.01 Financial Statements and Exhibits.**

##### (d) Exhibits

Exhibit Number	Description
1.1	<a href="#">Underwriting Agreement, dated December 7, 2022, by and among the Company, Piper Sandler &amp; Co., Stifel, Nicolaus &amp; Company, Incorporated, and Cantor Fitzgerald &amp; Co.</a>
4.1	<a href="#">Form of Pre-Funded Warrant.</a>
4.2	<a href="#">Form of Class C Warrant.</a>
5.1	<a href="#">Opinion of Cooley LLP.</a>
99.1	<a href="#">Press release, dated December 6, 2022, announcing the launch of the underwritten public offering.</a>
99.2	<a href="#">Press release, dated December 7, 2022, announcing the pricing of the underwritten public offering.</a>
104	Cover Page Interactive Data File (embedded within the Inline XBRL document).

## SIGNATURES

Pursuant to the requirements of the Securities Exchange Act of 1934 the registrant has duly caused this report to be signed on its behalf by the undersigned hereunto duly authorized.

**X4 PHARMACEUTICALS, INC.**

Date: December 9, 2022

By: /s/ Adam Mostafa  
Adam Mostafa  
Chief Financial Officer

**X4 PHARMACEUTICALS, INC.**  
**52,300,000 Shares of Common Stock**  
**Pre-Funded Warrants to Purchase 6,800,000 Shares of Common Stock**  
**Class C Warrants to Purchase 29,550,000 Shares of Common Stock**  
**UNDERWRITING AGREEMENT**

December 7, 2022

Piper Sandler & Co.  
Stifel, Nicolaus & Company, Incorporated  
Cantor Fitzgerald & Co.  
As Representatives of the several Underwriters

c/o Piper Sandler & Co.  
800 Nicollet Mall  
Minneapolis, Minnesota 55402

c/o Stifel, Nicolaus & Company, Incorporated  
One Montgomery Street, Suite 3700  
San Francisco, California 94104

c/o Cantor Fitzgerald & Co.  
499 Park Avenue  
New York, New York 10022

Dear Sirs and Madams:

1. *INTRODUCTORY.* X4 Pharmaceuticals, Inc., a Delaware corporation (the “**Company**”), proposes to sell, pursuant to the terms of this Underwriting Agreement (this “**Agreement**”), to the several underwriters named in Schedule A hereto (the “**Underwriters**,” or, each, an “**Underwriter**”), an aggregate of (i) 52,300,000 shares (the “**Firm Shares**”) of common stock, \$0.001 par value per share (the “**Common Stock**”), of the Company, (ii) Pre-Funded Warrants, substantially in the form of Annex A hereto, to purchase 6,800,000 shares of Common Stock with an exercise price equal to \$0.001 per share (the “**Pre-Funded Warrants**”) and (iii) Class C Warrants, substantially in the form of Annex B hereto, to purchase an aggregate of 29,550,000 shares of Common Stock, with an exercise price of \$1.50 per share (the “**Firm Class C Warrants**”) and together with the Pre-Funded Warrants, being hereafter collectively referred to as the “**Firm Warrants**”, and such Firm Warrants and Firm Shares being collectively referred to as the “**Firm Securities**”). In addition, the Company has granted to the Underwriters an option to purchase up to (i) an additional 8,865,000 shares of Common Stock (the “**Optional Shares**”, together with the Firm Shares, the “**Shares**”) and/or (ii) Class C Warrants to purchase 4,432,500 shares of Common Stock, with an exercise price of \$1.50 per share (the “**Optional Class C Warrants**”, together with the Firm Class C Warrants, the “**Class C Warrants**”) and together with the Pre-Funded Warrants, herein referred to as the “**Warrants**”), as provided in Section 3 of this Agreement. The Optional Shares and/or Optional Class C Warrants to be sold by the Company pursuant to such option are collectively called the “**Optional Securities**”. The Firm Shares (and if applicable, the Pre-Funded Warrants) and the accompanying Firm Class C Warrants shall be sold together as a fixed combination, each consisting of (i) one Firm Share (or Pre-Funded Warrant) and (ii) one Firm Class C Warrant to purchase one-half of a share of Common Stock. The Firm Securities and, if and to the extent such option is exercised, the Optional Securities, are collectively referred to as the “**Securities**”. Piper Sandler & Co. (“**Piper**”), Stifel, Nicolaus & Company, Incorporated (“**Stifel**”) and Cantor Fitzgerald & Co. are acting as representatives of the several Underwriters and in such capacity are hereinafter referred to as the “**Representatives**.” As used herein, “**Warrant Shares**” means the shares of Common Stock issuable upon exercise of the Warrants.

2. *Representations and Warranties of the Company*

(i) Representations and Warranties of the Company. The Company represents and warrants to the several Underwriters, as of the date hereof and as of the First Closing Date (as hereinafter defined)

and as of each Option Closing Date (as defined herein), and agrees with the several Underwriters, that:

(a) **Registration Statement.** A registration statement of the Company on Form S-3 (File No. 333- 249544) (including all amendments thereto, the “**Initial Registration Statement**”) in respect of the Securities has been filed with the Securities and Exchange Commission (the “**Commission**”) pursuant to Rule 415 under the Securities Act of 1933, as amended (the “**Securities Act**”). The Company meets the requirements for use of Form S-3 under the Securities Act, and the rules and regulations of the Commission thereunder (the “**Rules and Regulations**”). The Company represents and warrants that it meets the requirements for the use of Form S-3 set forth in General Instruction I.A of Form S-3 and that the proposed offering of the Securities may be made pursuant to General Instruction I.B.1 of Form S-3. The Initial Registration Statement and any post-effective amendment thereto, each in the form, excluding exhibits thereto, heretofore delivered or made available to you for each of the other Underwriters, have been declared effective by the Commission in such form and meet the requirements of the Securities Act, and the Rules and Regulations. The Initial Registration Statement and any post-effective amendment thereto, each in the form excluding exhibits heretofore delivered or made available to the Representatives for each of the Underwriters, have been declared effective by the Commission in such form and meet the requirements of the Securities Act and the Rules and Regulations. Other than (i) the Initial Registration Statement, (ii) a registration statement, if any, increasing the size of the offering filed pursuant to Rule 462(b) under the Securities Act and the Rules and Regulations (a “**Rule 462(b) Registration Statement**”), (iii) any Preliminary Prospectus (as defined below), (iv) the Prospectus (as defined below) contemplated by this Agreement to be filed pursuant to Rule 424(b) of the Rules and Regulations in accordance with Section 4(i)(a) hereof and (v) any Issuer Free Writing Prospectus (as defined below), no other document with respect to the offer and sale of the Securities has heretofore been filed with the Commission. No stop order suspending the effectiveness of the Initial Registration Statement, any post-effective amendment thereto or the Rule 462(b) Registration Statement, if any, has been issued and no proceeding for that purpose or pursuant to Section 8A of the Securities Act has been initiated or, to the Company’s knowledge, threatened by the Commission (any preliminary prospectus included in the Initial Registration Statement or filed with the Commission pursuant to Rule 424 of the Rules and Regulations is hereinafter called a “**Preliminary Prospectus**”). The Initial Registration Statement including all exhibits thereto and including the information contained in the Prospectus filed with the Commission pursuant to Rule 424(b) of the Rules and Regulations and deemed by virtue of Rule 430A, Rule 430B and Rule 430C, as applicable, under the Securities Act to be part of the Initial Registration Statement at the time it became effective is hereinafter collectively called the “**Registration Statement**.” If the Company has filed a Rule 462(b) Registration Statement, then any reference herein to the term “Registration Statement” shall be deemed to include such Rule 462 Registration Statement. The base prospectus included in the Initial Registration Statement at the time of effectiveness thereof (the “**Base Prospectus**”), as supplemented by the final prospectus supplement relating to the offer and sale of the Securities, in the form filed pursuant to and within the time limits described in Rule 424(b) under the Rules and Regulations, is hereinafter called the “**Prospectus**.”

Any reference herein to the Registration Statement, Base Prospectus, Preliminary Prospectus or the Prospectus shall be deemed to refer to and include the documents incorporated by reference therein. Any reference to any amendment or supplement to any Preliminary Prospectus or the Prospectus shall be deemed to refer to and include any documents filed after the date of such Preliminary Prospectus or the Prospectus under the Securities Exchange Act of 1934, as amended (the “**Exchange Act**”), and incorporated by reference in such Preliminary Prospectus or Prospectus, as the case may be. Any reference to (i) the Registration Statement shall be deemed to refer to and include the annual report on Form 10-K of the Company for the last completed fiscal year of the Company for which an annual report on Form 10-K has been filed under Section 13(a) or 15(d) of the Exchange Act prior to the date hereof and (ii) the effective date of such Registration Statement shall be deemed to refer to and include the date such Registration Statement became effective and, if later, the date such Form 10-K was so filed. Any reference to any amendment to the Registration Statement shall be deemed to refer to and include any annual report of the Company filed pursuant to Section 13(a) or 15(d) of the Exchange Act after the date of this Agreement that is incorporated by reference in the Registration Statement.

**(b) General Disclosure Package.** As of the Applicable Time (as defined below) and as of the First Closing Date and at each applicable Option Closing Date, neither (i) the General Use Free Writing Prospectus(es) (as defined below) issued at or prior to the Applicable Time, and the Pricing Prospectus (as defined below) and the information included on Schedule C hereto, all considered together (collectively, the “**General Disclosure Package**”), (ii) any individual Limited Use Free Writing Prospectus (as defined below), nor (iii) the bona fide electronic roadshow (as defined in Rule 433(h)(5) of the Rules and Regulations), when considered together with the General Disclosure Package, included or will include any untrue statement of a material fact or omitted or will omit to state a material fact necessary in order to make the statements therein, in the light of the circumstances under which they were made, not misleading; *provided, however*, that the Company makes no representations or warranties as to information contained in or omitted from the Pricing Prospectus or any Issuer Free Writing Prospectus (as defined below), in reliance upon, and in conformity with, written information furnished to the Company through the Representatives by or on behalf of any Underwriter specifically for inclusion therein, which information the parties hereto agree is limited to the Underwriters’ Information (as defined herein). As used in this paragraph (b) and elsewhere in this Agreement:

“**Applicable Time**” means 8:00 a.m., New York time, on the date of this Agreement or such other time as agreed to by the Company and the Representatives.

“**Pricing Prospectus**” means the Base Prospectus, as amended and supplemented immediately prior to the Applicable Time, including any document incorporated by reference therein and any prospectus supplement deemed to be a part thereof.

“**Issuer Free Writing Prospectus**” means any “issuer free writing prospectus,” as defined in Rule 433 of the Rules and Regulations relating to the Securities in the form filed or required to be filed with the Commission or, if not required to be filed, in the form retained in the Company’s records pursuant to Rule 433(g) of the Rules and Regulations.

“**General Use Free Writing Prospectus**” means any Issuer Free Writing Prospectus that is identified on Schedule B to this Agreement.

“**Limited Use Free Writing Prospectuses**” means any Issuer Free Writing Prospectus that is not a General Use Free Writing Prospectus.

“**Written Testing-the-Waters Communication**” means any Testing-the-Waters Communication (as defined below) that is a written communication within the meaning of Rule 405 of the Rules and Regulations.

**(c) No Stop Orders; No Material Misstatements.** No order preventing or suspending the use of any Preliminary Prospectus, any Issuer Free Writing Prospectus or the Prospectus relating to the proposed offering of the Securities has been issued by the Commission, and no proceeding for that purpose or pursuant to Section 8A of the Securities Act has been instituted or threatened by the Commission, and each Preliminary Prospectus, at the time of filing thereof, conformed in all material respects to the requirements of the Securities Act and the Rules and Regulations, and did not contain an untrue statement of a material fact or omit to state a material fact required to be stated therein or necessary to make the statements therein, in the light of the circumstances under which they were made, not misleading; *provided, however*, that the Company makes no representations or warranties as to information contained in or omitted from any Preliminary Prospectus, in reliance upon, and in conformity with, written information furnished to the Company through the Representatives by or on behalf of any Underwriter specifically for inclusion therein, which information the parties hereto agree is limited to the Underwriters’ Information.

**(d) Registration Statement and Prospectus Contents.** At the respective times the Registration Statement and any amendments thereto became or become effective as to the Underwriters and at the First Closing Date and at each applicable Option Closing Date, the Registration Statement and any amendments thereto conformed and will conform in all material respects to the requirements of the Securities Act and the Rules and Regulations and did not and will not contain any untrue statement of a material fact or omit to state any material fact required to be stated therein or necessary to make the statements therein not misleading; and the Prospectus and any amendments or supplements thereto, at the time the Prospectus or any amendment or supplement thereto was issued and at the First Closing Date and at each applicable Option Closing Date, conformed and

will conform in all material respects to the requirements of the Securities Act and the Rules and Regulations and did not and will not contain an untrue statement of a material fact or omit to state a material fact necessary in order to make the statements therein, in light of the circumstances under which they were made, not misleading; *provided, however*, that the foregoing representations and warranties in this paragraph (d) shall not apply to information contained in or omitted from the Registration Statement or the Prospectus, or any amendment or supplement thereto, in reliance upon, and in conformity with, written information furnished to the Company through the Representatives by or on behalf of any Underwriter specifically for inclusion therein, which information the parties hereto agree is limited to the Underwriters' Information.

(e) Issuer Free Writing Prospectus. Each Issuer Free Writing Prospectus, as of its issue date and at all subsequent times through the completion of the public offer and sale of the Securities or until any earlier date that the Company notified or notifies the Representatives as described in Section 4(i)(f), did not, does not and will not include any information that conflicted, conflicts or will conflict with the information contained in the Registration Statement, the Pricing Prospectus or the Prospectus, including any document incorporated by reference therein and any prospectus supplement deemed to be a part thereof that has not been superseded or modified, or included or would include an untrue statement of a material fact or omitted or would omit to state a material fact required to be stated therein or necessary in order to make the statements therein, in the light of the circumstances under which they were made, not misleading *provided, however*, that the foregoing representations and warranties in this paragraph (e) shall not apply to information contained in or omitted from the Registration Statement, the Pricing Prospectus or the Prospectus, or any amendment or supplement thereto, in reliance upon, and in conformity with, written information furnished to the Company through the Representatives by or on behalf of any Underwriter specifically for inclusion therein, which information the parties hereto agree is limited to the Underwriters' Information.

(f) Documents Incorporated by Reference. The documents incorporated by reference in the Prospectus, when they became effective or were filed with the Commission, as the case may be, conformed in all material respects to the requirements of the Securities Act or the Exchange Act, as applicable, and the rules and regulations of the Commission thereunder and none of such documents contained any untrue statement of a material fact or omitted to state any material fact required to be stated therein, or necessary to make the statements therein, in the light of the circumstances under which they were made, not misleading; and any further documents so filed and incorporated by reference in the Prospectus, when such documents are filed with Commission will conform in all material respects to the requirements of the Securities Act or the Exchange Act, as applicable, and the rules and regulations of the Commission thereunder and will not contain any untrue statement of a material fact or omit to state any material fact required to be stated therein or necessary to make the statements therein, in the light of the circumstances under which they were made, not misleading.

(g) Distribution of Offering Materials. The Company has not, directly or indirectly, distributed and will not distribute any offering material in connection with the offering and sale of the Securities other than any Preliminary Prospectus, the Prospectus and other materials, if any, permitted under the Securities Act and consistent with Section 4(i)(c) below. The Company will file with the Commission all Issuer Free Writing Prospectuses (other than a "road show" as described in Rule 433(d)(8) of the Rules and Regulations) in the time and manner required under Rules 163(b)(2) and 433(d) of the Rules and Regulations.

(h) Emerging Growth Company. From the first date on which the Company engaged directly or through any person authorized to act on its behalf in any communication in reliance on Section 5(d) of the Securities Act through the date hereof, the Company has been and is an "emerging growth company," as defined in Section 2(a) of the Securities Act (an "**Emerging Growth Company**").

(i) Not an Ineligible Issuer. At the time of filing the Initial Registration Statement, any Rule 462(b) Registration Statement and any post-effective amendments thereto, and at the date hereof, the Company was not, and the Company currently is not, an "ineligible issuer," as defined in Rule 405 of the Rules and Regulations.

(j) Testing the Waters Communications. The Company (a) has not alone engaged in any Testing-the-Waters Communication other than Testing-the-Waters Communications with the consent of the Representatives with entities that are qualified institutional buyers within the meaning of Rule



144A under the Securities Act or institutions that are accredited investors within the meaning of Rule 501 under the Securities Act and (b) has not authorized anyone to engage in Testing-the-Waters Communications. The Company has not distributed any Written Testing-the-Waters Communications other than those listed on Schedule D hereto. “**Testing-the-Waters Communication**” means any oral or written communication with potential investors undertaken in reliance on Section 5(d) of the Securities Act.

(k) Organization and Good Standing. The Company and each of its subsidiaries have been duly organized and are validly existing as corporations or other legal entities in good standing (or the foreign equivalent thereof) under the laws of their respective jurisdictions of organization. The Company and each of its subsidiaries are duly qualified to do business and are in good standing as foreign corporations or other legal entities in each jurisdiction in which their respective ownership or lease of property or the conduct of their respective businesses requires such qualification and have all power and authority (corporate or other) necessary to own or hold their respective properties and to conduct the businesses in which they are engaged, except where the failure to so qualify or have such power or authority would not (i) have, singularly or in the aggregate, a material adverse effect on the business, properties, management, financial position, stockholders’ equity, results of operations or prospects of the Company and its subsidiaries taken as a whole, or (ii) impair in any material respect the ability of the Company to perform its obligations under this Agreement or the Warrant Agreement (as defined below) or to consummate any transactions contemplated by this Agreement or the consummation by the Company of the transactions contemplated by the Warrant Agreement, the General Disclosure Package or the Prospectus (any such effect as described in clauses (i) or (ii), a “**Material Adverse Effect**”). The Company does not own or control, directly or indirectly, any corporation, association or other entity other than the subsidiaries listed in Schedule E to this Agreement. Since inception, X4 Pharmaceuticals Securities Corporation, an indirect subsidiary of the Company, has not conducted, and does not currently conduct, any operations, has not had and does not have any employees and has been and is engaged exclusively in buying, selling, dealing in and holding publicly-traded securities on its own behalf and not as a broker. The Company holds all of the outstanding capital stock of X4 Therapeutics, Inc. (“**X4**”), X4 holds all of the outstanding capital stock of X4 Pharmaceuticals Securities Corporation, and no person or entity has any right to acquire any equity interest in X4 Pharmaceuticals Securities Corporation or X4 Therapeutics, Inc. No subsidiary of the Company is a significant subsidiary within the meaning of Rule 1-02 of Regulation S-K, with the exception of X4 Therapeutics, Inc. and X4 Pharmaceuticals (Austria) GmbH.

(l) Underwriting Agreement and Warrant Agreement. This Agreement has been duly authorized, executed and delivered by the Company. The warrant agreement governing the Class C Warrants (the “**Warrant Agreement**”), to be dated as of the Closing Date and entered into by and between the Company and Computershare Trust Company, N.A. (the “**Warrant Agent**”), has been duly authorized by the Company and, when executed and delivered by the Company and the Warrant Agent, will be a valid and binding agreement of the Company, enforceable against the Company in accordance with its terms, except as the enforceability thereof may be limited by bankruptcy, insolvency, reorganization, moratorium or similar laws affecting creditors’ rights generally and general principles of equity.

(m) The Securities. The Shares to be issued and sold by the Company to the Underwriters hereunder have been duly authorized and, when issued and delivered by the Company against payment therefor as provided herein, will be validly issued, fully paid and non-assessable and the Securities will conform to the descriptions thereof in the Registration Statement, the General Disclosure Package and the Prospectus; and the issuance of the Securities is not subject to any preemptive or similar rights. The Warrants have been duly authorized by the Company and, when executed and delivered by the Company, will be valid and binding agreements of the Company, enforceable against the Company in accordance with their respective terms, except as the enforcement thereof may be limited by bankruptcy, insolvency, reorganization, moratorium or other similar laws relating to or affecting the rights and remedies of creditors or by general equitable principles. The Warrant Shares have been duly authorized and validly reserved for issuance upon exercise of the Warrants in a number sufficient to meet the current exercise requirements. The Warrant Shares, when issued and delivered upon exercise of the Warrants in accordance therewith, will be validly issued, fully paid and nonassessable, and the issuance of the Warrant Shares is not subject to any preemptive or similar rights.

(n) Capitalization. The Company has an authorized capitalization as set forth under the heading “Capitalization” in the Pricing Prospectus, and all of the issued shares of capital stock of the Company have been duly and validly authorized and issued, are fully paid and non-assessable, have been issued in compliance with federal and state securities laws, and the capital stock of the Company (including the Common Stock, Shares and Warrant Shares and the Warrants) conform to the description thereof contained in the General Disclosure Package and the Prospectus. All of the Company’s options, warrants and other rights to purchase or exchange any securities for shares of the Company’s capital stock have been duly authorized and validly issued and were issued in compliance with federal and state securities laws. None of the outstanding shares of Common Stock was issued in violation of any preemptive rights, rights of first refusal or other similar rights to subscribe for or purchase securities of the Company. As of the date set forth in the General Disclosure Package, there were no authorized or outstanding shares of capital stock, options, warrants, preemptive rights, rights of first refusal or other rights to purchase, or equity or debt securities convertible into or exchangeable or exercisable for, any capital stock of the Company or any of its subsidiaries other than those described above or accurately described in the General Disclosure Package. Since such date, the Company has not issued any securities other than Common Stock issued pursuant to the exercise of warrants or upon the exercise of stock options or other awards outstanding under the Company’s stock option plans, options or other securities granted or issued pursuant to the Company’s existing equity compensation plans or other plans, and the issuance of Common Stock pursuant to employee stock purchase plans. The description of the Company’s stock option, stock bonus and other stock plans or arrangements, and the options or other rights granted thereunder, as described in the General Disclosure Package and the Prospectus, accurately and fairly present the information required to be shown with respect to such plans, arrangements, options and rights.

(o) Capitalization of Subsidiaries. All the outstanding shares of capital stock (if any) of each subsidiary of the Company have been duly authorized and validly issued, are fully paid and nonassessable and, except to the extent set forth in the General Disclosure Package or the Prospectus, are owned by the Company directly or indirectly through one or more wholly-owned subsidiaries, are free of any preemptive or other similar rights, have been issued in compliance with federal and state securities laws and are free and clear of any claim, lien, encumbrance, security interest, restriction upon voting or transfer or any other claim of any third party, except as disclosed in the Registration Statement, the Pricing Prospectus or the Prospectus.

(p) No Conflicts. The execution, delivery and performance of this Agreement by the Company, the execution, delivery and performance of the Warrant Agreement by the Company, the issue and sale of the Securities and, if applicable, the issuance of the Warrant Shares, by the Company and the consummation of the transactions contemplated hereby or the consummation by the Company of the transactions contemplated by the Warrant Agreement will not (with or without notice or lapse of time or both) (i) conflict with or result in a breach or violation of any of the terms or provisions of, constitute a default or a Debt Repayment Triggering Event (as defined below) under, or result in the creation or imposition of any lien, encumbrance, security interest, claim or charge upon any property or assets of the Company or any subsidiary pursuant to, any indenture, mortgage, deed of trust, loan agreement or other agreement or instrument to which the Company or any of its subsidiaries is a party or by which the Company or any of its subsidiaries is bound or to which any of the property or assets of the Company or any of its subsidiaries is subject, (ii) result in any violation of the provisions of the charter or by-laws (or analogous governing instruments, as applicable) of the Company or any of its subsidiaries or (iii) result in the violation of any law, statute, rule, regulation, judgment, order or decree of any court or governmental or regulatory agency or body, domestic or foreign, having jurisdiction over the Company or any of its subsidiaries or any of their properties or assets except, in the case of clauses (i) and (iii) above, for any such conflict, breach, violation or default that would not, individually or in the aggregate, have a Material Adverse Effect. A “**Debt Repayment Triggering Event**” means any event or condition that gives, or with the giving of notice or lapse of time would give the holder of any note, debenture or other evidence of indebtedness (or any person acting on such holder’s behalf) the right to require the repurchase, redemption or repayment of all or a portion of such indebtedness by the Company of any of its subsidiaries.

(q) No Consents Required. Except for the registration of the Shares, the Warrants and the Warrant Shares under the Securities Act and applicable state securities laws, and such consents, approvals, authorizations, orders and registrations or qualifications as may be required by the

Financial Industry Regulatory Authority, Inc. (“**FINRA**”) and the Nasdaq Capital Market (the “**Exchange**”) in connection with the purchase and distribution of the Securities by the Underwriters and the listing of the Shares and the Warrant Shares, on the Exchange, no consent, approval, authorization or order of, or filing, qualification or registration (each an “**Authorization**”) with, any court, governmental or regulatory agency or body, foreign or domestic, which has not been made, obtained or taken and is not in full force and effect, is required for the execution, delivery and performance of this Agreement by the Company or the execution, delivery and performance of the Warrant Agreement by the Company, the issuance and sale of the Securities or the consummation of the transactions contemplated hereby or the consummation by the Company of the transactions contemplated by the Warrant Agreement; and no event has occurred that allows or results in, or after notice or lapse of time or both would allow or result in, revocation, suspension, termination or invalidation of any such Authorization or any other impairment of the rights of the holder or maker of any such Authorization. All corporate approvals (including those of stockholders) necessary for the Company to consummate the transactions contemplated by this Agreement and to consummate the transactions contemplated by the Warrant Agreement have been obtained and are in effect.

(r) Independent Auditors. PricewaterhouseCoopers LLP, who has certified certain financial statements of the Company or its subsidiaries included or incorporated by reference in the Registration Statement, the General Disclosure Package and the Prospectus, is an independent registered public accounting firm with respect to the Company and its subsidiaries within the meaning of Article 2-01 of Regulation S-X and the Public Company Accounting Oversight Board (United States) (the “**PCAOB**”).

(s) Financial Statements. The financial statements, together with the related notes, included or incorporated by reference in the General Disclosure Package, the Prospectus and the Registration Statement fairly present, in all material respects, the consolidated financial position and the results of operations and changes in financial position of the Company and its consolidated subsidiaries at the respective dates or for the respective periods therein specified. Such statements and related notes have been prepared in accordance with the generally accepted accounting principles in the United States (“**GAAP**”) applied on a consistent basis throughout the periods involved except as may be set forth in the related notes included or incorporated by reference in the General Disclosure Package. The financial statements, together with the related notes, included or incorporated by reference in the General Disclosure Package and the Prospectus comply in all material respects with Regulation S-X. No other financial statements or supporting schedules or exhibits are required by Regulation S-X to be described, included or incorporated by reference in the Registration Statement, the General Disclosure Package or the Prospectus. There is no pro forma or as adjusted financial information which is required to be included in the Registration Statement, the General Disclosure Package, or the Prospectus or a document incorporated by reference therein in accordance with Regulation S-X which has not been included or incorporated as so required. The financial data included or incorporated by reference in the General Disclosure Package, the Prospectus and the Registration Statement fairly present, in all material respects, the information shown therein as of the respective dates and for the respective periods specified and are derived from the consolidated financial statements set forth or incorporated by reference in the Registration Statement, the Pricing Prospectus and the Prospectus and other financial information.

(t) eXtensible Business Reporting Language. The interactive data in eXtensible Business Reporting Language included or incorporated by reference in the Registration Statement fairly presents the information called for in all material respects and has been prepared in accordance in all material respects with the Commission’s rules and guidelines applicable thereto.

(u) No Material Adverse Change. Neither the Company nor any of its subsidiaries has sustained, since the date of the latest audited financial statements included or incorporated by reference in the General Disclosure Package: (i) any material loss or interference with its business from fire, explosion, flood or other calamity, whether or not covered by insurance, or from any labor dispute or action, order or decree of any court or governmental or regulatory authority, otherwise than as set forth or contemplated in the General Disclosure Package; (ii) any change in the capital stock of the Company (other than the issuance of shares of Common Stock (A) upon exercise of stock options and warrants described as outstanding in, and the grant of options and awards under existing equity incentive plans described in, the Registration Statement, the General Disclosure Package and the Prospectus or (B) otherwise disclosed in the General Disclosure Package and the

Prospectus); (iii) any increase in the long-term debt of the Company or any of its subsidiaries; (iv) any dividend or distribution of any kind declared, set aside for payment, paid or made by the Company on any class of capital stock; or (v) any material adverse changes, or any development involving a prospective material adverse change, in or affecting the business, properties, assets, general affairs, management, financial position, prospects, stockholders' equity or results of operations of the Company and its subsidiaries taken as a whole, otherwise than as set forth or contemplated in the General Disclosure Package.

(v) Legal Proceedings. Except as set forth in the General Disclosure Package, there is no legal or governmental proceeding to which the Company or any of its subsidiaries is a party or of which any property or assets of the Company or any of its subsidiaries is the subject, including any proceeding before the United States Food and Drug Administration of the U.S. Department of Health and Human Services ("**FDA**") or comparable federal, state, local or foreign governmental bodies (it being understood that the interaction between the Company and the FDA and such comparable governmental bodies relating to the testing, nonclinical and clinical development, manufacture and product review process shall not be deemed proceedings for purposes of this representation), which is required to be described in the Registration Statement, the General Disclosure Package or the Prospectus or a document incorporated by reference therein and is not described therein, or which, singularly or in the aggregate, if determined adversely to the Company or any of its subsidiaries, would reasonably be expected to have a Material Adverse Effect; and no such proceedings are, to the Company's knowledge, threatened or contemplated by governmental or regulatory authorities or threatened by others. The Company and each of its subsidiaries is in compliance with all applicable federal, state, local and foreign laws, regulations, orders and decrees governing its business as required by the FDA, or any other federal, state or foreign agencies or bodies engaged in the regulation of pharmaceuticals, except where noncompliance would not, singly or in the aggregate, have a Material Adverse Effect. All nonclinical studies and clinical trials conducted by or on behalf of the Company and each of its subsidiaries to support approval for commercialization of the Company's products have been conducted by the Company, or to the Company's knowledge by third parties, in compliance with all applicable federal, state or foreign laws, rules, orders and regulations, except for such failure or failures to be in compliance as would not reasonably be expected to have, singly or in the aggregate, a Material Adverse Effect. Neither the Company nor any of its subsidiaries is a party to any corporate integrity agreements, monitoring agreements, consent decrees, settlement orders, or similar agreements with or imposed by any governmental or regulatory authority. Additionally, neither the Company, any of its subsidiaries nor any of their respective employees, officers, directors, or agents has been excluded, suspended or debarred from participation in any human clinical research or, to the knowledge of the Company, is subject to a governmental inquiry, investigation, proceeding, or other similar action that would reasonably be expected to result in debarment, suspension, or exclusion.

(w) No Violation or Default. Neither the Company nor any of its subsidiaries is (i) in violation of its charter or by-laws (or analogous governing instrument, as applicable), (ii) in default in any respect, and no event has occurred which, with notice or lapse of time or both, would constitute such a default, in the due performance or observance of any term, covenant or condition contained in any indenture, mortgage, deed of trust, loan agreement, lease or other agreement or instrument to which it is a party or by which it is bound or to which any of its property or assets is subject or (iii) in violation in any respect of any law, ordinance, governmental rule, regulation or court order, decree or judgment to which it or its property or assets may be subject (including, without limitation, those administered by the FDA or by any foreign, federal, state or local governmental or regulatory authority performing functions similar to those performed by the FDA) except, in the case of clauses (ii) and (iii) above, for any such violation or default that would not, singularly or in the aggregate, have a Material Adverse Effect.

(x) Licenses or Permits. The Company and each of its subsidiaries possess all licenses, certificates, authorizations and permits issued by, and have made all declarations and filings with, the appropriate local, state, federal or foreign governmental or regulatory agencies or bodies (including, without limitation, the FDA or any foreign, federal, state or local governmental or regulatory authority performing functions similar to those performed by the FDA) that are necessary for the ownership or lease of their respective properties or the conduct of their respective businesses as described in the General Disclosure Package and the Prospectus (collectively, the "**Governmental Permits**") except where any failures to possess or make the

same would not, singularly or in the aggregate, have a Material Adverse Effect. The Company and its subsidiaries are in compliance, in all material respects, with all such Governmental Permits; and all such Governmental Permits are valid and in full force and effect, except where the validity or failure to be in full force and effect would not, singularly or in the aggregate, have a Material Adverse Effect. Neither the Company nor any subsidiary has received notification of any revocation, modification, suspension, termination or invalidation (or proceedings related thereto) of any such Governmental Permit and the Company has no knowledge that any such Governmental Permit will not be renewed.

(y) Regulatory Matters. The nonclinical studies and clinical trials conducted by or on behalf of the Company and each of its subsidiaries that are described in the General Disclosure Package and the Prospectus (the “*Company Studies and Trials*”) were and, if still pending, are being, conducted in all material respects in accordance with experimental protocols, procedures and controls pursuant to, where applicable, accepted professional scientific standards; the descriptions of the results of the Company Studies and Trials contained in the General Disclosure Package and Prospectus are accurate in all material respects; the Company has no knowledge of any other studies or trials not described in the General Disclosure Package and the Prospectus, the results of which are inconsistent with or call into question the results described or referred to in the General Disclosure Package and the Prospectus; and the Company has not received any notices or correspondence from the FDA or any foreign, state or local governmental body exercising comparable authority requiring the termination, suspension or material modification of any Company Studies or Trials that termination, suspension or material modification would reasonably be expected to have a Material Adverse Effect and, to the Company’s knowledge, there are no reasonable grounds for the same. The Company has obtained (or caused to be obtained) informed consent by or on behalf of each human subject who participated in the Company Studies and Trials. In using or disclosing patient information received by the Company in connection with the Company Studies and Trials, the Company has complied in all material respects with all applicable laws and regulatory rules or requirements, including, without limitation, the Health Insurance Portability and Accountability Act of 1996 and the rules and regulations thereunder. To the Company’s knowledge, none of the Company Studies and Trials involved any investigator who has been disqualified as a clinical investigator or has been found by the FDA to have engaged in scientific misconduct. To the Company’s knowledge, the manufacturing facilities and operations of its suppliers are operated in compliance in all material respects with all applicable statutes, rules, and regulations of the FDA and comparable regulatory agencies outside of the United States to which the Company is subject.

(z) Regulatory Compliance. Neither the Company nor any of its subsidiaries has received any unresolved FDA Form 483, notice of adverse filing, warning letter, untitled letter or other correspondence or notice from the FDA, or any other court or arbitrator or federal, state, local, or foreign governmental or regulatory authority, alleging or asserting noncompliance with the Federal Food, Drug and Cosmetic Act (21 U.S.C § 301 et seq.) (the “*FDCA*”). The Company, each of its subsidiaries and the directors, officers, employees and agents of the Company and each of its subsidiaries are and have been in material compliance with applicable health care laws, including without limitation, the FDCA, the federal Anti-Kickback Statute (42 U.S.C. § 1320a-7b(b)), the civil False Claims Act (31 U.S.C. § 3729 et seq.), the criminal False Claims Law (42 U.S.C. § 1320a-7b(a)), the Civil Monetary Penalties Law (42 U.S.C. § 1320a-7a), the Health Insurance Portability and Accountability Act of 1996 (42 U.S.C. § 1320d et seq.), as amended by the Health Information Technology for Economic and Clinical Health Act of 2009 (42 U.S.C. § 17921 et seq.) the exclusions law (42 U.S.C. § 1320a-7), Medicare (Title XVIII of the Social Security Act), Medicaid (Title XIX of the Social Security Act), and the Patient Protection and Affordable Care Act of 2010, as amended by the Health Care and Education Affordability Reconciliation Act of 2010, including, without limitation, the Physician Payments Sunshine Act (42 U.S.C. § 1320a-7h), and the regulation promulgated pursuant to such laws, and comparable state laws, and all other local, state, federal, national, supranational, and foreign health regulatory laws that are applicable to the Company (collectively, “*Health Care Laws*”). Neither the Company nor any of its subsidiaries has, either voluntarily or involuntarily, initiated, conducted or issued or caused to be initiated, conducted or issued, any recall, market withdrawal or replacement, safety alert, post-sale warning, “dear health care provider” letter, or other notice or action relating to the alleged lack of safety or efficacy of any product or any alleged product defect or violation and, to the Company’s knowledge, no third-party has initiated or conducted any such notice or action. Neither the Company nor any of its officers, directors, employees, or,

to the Company's knowledge, any of its agents has been or is currently excluded from participation in the Medicare and Medicaid programs or any other state or federal health care program.

(aa) Investment Company Act. Neither the Company nor any of its subsidiaries is or, after giving effect to the offering of the Securities and the application of the net proceeds thereof as described in the General Disclosure Package and the Prospectus, will be required to register as an "investment company" or an entity "controlled" by an "investment company" within the meaning of the Investment Company Act of 1940, as amended, and the rules and regulations of the Commission thereunder.

(bb) No Stabilization. Neither the Company nor, to the Company's knowledge, any of its officers, directors or affiliates has taken or will take, directly or indirectly, any action designed or intended to stabilize or manipulate the price of any security of the Company, or which caused or resulted in, or which might in the future reasonably be expected to cause or result in, stabilization or manipulation of the price of any security of the Company.

(cc) Intellectual Property. Except as disclosed in the Registration Statement, General Disclosure Package and the Prospectus, the Company or its subsidiaries own or possess the lawful right to use all (i) valid and enforceable patents, patent applications, trademarks, trademark registrations, service marks, service mark registrations, Internet domain name registrations, copyrights, copyright registrations, licenses, trade secret rights ("**Intellectual Property Rights**") and (ii) inventions, software, works of authorships, trademarks, service marks, trade names, databases, formulae, know how, Internet domain names and other intellectual property (including trade secrets and other unpatented and/or unpatentable proprietary confidential information, systems, or procedures) (collectively, "**Intellectual Property Assets**") necessary to conduct their respective businesses as currently conducted, and as proposed to be conducted and described in the General Disclosure Package and the Prospectus. The Company and its subsidiaries have not received any opinion from their legal counsel concluding that any activities of their respective businesses infringe, misappropriate, or otherwise violate, valid and enforceable Intellectual Property Rights of any other person, and have not received written notice of any challenge, which is to their knowledge still pending, by any other person to the rights of the Company and its subsidiaries with respect to any Intellectual Property Rights or Intellectual Property Assets owned or used by the Company or its subsidiaries. To the Company's knowledge, the Company and its subsidiaries' respective businesses as now conducted do not give rise to any infringement of, any misappropriation of, or other violation of, any valid and enforceable Intellectual Property Rights of any other person. All licenses for the use of the Intellectual Property Rights described in the General Disclosure Package and the Prospectus are valid, binding upon, and enforceable by or against the respective parties thereto in accordance with their respective terms. The Company has complied in all material respects with, and is not in breach nor has received any asserted or threatened claim of breach of any Intellectual Property license, and the Company has no knowledge of any breach or anticipated breach by any other person to any Intellectual Property license. Except as described in the General Disclosure Package, no claim has been made against the Company alleging the infringement by the Company of any patent, trademark, service mark, trade name, copyright, trade secret, license in or other intellectual property right or franchise right of any person. The Company has taken all reasonable steps to protect, maintain and safeguard its Intellectual Property Rights, including the execution of appropriate nondisclosure and confidentiality agreements. The consummation of the transactions contemplated by this Agreement and the consummation by the Company of the transactions contemplated by the Warrant Agreement will not result in the loss or impairment of or payment of any additional amounts with respect to, nor require the consent of any other person in respect of, the Company's right to own, use, or hold for use any of the Intellectual Property Rights as owned, used or held for use in the conduct of the business as currently conducted.

(dd) Privacy Laws. The Company and its subsidiaries are, and at all applicable prior times were, in material compliance with all applicable data privacy and security laws and regulations, including, without limitation as applicable, the Health Insurance Portability and Accountability Act ("**HIPAA**"), as amended by the Health Information Technology for Economic and Clinical Health Act (the "**HITECH Act**") (42 U.S.C. Section 17921 et seq.); and the Company and its subsidiaries have taken all necessary actions to comply with the European Union General Data Protection Regulation ("**GDPR**") (EU 2016/679) (collectively, "**Privacy Laws**"). To ensure compliance with the Privacy Laws, the Company and its subsidiaries have in place, comply with,

and take appropriate steps reasonably designed to ensure compliance in all material respects with their policies and procedures relating to data privacy and security and the collection, storage, use, disclosure, handling and analysis of Personal Data (the “**Policies**”). Where required by Privacy Laws, the Company provides accurate notice of its Policies to its customers, employees, third party vendors and representatives. The Policies provide accurate and sufficient notice of the Company’s then-current privacy practices relating to its subject matter and such Policies do not contain any material omissions of the Company’s then-current privacy practices. “**Personal Data**” means (i) a natural persons’ name, street address, telephone number, email address, photograph, social security number, bank information, or customer or account number; (ii) any information which would qualify as “personally identifying information” under the Federal Trade Commission Act, as amended; (iii) Protected Health Information as defined by HIPAA; (iv) “personal data” as defined by GDPR; and (v) any other piece of information that allows the identification of such natural person, or his or her family, or permits the collection or analysis of any data related to an identified person’s health or sexual orientation. None of such disclosures made or contained in any of the Policies have been inaccurate, misleading, deceptive or in violation of any Privacy Laws or Policies in any material respect. The execution, delivery and performance of this Agreement or any other agreement referred to in this Agreement will not result in a breach of any Privacy Laws or Policies. Neither the Company nor any of its subsidiaries, (i) has received written notice from a governmental or regulatory authority of any actual or potential liability under or relating to, or actual or potential violation of, any of the Privacy Laws, and has no knowledge of any event or condition that would reasonably be expected to result in any such notice; (ii) is currently conducting or paying for, in whole or in part, any investigation, remediation or other corrective action pursuant to any Privacy Law; or (iii) is a party to any order, decree, or agreement that imposed any obligation or liability under any Privacy Law.

(ee) IT Systems. (i)(x) To the Company’s knowledge, there has been no material security breach or attack or other compromise of or relating to any of the Company’s and its subsidiaries’ information technology and computer systems, networks, hardware, software, data (including the data of their respective customers, employees, suppliers, vendors and any third party data maintained by or on behalf of them), equipment or technology (“**IT Systems and Data**”), and (y) the Company and its subsidiaries have not been notified of, and have no knowledge of any event or condition that would reasonably be expected to result in any material security breach, attack or compromise to their IT Systems and Data, (ii) the Company and its subsidiaries have complied, and are presently in compliance with, in all material respects, all applicable laws, statutes or any judgment, order, rule or regulation of any court or arbitrator or governmental or regulatory authority and all contractual obligations relating to the privacy and security of IT Systems and Data and to the protection of such IT Systems and Data from unauthorized use, access, misappropriation or modification and (iii) the Company and its subsidiaries have implemented backup and disaster recovery technology consistent with industry standards and practice.

(ff) Title to Real and Personal Property. Except as disclosed in the Registration Statement, General Disclosure Package and the Prospectus, the Company and each of its subsidiaries have good and marketable title in and (in the case of real property) to, or have valid and marketable rights to lease or otherwise use, all items of real or personal property which are material to the business of the Company and its subsidiaries taken as a whole, in each case free and clear of all liens, encumbrances, security interests, claims and defects that (i) do not, singularly or in the aggregate, materially affect the value of such property and do not materially interfere with the use made and proposed to be made of such property by the Company or any of its subsidiaries or (ii) would not reasonably be expected, singularly or in the aggregate, to have a Material Adverse Effect. All of the leases and subleases material to the business of the Company, and under which the Company holds properties described in the General Disclosure Package and the Prospectus, are in full force and effect and the Company has not received any notice of any material claim of any sort that has been asserted by anyone adverse to the rights of the Company under any of the leases or subleases mentioned above, or affecting or questioning the rights of the Company to the continued possession of the leased or subleased premises under any such lease or sublease.

(gg) No Labor Dispute. There is (A) no significant unfair labor practice complaint pending against the Company, or any of its subsidiaries, nor to the Company’s knowledge, threatened against it or any of its subsidiaries, before the National Labor Relations Board, any state or local labor relation board or any foreign labor relations board, and no significant grievance or

significant arbitration proceeding arising out of or under any collective bargaining agreement is so pending against the Company or any of its subsidiaries, or, to the Company's knowledge, threatened against it and (B) no labor disturbance by or dispute with, employees of the Company or any of its subsidiaries exists or, to the Company's knowledge, is contemplated or threatened, and the Company is not aware of any existing or imminent labor disturbance by the employees of any of its or its subsidiaries' principal suppliers, manufacturers, customers or contractors, that would reasonably be expected, singularly or in the aggregate, to have a Material Adverse Effect. The Company is not aware that any key employee or significant group of employees of the Company or any subsidiary plans to terminate employment with the Company or any such subsidiary.

(hh) Compliance with ERISA. No "prohibited transaction" (as defined in Section 406 of the Employee Retirement Income Security Act of 1974, as amended, including the regulations and published interpretations thereunder ("**ERISA**"), or Section 4975 of the Internal Revenue Code of 1986, as amended from time to time (the "**Code**")) or "accumulated funding deficiency" (as defined in Section 302 of ERISA) or any of the events set forth in Section 4043(b) of ERISA (other than events with respect to which the thirty (30)-day notice requirement under Section 4043 of ERISA has been waived) has occurred or would reasonably be expected to occur with respect to any employee benefit plan of the Company or any of its subsidiaries which would, singularly or in the aggregate, reasonably be expected to have a Material Adverse Effect. Each employee benefit plan of the Company or any of its subsidiaries is in compliance in all material respects with applicable law, including ERISA and the Code. The Company and its subsidiaries have not incurred, and would not reasonably be expected to incur, liability under Title IV of ERISA with respect to the termination of, or withdrawal from, any pension plan (as defined in ERISA). Each pension plan for which the Company or any of its subsidiaries would have any liability that is intended to be qualified under Section 401(a) of the Code is so qualified, and nothing has occurred, whether by action or by failure to act, which would, singularly or in the aggregate, reasonably be expected to cause the loss of such qualification.

(ii) Environmental Laws and Hazardous Materials. The Company and its subsidiaries are in compliance in all material respects with all foreign, federal, state and local rules, laws and regulations relating to the use, treatment, storage and disposal of hazardous or toxic substances or waste and protection of health and safety or the environment which are applicable to their businesses ("**Environmental Laws**"). There has been no storage, generation, transportation, handling, treatment, disposal, discharge, emission, or other release of any kind of toxic or other wastes or other hazardous substances by, due to, or caused by the Company or any of its subsidiaries (or, to the Company's knowledge, any other entity for whose acts or omissions the Company or any of its subsidiaries is or may otherwise be liable) upon any of the property now or previously owned or leased by the Company or any of its subsidiaries, or upon any other property, in violation of any law, statute, ordinance, rule, regulation, order, judgment, decree or permit or which would, under any law, statute, ordinance, rule (including rule of common law), regulation, order, judgment, decree or permit, give rise to any liability; and there has been no disposal, discharge, emission or other release of any kind onto such property or into the environment surrounding such property of any toxic or other wastes or other hazardous substances with respect to which the Company or any of its subsidiaries has knowledge.

(jj) Taxes. The Company and its subsidiaries each (i) have timely filed all necessary federal, state, local and foreign tax returns, and all such returns were true, complete and correct, (ii) have paid all federal, state, local and foreign taxes due and payable, for which it is liable, including, without limitation, all sales and use taxes and all taxes which the Company or any of its subsidiaries is obligated to withhold from amounts owing to employees, creditors and third parties, and (iii) do not have any tax deficiency or claims outstanding or assessed or, to its knowledge, proposed against any of them, except those, in each of the cases described in clauses (i), (ii) and (iii) above, that would not, singularly or in the aggregate, have a Material Adverse Effect.

(kk) Accuracy of Exhibits. There is no franchise agreement, lease, contract, or other agreement or document required by the Securities Act or by the Rules and Regulations to be described in the General Disclosure Package or to be filed as an exhibit to the Registration Statement or to the documents incorporated by reference therein which is not so described or filed therein as required; and all descriptions of any such franchise agreements, leases, contracts, or other agreements or documents contained in the General Disclosure Package or the documents



incorporated by reference therein are accurate and complete descriptions of such documents in all material respects. Other than as described in the General Disclosure Package or the documents incorporated by reference therein, no such franchise agreement, lease, contract or other agreement has been suspended or terminated for convenience or default by the Company or any of the other parties thereto, and the Company has not received notice of and the Company does not have knowledge of any such pending or threatened suspension or termination.

(ll) Insurance. The Company and each of its subsidiaries carry, or are covered by, insurance in such amounts and covering such risks as is adequate for the conduct of their respective businesses and the value of their respective properties. Neither the Company nor any of its subsidiaries has any reason to believe that it will not be able to renew its existing insurance coverage as and when such coverage expires or to obtain similar coverage from similar insurers as may be necessary to continue its business at a cost that would not have a Material Adverse Effect. None of the Company nor any of its subsidiaries has received written notice from any insurer, agent of such insurer or the broker of the Company or any of its subsidiaries that any material capital improvements or any other material expenditures (other than premium payments) are required or necessary to be made in order to continue such insurance.

(mm) Accounting Controls. The Company and each of its subsidiaries maintains a system of “internal control over financial reporting” (as such term is defined in Rule 13a-15(f) of the General Rules and Regulations under the Exchange Act (the “*Exchange Act Rules*”)) that complies with the requirements of the Exchange Act and has been designed by their respective principal executive and principal financial officers, or under their supervision, to provide reasonable assurances that (i) transactions are executed in accordance with management’s general or specific authorizations; (ii) transactions are recorded as necessary to permit preparation of financial statements in conformity with GAAP and to maintain accountability for assets; (iii) access to assets is permitted only in accordance with management’s general or specific authorization; (iv) the recorded accountability for assets is compared with existing assets at reasonable intervals and appropriate action is taken with respect to any differences and (v) interactive data in eXtensible Business Reporting Language included or incorporated by reference in the Registration Statement fairly presents the information called for in all material respects and has been prepared in accordance with the Commission’s rules and guidelines applicable thereto. The Company’s internal control over financial reporting is effective. Since the end of the Company’s most recent audited fiscal year, there has been (A) no material weakness in the Company’s internal control over financial reporting (whether or not remediated) and (B) no change in the Company’s internal control over financial reporting that has materially affected, or is reasonably likely to materially affect, the Company’s internal control over financial reporting.

(nn) Disclosure Controls. The Company and its subsidiaries maintain disclosure controls and procedures (as such is defined in Rule 13a-15(e) of the Exchange Act Rules) that comply with the requirements of the Exchange Act; such disclosure controls and procedures have been designed to ensure that information required to be disclosed by the Company and its subsidiaries in reports that they file or submit under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in the Commission’s rules and forms, including controls and procedures designed to ensure that such information is accumulated and communicated to the Company’s management to allow timely decisions regarding disclosures. The Company and its subsidiaries have conducted evaluations of the effectiveness of their disclosure controls as required by Rule 13a-15 of the Exchange Act.

(oo) Minute Books. The minute books of the Company and each of its subsidiaries have been made available to the Underwriters and counsel for the Underwriters, and such books (i) contain a complete summary, in all material respects, of all meetings and actions of the board of directors (including each board committee) and stockholders of the Company (or analogous governing bodies and interest holders, as applicable), and each of its subsidiaries since the time of its respective incorporation or organization through the date of the latest meeting and action, and (ii) accurately in all material respects reflect all transactions referred to in such minutes.

(pp) No Undisclosed Relationships. No relationship, direct or indirect, exists between or among the Company or any of its subsidiaries on the one hand, and the directors, officers, stockholders (or analogous interest holders), customers or suppliers of the Company or any of its affiliates on the other hand, which is required to be described in the General Disclosure Package and the Prospectus or a document incorporated by reference therein and which is not so described.

(qq) No Registration Rights. No person or entity has the right to require registration of shares of Common Stock or other securities of the Company or any of its subsidiaries because of the filing or effectiveness of the Registration Statement or otherwise, except for persons and entities who have expressly waived such right in writing or who have been given timely and proper written notice and have failed to exercise such right within the time or times required under the terms and conditions of such right. Except as described in the General Disclosure Package, there are no persons with registration rights or similar rights to have any securities registered by the Company or any of its subsidiaries under the Securities Act.

(rr) Margin Rules. The application of the proceeds received by the Company from the issuance, sale and delivery of the Securities as described in the General Disclosure Package and the Prospectus will not violate Regulation T, U or X of the Board of Governors of the Federal Reserve system or any other regulation of such Board of Governors.

(ss) No Broker's Fees. Neither the Company nor any of its subsidiaries is a party to any contract, agreement or understanding with any person (other than this Agreement) that would give rise to a valid claim against the Company or any of its subsidiaries or the Underwriters for a brokerage commission, finder's fee or like payment in connection with the offering and sale of the Securities or any transaction contemplated by this Agreement or the Warrant Agreement, the Registration Statement, the General Disclosure Package or the Prospectus.

(tt) No Restrictions on Subsidiaries. Except as described in the General Disclosure Package and the Prospectus, no subsidiary of the Company is currently prohibited, directly or indirectly, under any agreement or other instrument to which it is a party or is subject, from paying any dividends to the Company, from making any other distribution on such subsidiary's capital stock, from repaying to the Company any loans or advances to such subsidiary from the Company or from transferring any of such subsidiary's properties or assets to the Company or any other subsidiary of the Company.

(uu) Forward-Looking Statements. No forward-looking statement (within the meaning of Section 27A of the Securities Act and Section 21E of the Exchange Act) contained in either the General Disclosure Package or the Prospectus has been made or reaffirmed without a reasonable basis or has been disclosed other than in good faith.

(vv) Listing. The Company is subject to and in compliance in all material respects with the reporting requirements of Section 13 or Section 15(d) of the Exchange Act. The Common Stock is registered pursuant to Section 12(b) or 12(g) of the Exchange Act and is listed on the Exchange, and the Company has taken no action designed to, or reasonably likely to have the effect of, terminating the registration of the Common Stock under the Exchange Act or delisting the Common Stock from the Exchange, nor has the Company received any notification that the Commission or FINRA is contemplating terminating such registration or listing.

(ww) Sarbanes-Oxley Act. There is and has been no failure on the part of the Company or, to the Company's knowledge, any of the Company's officers or directors, in their capacities as such, to comply with any provision of the Sarbanes-Oxley Act of 2002 and the rules and regulations promulgated in connection therewith (the "*Sarbanes-Oxley Act*"), including Section 402 related to loans and Sections 302 and 906 related to certifications.

(xx) No Unlawful Payments. Neither the Company nor any of its subsidiaries nor, to the Company's knowledge, any director, officer, employee, agent, affiliate or other person acting on behalf of the Company or any subsidiary, has (i) used any corporate funds for unlawful contributions, gifts, entertainment or other unlawful expenses relating to political activity, (ii) made any direct or indirect unlawful payment to foreign or domestic government officials or employees, political parties or campaigns, political party officials, or candidates for political office from corporate funds, (iii) violated or is in violation of any provision of the U.S. Foreign Corrupt Practices Act of 1977, as amended, or any applicable anti-corruption laws, rules, or regulation of any other jurisdiction in which the Company or any subsidiary conducts business, or (iv) made any other unlawful bribe, rebate, payoff, influence payment, kickback, or other unlawful payment to any person.

(yy) Statistical and Market Data. The statistical and market related data included in the Registration Statement, the General Disclosure Package and the Prospectus are based on or

derived from sources that the Company believes to be reliable and accurate (but has not independently verified), and such data agree with the sources from which they are derived.

(zz) Compliance with Money Laundering Laws. The operations of the Company and its subsidiaries are and have been conducted at all times in compliance with all applicable financial recordkeeping and reporting requirements, including those of the U.S. Bank Secrecy Act, as amended by Title III of the Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism Act of 2001 (USA PATRIOT Act), and the applicable anti-money laundering statutes of jurisdictions where the Company and its subsidiaries conduct business, the rules and regulations thereunder and any related or similar rules, regulations or guidelines, issued, administered or enforced by any governmental agency (collectively, the “*Anti-Money Laundering Laws*”), and no action, suit or proceeding by or before any court or governmental agency, authority or body or any arbitrator involving the Company or any of its subsidiaries with respect to the Anti-Money Laundering Laws is pending or, to the knowledge of the Company, threatened.

(aaa) Compliance with OFAC.

- (A) Neither the Company nor any of its subsidiaries, nor any director, officer or employee thereof, nor, to the Company’s knowledge, any agent, affiliate, representative or other person acting on behalf of the Company or any of its subsidiaries, is an individual or entity (“*Person*”) that is, or is owned or controlled by a Person that is: (i) the subject of any sanctions administered or enforced by the U.S. Department of Treasury’s Office of Foreign Assets Control (“*OFAC*”), the United Nations Security Council (“*UNSC*”), the European Union (“*EU*”), Her Majesty’s Treasury (“*HMT*”), or other relevant sanctions authority (collectively, “*Sanctions*”), nor (ii) located, organized or resident in a country or territory that is the subject of a U.S. government embargo (currently, the so-called Donetsk People’s Republic, the so-called Luhansk People’s Republic, and the Crimea regions of Ukraine, Cuba, Iran, North Korea or Syria).
- (B) The Company will not, directly or indirectly, use the proceeds of the offering, or lend, contribute or otherwise make available such proceeds to any subsidiary, joint venture partner or other Person: (i) to fund or facilitate any activities or business of or with any Person that, at the time of such funding or facilitation, is the subject of Sanctions, or in any country or territory that, at the time of such funding or facilitation, is the subject of a U.S. government embargo; or (ii) in any other manner that will result in a violation of Sanctions by any Person (including any Person participating in the offering, whether as underwriter, advisor, investor or otherwise).
- (C) For the past five (5) years, the Company and its subsidiaries have not knowingly engaged in, are not now knowingly engaged in, and will not engage in, any direct or indirect dealings or transactions with any Person that at the time of the dealing or transaction is or was the subject of Sanctions or any country or territory that, at the time of the dealing or transaction is or was the subject of a U.S. government embargo.

(bbb) No Associated Persons; FINRA Matters. Neither the Company nor, to the knowledge of the Company, any of its affiliates (within the meaning of FINRA Rule 5121(f)(1)) directly or indirectly controls, is controlled by, or is under common control with, or is an associated person (within the meaning of Article I, Section 1(ee) of the By-laws of FINRA) of, any member firm of FINRA.

(ccc) Certification Regarding Beneficial Owners. If requested by the Representatives, the Company has delivered to the Representatives a properly completed and executed Certification Regarding Beneficial Owners of Legal Entity Customers, and, if required, copies of identifying documentation.

(ddd) Registration Statement for Warrants. The Company shall, at all times while any Warrants are outstanding, use its commercially reasonable efforts to maintain a registration statement covering the issue and sale of the Warrant Shares upon exercise of the Warrants such that the Warrant Shares, when issued, will not be subject to resale and restrictions under the Securities Act except to the extent that the Warrant Shares are owned by affiliates.

(eee) Reserve for Warrant Shares. The Company shall, at all times while any Warrants are outstanding, reserve and keep available out of the aggregate of its authorized but unissued and otherwise unreserved Common Stock, solely for the purpose of enabling it to issue Warrant Shares upon exercise of such Warrants, the number of Warrant Shares that are initially issuable and deliverable upon the then-outstanding Warrants.

Any certificate signed by or on behalf of the Company and delivered to the Representatives or to counsel for the Underwriters shall be deemed to be a representation and warranty by the Company to each Underwriter as to the matters covered thereby.

3. PURCHASE, SALE AND DELIVERY OF OFFERED SECURITIES. On the basis of the representations, warranties and agreements herein contained, but subject to the terms and conditions herein set forth, the Company agrees to sell to the Underwriters, and the Underwriters agree, severally and not jointly, to purchase from the Company the respective numbers of Firm Securities set forth opposite the names of the Underwriters in Schedule A hereto.

(a) The Firm Securities; First Closing Date. The purchase price to be paid by the several Underwriters to the Company for the Firm Securities shall be \$1.0246 per share of Common Stock and \$0.0094 per accompanying Class C Warrant (or, for Pre-Funded Warrants in lieu of Firm Shares, \$1.0236 per Pre-Funded Warrant and \$0.0094 per accompanying Class C Warrant) (the "**Purchase Price**"). The Company will deliver (a) the Firm Shares and accompanying Class C Warrants to the Representatives for the respective accounts of the several Underwriters, through the facilities of The Depository Trust Company (unless the Representatives have instructed the Company in writing that all or a portion of the Class C Warrants shall be issued in physical form in accordance with subclause (b) herein) and (b) the Pre-Funded Warrants to the Representatives for the respective accounts of the several Underwriters, in each such case, issued in such names and in such denominations as the Representatives may direct by notice in writing to the Company given at or prior to 12:00 Noon, New York time, on the second (2<sup>nd</sup>) full business day preceding the First Closing Date against payment of the aggregate Purchase Price therefor by wire transfer in federal (same day) funds to an account at a bank specified by the Company payable to the order of the Company for the Firm Securities sold by them all at the offices of Piper Sandler & Co., 800 Nicollet Mall, Minneapolis, Minnesota 55402. The time and date of the delivery and closing shall be at 10:00 A.M., New York time, on December 9, 2022, in accordance with Rule 15c6-1 of the Exchange Act. The time and date of such payment and delivery are herein referred to as the "**First Closing Date**". The First Closing Date and the location of delivery of, and the form of payment for, the Firm Securities may be varied by agreement among the Company and the Representatives. Notwithstanding anything to the contrary in this Section 2, the Company and the Representatives shall instruct purchasers of the Pre-Funded Warrants to make payment of the Pre-Funded Warrant Purchase Price at the First Closing Date to the Company by wire transfer in immediately available funds to the account specified by the Company in lieu of payment by the Representatives for such Pre-Funded Warrants, and the Company shall deliver such Pre-Funded Warrants to such purchasers at the Closing Date in definitive form against such payment, in lieu of the Company's obligation to deliver such Pre-Funded Warrants to the Representatives; provided that the Representatives shall withhold \$0.06534 per Pre-Funded Warrant with respect to such Pre-Funded Warrants as an offset against the payment owed by the Representatives to the Company with respect to the Firm Securities Shares hereunder.

(b) The Optional Securities; Option Closing Date. In addition, on the basis of the representations, warranties and agreements herein contained, and upon the terms but subject to the conditions herein set forth, the Company hereby grants an option to the several Underwriters, severally and not jointly, to purchase up to an aggregate of 8,865,000 shares of Common Stock from the Company at 1.0246 per share of Common Stock and/or up to an aggregate of 4,432,500 Optional Class C Warrants from the Company at \$0.0094 per Optional Class C Warrant. The option granted hereunder may be exercised at any time and from time to time in whole or in part upon notice by the Representatives to the Company, which notice may be given at any time within 30 days from the date of this Agreement. Such notice shall set forth (i) the aggregate number of Optional Shares and/or Optional Class C Warrants as to which the Underwriters are exercising the option and (ii) the time, date and place at which certificates for such Optional Securities will be delivered (which time and date may be simultaneous with, but not earlier than, the First Closing Date; and in the event that such time and date are simultaneous with the First Closing Date, the term "**First Closing Date**" shall refer to the time and date of delivery of certificates for the Firm Securities and such Optional Securities). Any such time and date of delivery, if subsequent to the First Closing Date, is called an "**Option Closing Date**," shall be determined by the Representatives and shall not be earlier than three or later than five

full business days after delivery of such notice of exercise. The number of Optional Shares and/or Optional Class C Warrants to be purchased by each Underwriter shall be the same percentage of the total number of Optional Shares and/or Optional Class C Warrants to be purchased by the Underwriters as the number of Firm Shares and/or Firm Class C Warrants to be purchased by such Underwriter is of the total number of Firm Shares and/or Firm Class C Warrants to be purchased by the Underwriters, as adjusted by the Representatives in such manner as the Representatives deems advisable to avoid fractional shares.

In the event that the Firm Securities (and Optional Securities, if elected by the Representatives) are not delivered to the Representatives by 2:30 p.m., New York City time, on the First Closing Date (and the Option Closing Date, if elected by the Representatives), the Company will return payment of the full purchase price to the Representatives' agent, Pershing LLC, via same day funds by 4:30 p.m., New York City time. The Company shall remain liable to Pershing LLC for the full amount of the purchase price and any costs associated with recovering the purchase price until the full amount has been received by Pershing LLC.

The several Underwriters propose to offer the Securities for sale upon the terms and conditions set forth in the Prospectus.

4. *Further Agreements Of The Company*

(i) *Further Agreements Of The Company.* The Company agrees with the several Underwriters:

(a) Required Filings; Amendments or Supplements; Notice to the Representative. To prepare the Rule 462(b) Registration Statement, if necessary, in a form approved by the Representatives and file such Rule 462(b) Registration Statement with the Commission by 10:00 P.M., New York time, on the date hereof, and the Company shall at the time of filing either pay to the Commission the filing fee for the Rule 462(b) Registration Statement or give irrevocable instructions for the payment of such fee pursuant to Rule 111(b) under the Rules and Regulations; to prepare the Prospectus in a form approved by the Representatives containing information previously omitted at the time of effectiveness of the Registration Statement in reliance on Rule 430A, Rule 430B and Rule 430C of the Rules and Regulations and to file such Prospectus pursuant to Rule 424(b) of the Rules and Regulations not later than the second (2<sup>nd</sup>) business day following the execution and delivery of this Agreement or, if applicable, such earlier time as may be required by the Securities Act; to notify the Representatives immediately of the Company's intention to file or prepare any supplement or amendment to the Registration Statement or to the Prospectus and to make no amendment or supplement to the Registration Statement, the General Disclosure Package or to the Prospectus to which the Representatives shall reasonably object by notice to the Company after a reasonable period to review; to advise the Representatives, promptly after it receives notice thereof, of the time when any amendment to the Registration Statement has been filed or becomes effective or any supplement to the General Disclosure Package or the Prospectus or any amended Prospectus or any Issuer Free Writing Prospectus has been filed and to furnish the Underwriters with copies thereof; to file promptly all material required to be filed by the Company with the Commission pursuant to Rules 433(d) or 163(b)(2) of the Rules and Regulations, as the case may be; to file promptly all reports and any definitive proxy or information statements required to be filed by the Company with the Commission pursuant to Section 13(a), 13(c), 14 or 15(d) of the Exchange Act subsequent to the date of the Prospectus and for so long as the delivery of a prospectus (or in lieu thereof, the notice referred to in Rule 173(a) of the Rules and Regulations) is required in connection with the offering or sale of the Securities; to advise the Representatives, promptly after it receives notice thereof, of the issuance by the Commission of any stop order or of any order preventing or suspending the use of any Preliminary Prospectus, any Issuer Free Writing Prospectus or the Prospectus, of the suspension of the qualification of the Securities for offering or sale in any jurisdiction, of the initiation or threatening of any proceeding for any such purpose, or of any request by the Commission for the amending or supplementing of the Registration Statement, the General Disclosure Package or the Prospectus or for additional information; and, in the event of the issuance of any stop order or of any order preventing or suspending the use of any Preliminary Prospectus, any Issuer Free Writing Prospectus or the Prospectus or suspending any such qualification, and promptly to use its best efforts to obtain the withdrawal of such order.

(b) Emerging Growth Company. The Company will promptly notify the Representatives if the Company ceases to be an Emerging Growth Company at any time prior to the earlier of (i) December 31, 2022 and (ii) the completion of the distribution of the Securities within the meaning of the Securities Act.

(c) Permitted Free Writing Prospectus. The Company represents and agrees that, unless it obtains the prior consent of the Representative, and each Underwriter represents and agrees that, unless it obtains the prior consent of the Company and the Representatives, it has not made and will not make any offer relating to the Securities that would constitute a “free writing prospectus” as defined in Rule 405 of the Rules and Regulations (each, a “**Permitted Free Writing Prospectus**”); *provided* that the prior written consent of the Representatives hereto shall be deemed to have been given in respect of the Issuer Free Writing Prospectuses included in Schedule B hereto. The Company represents that it has treated and agrees that it will treat each Permitted Free Writing Prospectus as an Issuer Free Writing Prospectus, comply with the requirements of Rules 164 and 433 of the Rules and Regulations applicable to any Issuer Free Writing Prospectus, including the requirements relating to timely filing with the Commission, legending and record keeping and will not take any action that would result in an Underwriter or the Company being required to file with the Commission pursuant to Rule 433(d) of the Rules and Regulations a free writing prospectus prepared by or on behalf of such Underwriter that such Underwriter otherwise would not have been required to file thereunder.

(d) Ongoing Compliance. If at any time prior to the date when a prospectus relating to the Securities is required to be delivered (or in lieu thereof, the notice referred to in Rule 173(a) under the Securities Act) any event occurs or condition exists as a result of which the Prospectus as then amended or supplemented would include any untrue statement of a material fact, or omit to state any material fact necessary to make the statements therein, in light of the circumstances under which they were made when the Prospectus is delivered (or in lieu thereof, the notice referred to in Rule 173(a) of the Rules and Regulations), not misleading, or if it is necessary at any time to amend or supplement the Registration Statement or the Prospectus or to file under the Exchange Act any document incorporated by reference in the Prospectus to comply with the Securities Act or the Exchange Act, that the Company will promptly notify the Representatives thereof and upon their request will prepare an appropriate amendment or supplement or upon their request make an appropriate filing pursuant to Section 13 or 14 of the Exchange Act in form and substance satisfactory to the Representatives which will correct such statement or omission or effect such compliance and will use its reasonable best efforts to have any amendment to the Registration Statement declared effective as soon as possible. The Company will furnish without charge to each Underwriter and to any dealer in securities as many copies as the Representatives may from time to time reasonably request of such amendment or supplement. In case any Underwriter is required to deliver a prospectus (or in lieu thereof, the notice referred to in Rule 173(a) of the Rules and Regulations) relating to the Securities, the Company upon the request of the Representatives will prepare promptly an amended or supplemented Prospectus as may be necessary to permit compliance with the requirements of Section 10(a)(3) of the Securities Act and deliver to such Underwriter as many copies as such Underwriter may request of such amended or supplemented Prospectus complying with Section 10(a)(3) of the Securities Act.

(e) Amendment to General Disclosure Package. If the General Disclosure Package is being used to solicit offers to buy the Securities at a time when the Prospectus is not yet available to prospective purchasers and any event shall occur as a result of which, in the judgment of the Company or in the reasonable opinion of the Underwriters, it becomes necessary to amend or supplement the General Disclosure Package in order to make the statements therein, in the light of the circumstances then prevailing, not misleading, or to make the statements therein not conflict with the information contained or incorporated by reference in the Registration Statement then on file and not superseded or modified, or if it is necessary at any time to amend or supplement the General Disclosure Package to comply with any law, the Company promptly will either (i) prepare, file with the Commission (if required) and furnish to the Underwriters and any dealers an appropriate amendment or supplement to the General Disclosure Package or (ii) prepare and file with the Commission an appropriate filing under the Exchange Act which shall be incorporated by reference in the General Disclosure Package so that the General Disclosure Package as so amended or supplemented will not, in the light of the circumstances then prevailing, be misleading or conflict with the Registration Statement then on file, or so that the General Disclosure Package will comply with law.

(f) Amendment to Issuer Free Writing Prospectus. If at any time following issuance of an Issuer Free Writing Prospectus there occurred or occurs an event or development as a result of which such Issuer Free Writing Prospectus conflicted or will conflict with the information contained in the Registration Statement, Pricing Prospectus or Prospectus, including any document

incorporated by reference therein and any prospectus supplement deemed to be a part thereof and not superseded or modified or included or would include an untrue statement of a material fact or omitted or would omit to state a material fact required to be stated therein or necessary in order to make the statements therein, in the light of the circumstances prevailing at the subsequent time, not misleading, the Company has promptly notified or will promptly notify the Representatives so that any use of the Issuer Free Writing Prospectus may cease until it is amended or supplemented and has promptly amended or will promptly amend or supplement, at its own expense, such Issuer Free Writing Prospectus to eliminate or correct such conflict, untrue statement or omission. The foregoing sentence does not apply to statements in or omissions from any Issuer Free Writing Prospectus in reliance upon, and in conformity with, written information furnished to the Company through the Representatives by or on behalf of any Underwriter specifically for inclusion therein, which information the parties hereto agree is limited to the Underwriters' Information.

(g) Delivery of Registration Statement. To the extent not available on the Commission's Electronic Data Gathering, Analysis and Retrieval system or any successor system ("**EDGAR**"), upon the request of the Representatives, to furnish promptly to the Representatives and to counsel for the Underwriters a signed copy of the Registration Statement as originally filed with the Commission, and of each amendment thereto filed with the Commission, including all consents and exhibits filed therewith.

(h) Delivery of Copies. Upon request of the Representatives, to the extent not available on EDGAR, to deliver promptly to the Representatives in New York City such number of the following documents as the Representatives shall reasonably request: (i) conformed copies of the Registration Statement as originally filed with the Commission (in each case excluding exhibits), (ii) each Preliminary Prospectus, (iii) any Issuer Free Writing Prospectus, (iv) the Prospectus (the delivery of the documents referred to in clauses (i), (ii), (iii) and (iv) of this paragraph (h) to be made not later than 10:00 A.M., New York time, on the business day following the execution and delivery of this Agreement), (v) conformed copies of any amendment to the Registration Statement (excluding exhibits), (vi) any amendment or supplement to the General Disclosure Package or the Prospectus (the delivery of the documents referred to in clauses (v) and (vi) of this paragraph (h) to be made not later than 10:00 A.M., New York City time, on the business day following the date of such amendment or supplement) and (vii) any document incorporated by reference in the General Disclosure Package or the Prospectus (excluding exhibits thereto) (the delivery of the documents referred to in clause (vi) of this paragraph (h) to be made not later than 10:00 A.M., New York City time, on the business day following the date of such document).

(i) Earnings Statement. To make generally available to its stockholders as soon as practicable, but in any event not later than sixteen (16) months after the effective date of the Registration Statement (as defined in Rule 158(c) of the Rules and Regulations), an earnings statement of the Company and its subsidiaries (which need not be audited) complying with Section 11(a) of the Securities Act (including, at the option of the Company, Rule 158).

(j) Blue Sky Compliance. To take promptly from time to time such actions as the Representatives may reasonably request to qualify the Securities for offering and sale under the securities or Blue Sky laws of such jurisdictions (domestic or foreign) as the Representatives may reasonably designate and to continue such qualifications in effect, and to comply with such laws, for so long as required to permit the offer and sale of Securities in such jurisdictions; *provided* that the Company and its subsidiaries shall not be obligated to (i) qualify as foreign corporations in any jurisdiction in which they are not so qualified, (ii) file a general consent to service of process in any jurisdiction or (iii) subject itself to taxation in any such jurisdiction if it is not otherwise so subject.

(k) Reports. Upon request, during the period of five (5) years from the date hereof, to deliver to each of the Underwriters, (i) as soon as they are available, copies of all reports or other communications (financial or other) furnished to stockholders, and (ii) as soon as they are available, copies of any reports and financial statements furnished or filed with the Commission or any national securities exchange on which the Common Stock is listed. However, so long as the Company is subject to the reporting requirements of either Section 13 or Section 15(d) of the Exchange Act and is timely filing reports with the Commission on EDGAR, it is not required to furnish such reports or statements to the Underwriters.

(l) **Lock-Up.** During the period commencing on and including the date hereof and ending on and including the ninetieth (90th) day following the date of this Agreement (the “**Lock-Up Period**”), the Company will not, without the prior written consent of Piper and Stifel (which consent may be withheld at the sole discretion of the Representatives), directly or indirectly offer, sell (including, without limitation, any short sale), assign, transfer, pledge, contract to sell, establish an open “put equivalent position” within the meaning of Rule 16a-1(h) under the Exchange Act, or otherwise dispose of, or announce the offering of, or file any registration statement under the Securities Act in respect of, any Common Stock, options, rights or warrants to acquire Common Stock or securities exchangeable or exercisable for or convertible into Common Stock (other than is contemplated by this Agreement with respect to the Securities) or publicly announce any intention to do any of the foregoing; *provided, however*, that the Company may (i) issue Common Stock and options to purchase Common Stock, shares of Common Stock underlying options granted and other securities, each pursuant to any director or employee stock incentive plan, stock ownership plan or dividend reinvestment plan of the Company in effect on the date hereof and described in the General Disclosure Package; (ii) issue Common Stock pursuant to the conversion of securities or the exercise of warrants, which securities or warrants are outstanding on the date hereof and described in the General Disclosure Package, as well as Warrant Shares issuable upon exercise of the Warrants; (iii) adopt a new equity incentive plan, amend any existing equity incentive plan (including without limitation, to increase the number of shares reserved for issuance thereunder) and file a registration statement on Form S-8 under the Securities Act to register the offer and sale of securities to be issued pursuant to such new equity incentive plan or amended equity incentive plan, and issue securities pursuant to such new equity incentive plan or amended equity incentive plan (including, without limitation, the issuance of shares of Common Stock upon the exercise of options or other securities issued pursuant to such new equity incentive plan or amended equity incentive plan), provided that (1) such new equity incentive plan or amended equity incentive plan satisfies the transaction requirements of General Instruction A.1 of Form S-8 under the Securities Act and (2) this clause (iii) shall not be available unless each recipient of shares of Common Stock, or securities exchangeable or exercisable for or convertible into Common Stock, (A) pursuant to such new equity incentive plan or (B) representing the additional shares reserved for issuance under such existing equity incentive plan pursuant to such amendment to such existing equity incentive plan, shall be contractually prohibited from selling, offering, disposing of or otherwise transferring any such shares or securities during the remainder of the Lock-Up Period; and (iv) enter into an agreement providing for the issuance of Common Stock or securities convertible into or exercisable for shares of Common Stock in connection with any acquisition, joint venture, collaboration, licensing, commercial relationship or other strategic transaction or any debt financing transaction, and the issuance of any such securities pursuant to any such agreement, provided that the aggregate number of shares of Common Stock, or any securities convertible into or exercisable or exchangeable for Common Stock, that the Company may issue or agree to issue pursuant to this clause (iv) shall not exceed 5% of the total outstanding shares of Common Stock immediately following the issuance of the Securities pursuant hereto. The Company will cause all executive officers and directors of the Company to furnish to the Representatives, prior to the First Closing Date, the “lock-up” agreement substantially in the form of Exhibit I hereto. In addition, the Company will direct the transfer agent to place stop transfer restrictions upon any such securities of the Company that are bound by such “lock-up” agreements.

(m) **Delivery of SEC Correspondence.** To supply the Underwriters with copies of all correspondence to and from, and all documents issued to and by, the Commission in connection with the registration of the Securities under the Securities Act or any of the Registration Statement, any Preliminary Prospectus or the Prospectus, or any amendment or supplement thereto or document incorporated by reference therein.

(n) **Press Releases.** Prior to the First Closing Date, not to issue any press release or other communication directly or indirectly or hold any press conference with respect to the Company, its condition, financial or otherwise, or earnings, business affairs or business prospects (except for routine oral marketing communications in the ordinary course of business and consistent with the past practices of the Company and of which the Representatives are notified), without the prior consent of the Representatives, unless in the judgment of the Company and its counsel, and after notification to the Representatives, such press release or communication is required by law.



(o) Compliance with Regulation M. Until the Underwriters shall have notified the Company of the completion of the resale of the Securities, that the Company will not, and will use its reasonable best efforts to cause its affiliated purchasers (as defined in Regulation M under the Exchange Act) not to, either alone or with one or more other persons, bid for or purchase, for any account in which it or any of its affiliated purchasers has a beneficial interest, any shares of Common Stock, or attempt to induce any person to purchase any shares of Common Stock; and not to, and to use its reasonable best efforts to cause its affiliated purchasers not to, make bids or purchase for the purpose of creating actual, or apparent, active trading in or of raising the price of the Securities or Warrant Shares.

(p) Registrar, Transfer Agent and Warrant Agent. To maintain, at its expense, a registrar and transfer agent for the Shares and a warrant agent for the Warrants.

(q) Use of Proceeds. To apply the net proceeds from the sale of the Securities as set forth in the Registration Statement, the General Disclosure Package and the Prospectus under the heading "Use of Proceeds," and except as disclosed in the General Disclosure Package, the Company does not intend to use any of the proceeds from the sale of the Securities hereunder to repay any outstanding debt owed to any affiliate of any Underwriter.

(r) Exchange Listing. To use its reasonable best efforts to list for quotation the Shares and Warrant Shares on the Exchange.

(s) Performance of Covenants and Satisfaction of Conditions. To use its reasonable best efforts to do and perform all things required to be done or performed under this Agreement by the Company prior to the First Closing Date and each applicable Option Closing Date and to satisfy all conditions precedent to the delivery of the Securities.

(t) License to use Marks. Upon request of any Underwriter, to furnish, or cause to be furnished, to such Underwriter an electronic version of the Company's trademarks, service marks and corporate logo for use on the website, if any, operated by such Underwriter for the purpose of facilitating the on-line offering of the Securities (the "*License*"); provided, however, that the License shall be used solely for the purpose described above, is granted without any fee and may not be assigned or transferred.

(u) Share Reserve. The Company will reserve and keep available at all times a sufficient number of shares of Common Stock for the purpose of enabling the Company to issue the Warrant Shares.

(v) Registration Statement for Warrants. The Company will, at all times while any Warrants are outstanding, use its commercially reasonable efforts to maintain a registration statement covering the issue and sale of the Warrant Shares upon exercise of the Warrants such that the Warrant Shares, when issued, will not be subject to resale and restrictions under the Securities Act except to the extent that the Warrant Shares are owned by affiliates.

5. PAYMENT OF EXPENSES. The Company agrees to pay, or reimburse if paid by any Underwriter, whether or not the transactions contemplated hereby are consummated or this Agreement is terminated: (a) the costs incident to the authorization, issuance, sale, preparation and delivery of the Securities and any taxes payable in that connection; (b) the costs incident to the registration of the Securities under the Securities Act; (c) the costs incident to the preparation, printing and distribution of the Registration Statement, the Base Prospectus, any Preliminary Prospectus, any Issuer Free Writing Prospectus, the General Disclosure Package, the Prospectus, any amendments, supplements and exhibits thereto or any document incorporated by reference therein and the costs of printing, reproducing and distributing this Agreement and the Warrant Agreement and any closing documents by mail, telex or other means of communications; (d) the fees and expenses (including related fees and expenses of counsel for the Underwriters) incurred in connection with securing any required review by FINRA of the terms of the sale of the Securities and any filings made with FINRA, in an amount together with the amounts paid under clause (f) of this Section 5, not to exceed \$15,000; (e) any applicable listing or other fees; (f) the fees and expenses (including related fees and expenses of counsel to the Underwriters) of qualifying the Securities under the securities laws of the several jurisdictions as provided in Section 4(i)(j) and of preparing, printing and distributing wrappers, Blue Sky Memoranda and Legal Investment Surveys; (g) the cost of preparing and printing stock certificates; (h) all fees and expenses of the registrar, transfer agent and Warrant Agent of the Shares and Class C Warrants, as applicable; (i) the expenses of the Company relating to investor presentations on any "road show" undertaken in connection with the

marketing of the offering of the Securities, including, without limitation, expenses associated with the preparation or dissemination of any electronic road show, expenses associated with the production of road show slides and graphics, fees and expenses of any consultants engaged in connection with the road show presentations with the prior approval of the Company, travel and lodging expenses of the officers of the Company and such consultants, including the cost of any aircraft chartered in connection with the road show, and (k) all other costs and expenses incurred by the Company incident to the offering of the Securities or the performance of the obligations of the Company under this Agreement (including, without limitation, the fees and expenses of the Company's counsel and the Company's independent accountants); *provided* that, except to the extent otherwise provided in this Section 5 and in Sections 9 and 10, the Underwriters shall pay their own costs and expenses, including the fees and expenses of their counsel not contemplated herein, any transfer taxes on the resale of any Securities by them and the expenses of advertising any offering of the Securities made by the Underwriters.

6. *Conditions of Underwriters' Obligations.* The respective obligations of the several Underwriters hereunder are subject to the accuracy, when made and as of the Applicable Time and on the First Closing Date and each applicable Option Closing Date, of the representations and warranties of the Company contained herein, to the accuracy of the statements of the Company made in any certificates pursuant to the provisions hereof, to the performance by the Company of its obligations hereunder, and to each of the following additional terms and conditions:

(a) Registration Compliance; No Stop Orders. The Registration Statement has become effective under the Securities Act, and no stop order suspending the effectiveness of the Registration Statement or any part thereof, preventing or suspending the use of any Base Prospectus, any Preliminary Prospectus, the Prospectus or any Permitted Free Writing Prospectus or any part thereof shall have been issued and no proceedings for that purpose or pursuant to Section 8A under the Securities Act shall have been initiated or threatened by the Commission, and all requests for additional information on the part of the Commission (to be included or incorporated by reference in the Registration Statement or the Prospectus or otherwise) shall have been complied with to the reasonable satisfaction of the Representatives; the Rule 462(b) Registration Statement, if any, each Issuer Free Writing Prospectus and the Prospectus shall have been filed with the Commission within the applicable time period prescribed for such filing by, and in compliance with, the Rules and Regulations and in accordance with Section 4(i)(a), and the Rule 462(b) Registration Statement, if any, shall have become effective immediately upon its filing with the Commission; and FINRA shall have raised no unresolved objection to the fairness and reasonableness of the terms of this Agreement or the transactions contemplated hereby.

(b) No Material Misstatements. None of the Underwriters shall have discovered and disclosed to the Company on or prior to the First Closing Date and each applicable Option Closing Date that the Registration Statement or any amendment or supplement thereto contains an untrue statement of a fact which, in the opinion of counsel for the Underwriters, is material or omits to state any fact which, in the opinion of such counsel, is material and is required to be stated therein or is necessary to make the statements therein not misleading, or that the General Disclosure Package, any Issuer Free Writing Prospectus or the Prospectus or any amendment or supplement thereto contains an untrue statement of fact which, in the opinion of such counsel, is material or omits to state any fact which, in the opinion of such counsel, is material and is necessary in order to make the statements, in the light of the circumstances in which they were made, not misleading.

(c) Corporate Proceedings. All corporate proceedings incident to the authorization, form and validity of each of this Agreement, the Securities, the Registration Statement, the General Disclosure Package, each Issuer Free Writing Prospectus and the Prospectus and the transactions contemplated hereby shall be reasonably satisfactory in all material respects to counsel for the Underwriters, and the Company shall have furnished to such counsel all documents and information that they may reasonably request to enable them to pass upon such matters.

(d) Opinion and 10b-5 Statement of Counsel for the Company. On each of the First Closing Date and at each applicable Option Closing Date, Cooley LLP shall have furnished to the Representatives such counsel's written opinion and 10b-5 Statement, as counsel to the Company, addressed to the Underwriters and dated such date, in form and substance reasonably satisfactory to the Representatives.

(e) Opinion of Intellectual Property Counsel for the Company. On each of the First Closing Date and at each applicable Option Closing Date, Dechert LLP shall have furnished to the Representatives such counsel's written opinion, as intellectual property counsel to the Company,

addressed to the Underwriters and dated such date, in form and substance reasonably satisfactory to the Representatives.

(f) Opinion and 10b-5 Statement of Counsel for the Underwriters. On each of the First Closing Date and at each applicable Option Closing Date, the Representatives shall have received from Goodwin Procter LLP, counsel for the Underwriters, such opinion or opinions and 10b-5 Statement, dated such date, with respect to such matters as the Underwriters may reasonably require, and the Company shall have furnished to such counsel such documents as they request for enabling them to pass upon such matters.

(g) Comfort Letters. At the time of the execution of this Agreement, the Representatives shall have received from PricewaterhouseCoopers LLP, which serves as the independent registered public accounting firm for the Company, a letter addressed to the Underwriters, executed and dated such date, in form and substance reasonably satisfactory to the Representatives (i) confirming that they are an independent registered accounting firm with respect to the Company and its subsidiaries within the meaning of the Securities Act and the Rules and Regulations and PCAOB and (ii) stating the conclusions and findings of such firm, of the type ordinarily included in accountants' "comfort letters" to underwriters, with respect to the financial statements and certain financial information contained or incorporated by reference in the Registration Statement, the General Disclosure Package and the Prospectus.

(h) Bring Down Comfort. On the effective date of any post-effective amendment to the Registration Statement and on the First Closing Date and at each applicable Option Closing Date, the Representatives shall have received a letter (a "*bring-down letter*") from PricewaterhouseCoopers LLP addressed to the Representatives and dated such date confirming, as of the date of such bring-down letter (or, with respect to matters involving changes or developments since the respective dates as of which specified financial information is given in the General Disclosure Package and the Prospectus, as the case may be, as of a date not more than three (3) business days prior to the date of such bring-down letter), the conclusions and findings of such firm, of the type ordinarily included in accountants' "comfort letters" to underwriters, with respect to the financial information and other matters covered by such letter delivered to the Representatives concurrently with the execution of this Agreement pursuant to paragraph (g) of this Section 6.

(i) Officer's Certificate. The Company shall have furnished to the Representatives a certificate, dated the First Closing Date and applicable Option Closing Date, of its Chairman of the Board or President and its Chief Financial Officer stating in their respective capacities as officers of the Company on behalf of the Company that (i) no stop order suspending the effectiveness of the Registration Statement (including, for avoidance of doubt, any Rule 462(b) Registration Statement), or any post-effective amendment thereto, shall be in effect and no proceedings for such purpose shall have been instituted or, to their knowledge, threatened by the Commission, (ii) for the period from and including the date of this Agreement through and including the such closing date, there has not occurred any Material Adverse Effect, (iii) to their knowledge, after reasonable investigation, as of such date, the representations and warranties of the Company in this Agreement are true and correct and the Company has complied with all agreements and satisfied all conditions on its part to be performed or satisfied hereunder at or prior to such closing date, and (iv) there has not been, subsequent to the date of the most recent audited financial statements included or incorporated by reference in the General Disclosure Package, any Material Adverse Effect in the financial position or results of operations of the Company and its subsidiaries taken as a whole, or any change or development that, singularly or in the aggregate, would reasonably be expected to involve a Material Adverse Effect, except as set forth in the General Disclosure Package and the Prospectus.

(j) No Material Adverse Effect. Since the date of the latest audited financial statements included in the General Disclosure Package or incorporated by reference in the General Disclosure Package as the date of the First Closing Date and each applicable Option Closing Date, (i) neither the Company nor any of its subsidiaries shall have sustained any loss or interference with its business from fire, explosion, flood or other calamity, whether or not covered by insurance, or from any labor dispute or court or governmental action, order or decree, otherwise than as set forth in the General Disclosure Package, and (ii) there shall not have been any change in the capital stock (other than upon the exercise of any stock option outstanding as of the date hereof, the grant of any stock option or other stock award under existing equity plans or the exercise of

any warrants outstanding as of the date hereof, in each case, as set forth in the General Disclosure Package) or increase in the long-term debt of the Company or any of its subsidiaries, or any change, or any development involving a prospective change, in or affecting the business, general affairs, management, financial position, stockholders' equity or results of operations of the Company and its subsidiaries, otherwise than as set forth in the General Disclosure Package, the effect of which, in any such case described in clause (i) or (ii) of this paragraph (j), is, in the judgment of the Representatives, so material and adverse as to make it impracticable or inadvisable to proceed with the sale or delivery of the Securities on the terms and in the manner contemplated in the General Disclosure Package.

(k) No Legal Impediment to Issuance. No action shall have been taken and no law, statute, rule, regulation or order shall have been enacted, adopted or issued by any governmental or regulatory agency or body which would prevent the issuance or sale of the Securities; and no injunction, restraining order or order of any other nature by any federal or state court of competent jurisdiction shall have been issued which would prevent the issuance or sale of the Securities or materially and adversely affect or potentially materially and adversely affect the business or operations of the Company.

(l) No Downgrade. Subsequent to the execution and delivery of this Agreement (i) no downgrading shall have occurred in the Company's corporate credit rating or the rating accorded the Company's debt securities by any "nationally recognized statistical rating organization," as that term is defined by the Commission for purposes of Rule 436(g)(2) of the Rules and Regulations and (ii) no such organization shall have publicly announced that it has under surveillance or review (other than an announcement with positive implications of a possible upgrading), the Company's corporate credit rating or the rating of any of the Company's debt securities.

(m) Market Conditions. Subsequent to the execution and delivery of this Agreement there shall not have occurred any of the following: (i) trading in any of the Company's securities shall have been suspended or materially limited by the Commission or the Exchange, or trading in securities generally on the New York Stock Exchange, Nasdaq Global Select Market, Nasdaq Global Market, Nasdaq Capital Market or the NYSE MKT LLC or in the over-the-counter market, or trading in any securities of the Company on any exchange or in the over-the-counter market, shall have been suspended or materially limited, or minimum or maximum prices or maximum range for prices shall have been established on any such exchange or such market by the Commission, by such exchange or market or by any other regulatory body or governmental authority having jurisdiction, (ii) a banking moratorium shall have been declared by Federal or state authorities or a material disruption has occurred in commercial banking or securities settlement or clearance services in the United States, (iii) the United States shall have become engaged in hostilities, or the subject of an act of terrorism, or there shall have been an outbreak of or escalation in hostilities involving the United States, or there shall have been a declaration of a national emergency or war by the United States or (iv) there shall have occurred such a material adverse change in general economic, political or financial conditions (or the effect of international conditions on the financial markets in the United States shall be such) as to make it, in the judgment of the Representatives, impracticable or inadvisable to proceed with the sale or delivery of the Securities on the terms and in the manner contemplated in the General Disclosure Package and the Prospectus.

(n) Exchange Listing. The Company shall have filed a Listing of Additional Shares Notification form with the Exchange for the Shares and Warrant Shares and shall have received no objection thereto from the Exchange.

(o) Good Standing. The Representatives shall have received on and as of the First Closing Date and each applicable Option Closing Date, satisfactory evidence of the good standing of the Company and its subsidiaries in their respective jurisdictions of organization and their good standing as foreign entities in such other jurisdictions as the Representatives may reasonably request, in each case in writing or any standard form of telecommunication from the appropriate Governmental Authorities of such jurisdictions.

(p) Lock-Up Agreements. The Representatives shall have received the written agreements, substantially in the form of Exhibit I hereto, of all executive officers and directors of the Company.

(g) Secretary's Certificate. On the First Closing Date and each applicable Option Closing Date, the Company shall have furnished to the Representatives a Secretary's Certificate of the Company, in form and substance reasonably satisfactory to counsel for the Underwriters and customary for the type of offering contemplated by this Agreement.

(r) Warrant Agreement. The Underwriters shall have received copies, duly executed by the Company and the Warrant Agent, of the Warrant Agreement. There shall exist no event or condition which would constitute a default or an event of default under the Warrant Agreement.

(s) Additional Documents. On or prior the First Closing Date and each applicable Option Closing Date, the Company shall have furnished to the Representatives such further certificates and documents as the Representatives may reasonably request.

All opinions, letters, evidence and certificates mentioned above or elsewhere in this Agreement shall be deemed to be in compliance with the provisions hereof only if they are in form and substance reasonably satisfactory to counsel for the Underwriters.

7. *Indemnification and Contribution.*

(a) Indemnification of Underwriters by the Company. The Company shall indemnify and hold harmless:

each Underwriter, its affiliates, directors, officers, managers, members, employees, representatives and agents and each person, if any, who controls any Underwriter within the meaning of Section 15 of the Securities Act or Section 20 of the Exchange Act (collectively the "**Underwriter Indemnified Parties**," and each an "**Underwriter Indemnified Party**") against any loss, claim, damage, expense or liability whatsoever (or any action, investigation or proceeding in respect thereof), joint or several, to which such Underwriter Indemnified Party may become subject, under the Securities Act or otherwise, insofar as such loss, claim, damage, expense, liability, action, investigation or proceeding arises out of or is based upon (A) any untrue statement or alleged untrue statement of a material fact contained in any Preliminary Prospectus, any Issuer Free Writing Prospectus, any "issuer information" filed or required to be filed pursuant to Rule 433(d) of the Rules and Regulations, the Registration Statement, the Prospectus, or in any amendment or supplement thereto or document incorporated by reference therein or in any materials or information provided to investors by, or with the approval of, the Company in connection with the marketing of the offering of the Securities, including any roadshow or investor presentations made to investors by the Company (whether in person or electronically) ("**Marketing Materials**") or (B) the omission or alleged omission to state in any Preliminary Prospectus, any Issuer Free Writing Prospectus, any "issuer information" filed or required to be filed pursuant to Rule 433(d) of the Rules and Regulations, the Registration Statement or the Prospectus, or in any amendment or supplement thereto or document incorporated by reference therein or in any Marketing Materials, a material fact required to be stated therein or necessary to make the statements therein not misleading, and shall reimburse each Underwriter Indemnified Party promptly upon demand for any legal fees or other expenses reasonably incurred by that Underwriter Indemnified Party in connection with investigating, or preparing to defend, or defending against, or appearing as a third party witness in respect of, or otherwise incurred in connection with, any such loss, claim, damage, expense, liability, action, investigation or proceeding, as such fees and expenses are incurred; *provided, however*, that the Company shall not be liable in any such case to the extent that any such loss, claim, damage, expense or liability arises out of or is based upon an untrue statement or alleged untrue statement in, or omission or alleged omission from any Preliminary Prospectus, the Registration Statement or the Prospectus, or any such amendment or supplement thereto, any Issuer Free Writing Prospectus or any Marketing Materials made in reliance upon and in conformity with written information furnished to the Company through the Representatives by or on behalf of any Underwriter specifically for use therein, which information the parties hereto agree is limited to the Underwriters' Information.

The indemnity agreement in this Section 7(a) is not exclusive and is in addition to each other liability which the Company might have under this Agreement or otherwise, and shall not limit

any rights or remedies which may otherwise be available under this Agreement, at law or in equity to any Underwriter Indemnified Party.

(b) Indemnification of Company by the Underwriters. Each Underwriter, severally and not jointly, shall indemnify and hold harmless the Company and its directors, its officers who signed the Registration Statement and each person, if any, who controls the Company within the meaning of Section 15 of the Securities Act or Section 20 of the Exchange Act (collectively the “**Company Indemnified Parties**” and each a “**Company Indemnified Party**”) against any loss, claim, damage, expense or liability whatsoever (or any action, investigation or proceeding in respect thereof), joint or several, to which such Company Indemnified Party may become subject, under the Securities Act or otherwise, insofar as such loss, claim, damage, expense, liability, action, investigation or proceeding arises out of or is based upon (i) any untrue statement or alleged untrue statement of a material fact contained in any Preliminary Prospectus, any Issuer Free Writing Prospectus, any "issuer information" filed or required to be filed pursuant to Rule 433(d) of the Rules and Regulations, the Registration Statement or the Prospectus, or in any amendment or supplement thereto or document incorporated by reference therein, or (ii) the omission or alleged omission to state in any Preliminary Prospectus, any Issuer Free Writing Prospectus, any "issuer information" filed or required to be filed pursuant to Rule 433(d) of the Rules and Regulations, the Registration Statement or the Prospectus, or in any amendment or supplement thereto or document incorporated by reference therein, a material fact required to be stated therein or necessary to make the statements therein not misleading, but in each case only to the extent that the untrue statement or alleged untrue statement or omission or alleged omission was made in reliance upon and in conformity with written information furnished to the Company through the Representatives by or on behalf of that Underwriter specifically for use therein, which information the parties hereto agree is limited to the Underwriters' Information, and shall reimburse the Company Indemnified Parties for any legal or other expenses reasonably incurred by such party in connection with investigating or preparing to defend or defending against or appearing as third party witness in connection with any such loss, claim, damage, liability, action, investigation or proceeding, as such fees and expenses are incurred. This indemnity agreement is not exclusive and will be in addition to any liability which the Underwriters might otherwise have and shall not limit any rights or remedies which may otherwise be available under this Agreement, at law or in equity to the Company Indemnified Parties.

(c) Promptly after receipt by an indemnified party under this Section 7 of notice of the commencement of any action, the indemnified party shall, if a claim in respect thereof is to be made against an indemnifying party under this Section 7, notify such indemnifying party in writing of the commencement of that action; *provided, however*; that the failure to notify the indemnifying party shall not relieve it from any liability which it may have under this Section 7 except to the extent it has been materially prejudiced by such failure; and, *provided, further*; that the failure to notify an indemnifying party shall not relieve it from any liability which it may have to an indemnified party otherwise than under this Section 7. If any such action shall be brought against an indemnified party, and it shall notify the indemnifying party thereof, the indemnifying party shall be entitled to participate therein and, to the extent that it wishes, jointly with any other similarly notified indemnifying party, to assume the defense of such action with counsel reasonably satisfactory to the indemnified party (which counsel shall not, except with the written consent of the indemnified party, be counsel to the indemnifying party). After notice from the indemnifying party to the indemnified party of its election to assume the defense of such action, except as provided herein, the indemnifying party shall not be liable to the indemnified party under Section 7 for any legal or other expenses subsequently incurred by the indemnified party in connection with the defense of such action other than reasonable costs of investigation; *provided, however*; that any indemnified party shall have the right to employ separate counsel in any such action and to participate in the defense of such action but the fees and expenses of such counsel (other than reasonable costs of investigation) shall be at the expense of such indemnified party unless (i) the employment thereof has been specifically authorized in writing by the Company in the case of a claim for indemnification under Section 7(a) or the Representatives in the case of a claim for indemnification under Section 7(b), (ii) such indemnified party shall have been advised by its counsel that there may be one or more legal defenses available to it which are different from or additional to those available to the indemnifying party, or (iii) the indemnifying party has failed to assume the defense of such action and employ counsel reasonably satisfactory to the indemnified party within a reasonable period of time after notice of the commencement of the action or the indemnifying party does not diligently defend the action after assumption of the

defense, in which case, if such indemnified party notifies the indemnifying party in writing that it elects to employ separate counsel at the expense of the indemnifying party, the indemnifying party shall not have the right to assume the defense of (or, in the case of a failure to diligently defend the action after assumption of the defense, to continue to defend) such action on behalf of such indemnified party and the indemnifying party shall be responsible for legal or other expenses subsequently incurred by such indemnified party in connection with the defense of such action; *provided, however*, that the indemnifying party shall not, in connection with any one such action or separate but substantially similar or related actions in the same jurisdiction arising out of the same general allegations or circumstances, be liable for the reasonable fees and expenses of more than one separate firm of attorneys at any time for all such indemnified parties (in addition to any local counsel), which firm shall be designated in writing by the Representatives if the indemnified parties under this Section 7 consist of any Underwriter Indemnified Party or by the Company if the indemnified parties under this Section 7 consist of any Company Indemnified Parties. Subject to this Section 7(c), the amount payable by an indemnifying party under Section 7 shall include, but not be limited to, (x) reasonable legal fees and expenses of counsel to the indemnified party and any other expenses in investigating, or preparing to defend or defending against, or appearing as a third party witness in respect of, or otherwise incurred in connection with, any action, investigation, proceeding or claim, and (y) all amounts paid in settlement of any of the foregoing. No indemnifying party shall, without the prior written consent of the indemnified parties, settle or compromise or consent to the entry of judgment with respect to any pending or threatened action or any claim whatsoever, in respect of which indemnification or contribution could be sought under this Section 7 (whether or not the indemnified parties are actual or potential parties thereto), unless such settlement, compromise or consent (i) includes an unconditional release of each indemnified party in form and substance reasonably satisfactory to such indemnified party from all liability arising out of such action or claim and (ii) does not include a statement as to or an admission of fault, culpability or a failure to act by or on behalf of any indemnified party. Subject to the provisions of the following sentence, no indemnifying party shall be liable for settlement of any pending or threatened action or any claim whatsoever that is effected without its written consent (which consent shall not be unreasonably withheld or delayed), but if settled with its written consent, if its consent has been unreasonably withheld or delayed or if there be a judgment for the plaintiff in any such matter, the indemnifying party agrees to indemnify and hold harmless any indemnified party from and against any loss or liability by reason of such settlement or judgment. In addition, if at any time an indemnified party shall have requested that an indemnifying party reimburse the indemnified party for fees and expenses of counsel, such indemnifying party agrees that it shall be liable for any settlement of the nature contemplated by Sections 7(a) or 7(b) effected without its written consent if (i) such settlement is entered into more than forty-five (45) days after receipt by such indemnifying party of the request for reimbursement, (ii) such indemnifying party shall have received notice of the terms of such settlement at least thirty (30) days prior to such settlement being entered into and (iii) such indemnifying party shall not have reimbursed such indemnified party in accordance with such request prior to the date of such settlement.

(d) If the indemnification provided for in this Section 7 is unavailable or insufficient to hold harmless an indemnified party under Section 7(a) or 7(b), then each indemnifying party shall, in lieu of indemnifying such indemnified party, contribute to the amount paid, payable or otherwise incurred by such indemnified party as a result of such loss, claim, damage, expense or liability (or any action, investigation or proceeding in respect thereof), as incurred, (i) in such proportion as shall be appropriate to reflect the relative benefits received by the Company on the one hand and the Underwriters on the other from the offering of the Securities, or (ii) if the allocation provided by clause (i) of this Section 7(d) is not permitted by applicable law, in such proportion as is appropriate to reflect not only the relative benefits referred to in clause (i) of this Section 7(d) but also the relative fault of the Company on the one hand and the Underwriters on the other with respect to the statements, omissions, acts or failures to act which resulted in such loss, claim, damage, expense or liability (or any action, investigation or proceeding in respect thereof) as well as any other relevant equitable considerations. The relative benefits received by the Company on the one hand and the Underwriters on the other with respect to such offering shall be deemed to be in the same proportion as the total net proceeds from the offering of the Securities purchased under this Agreement (before deducting expenses) received by the Company bear to the total underwriting discounts and commissions received by the Underwriters with respect to the Securities purchased under this Agreement, in each case as set forth in the table on the cover page

of the Prospectus. The relative fault of the Company on the one hand and the Underwriters on the other shall be determined by reference to, among other things, whether the untrue or alleged untrue statement of a material fact or the omission or alleged omission to state a material fact relates to information supplied by the Company on the one hand or the Underwriters on the other, the intent of the parties and their relative knowledge, access to information and opportunity to correct or prevent such untrue statement, omission, act or failure to act; *provided* that the parties hereto agree that the written information furnished to the Company through the Representatives by or on behalf of the Underwriters for use in the Preliminary Prospectus, the Registration Statement or the Prospectus, or in any amendment or supplement thereto, consists solely of the Underwriters' Information.

(e) The Company and the Underwriters agree that it would not be just and equitable if contributions pursuant to Section 7(d) above were to be determined by pro rata allocation or by any other method of allocation which does not take into account the equitable considerations referred to Section 7(d) above. The amount paid or payable by an indemnified party as a result of the loss, claim, damage, expense, liability, action, investigation or proceeding referred to in Section 7(d) above shall be deemed to include, subject to the limitations set forth above, any legal or other expenses reasonably incurred by such indemnified party in connection with investigating, preparing to defend or defending against or appearing as a third party witness in respect of, or otherwise incurred in connection with, any such loss, claim, damage, expense, liability, action, investigation or proceeding. Notwithstanding the provisions of this Section 7, no Underwriters shall be required to contribute any amount in excess of the amount by which the total underwriting discounts and commissions received by such Underwriter with respect to the offering of the Securities exceeds the amount of any damages which the Underwriter has otherwise paid or become liable to pay by reason of any untrue or alleged untrue statement, omission or alleged omission, act or alleged act or failure to act or alleged failure to act. No person guilty of fraudulent misrepresentation (within the meaning of Section 11(f) of the Securities Act) shall be entitled to contribution from any person who was not guilty of such fraudulent misrepresentation. The Underwriters' obligations to contribute as provided in this Section 7 are several in proportion to their respective underwriting obligations and not joint.

8. *Termination.* The obligations of the Underwriters hereunder may be terminated by the Representatives, in their absolute discretion by notice given to the Company prior to delivery of and payment for the Firm Securities if, prior to that time, any of the events described in Sections 6(j), 6(l) or 6(m) have occurred or if the Underwriters shall decline to purchase the Firm Securities for any reason permitted under this Agreement.

9. *Reimbursement of Underwriters' Expenses.* Notwithstanding anything to the contrary in this Agreement, if (a) this Agreement shall have been terminated pursuant to Section 8 or 10, (b) the Company shall fail to tender the Securities for delivery to the Underwriters for any reason not permitted under this Agreement, (c) the Underwriters shall decline to purchase the Securities for any reason permitted under this Agreement or (d) the sale of the Securities is not consummated because any condition to the obligations of the Underwriters set forth herein is not satisfied or because of the refusal, inability or failure on the part of the Company to perform any agreement herein or to satisfy any condition or to comply with the provisions hereof, then in addition to the payment of amounts in accordance with Section 5, the Company shall, pro rata based on the number of Securities it agreed to sell hereunder, reimburse the Underwriters for the reasonable fees and expenses of Underwriters' counsel and for such other reasonable out-of-pocket expenses as shall have been reasonably incurred by them in connection with this Agreement and the proposed purchase of the Securities, including, without limitation, reasonable travel and lodging expenses of the Underwriters, and upon demand the Company shall pay the full amount thereof to the Representatives; *provided* that if this Agreement is terminated pursuant to Section 10 by reason of the default of one or more Underwriters, the Company shall not be obligated to reimburse any defaulting Underwriter on account of expenses to the extent incurred by such defaulting Underwriter; *provided further* that the foregoing shall not limit any reimbursement obligation of the Company to any non-defaulting Underwriter under this Section 9.

10. *Substitution of Underwriters.* If any Underwriter or Underwriters shall default in its or their obligations to purchase Securities hereunder on the First Closing Date or any applicable Option Closing Date, and the aggregate number of Firm Securities, or Optional Securities, as applicable, which such defaulting Underwriter or Underwriters agreed but failed to purchase does not exceed ten percent (10%) of the total number of Firm Securities or Optional Securities to be purchased by all Underwriters on such closing date, the other Underwriters shall be obligated severally, in proportion to their respective



commitments hereunder, to purchase the Firm Securities or Optional Securities which such defaulting Underwriter or Underwriters agreed but failed to purchase on the such closing date. If any Underwriter or Underwriters shall so default and the aggregate number of Firm Securities or Optional Securities, as applicable, with respect to which such default or defaults occur is more than ten percent (10%) of the total number of such Firm Securities or Optional Securities, as applicable, to be purchased by all Underwriters on the First Closing Date or any applicable Option Closing Date, and arrangements satisfactory to the Representatives and the Company for the purchase of such Firm Securities or Optional Securities, as applicable, by other persons are not made within forty-eight (48) hours after such default, this Agreement shall terminate.

If the remaining Underwriters or substituted Underwriters are required hereby or agree to take up all or part of the Firm Securities or Option Securities of a defaulting Underwriter or Underwriters on the First Closing Date or any applicable Option Closing Date, as applicable, as provided in this Section 10, (i) the Company shall have the right to postpone such closing date for a period of not more than five (5) full business days in order that the Company may effect whatever changes may thereby be made necessary in the Registration Statement or the Prospectus, or in any other documents or arrangements, and the Company agrees promptly to file any amendments to the Registration Statement or supplements to the Prospectus which may thereby be made necessary, and (ii) the respective numbers of Firm Securities or Option Securities, as applicable, to be purchased by the remaining Underwriters or substituted Underwriters shall be taken as the basis of their underwriting obligation for all purposes of this Agreement. Nothing herein contained shall relieve any defaulting Underwriter of its liability to the Company, or the other Underwriters for damages occasioned by its default hereunder. Any termination of this Agreement pursuant to this Section 10 shall be without liability on the part of any non-defaulting Underwriter or the Company, except that the representations, warranties, covenants, indemnities, agreements and other statements set forth in Section 2, the obligations with respect to expenses to be paid or reimbursed pursuant to Sections 5 and 9 and the provisions of Section 7 and Sections 11 through 21, inclusive, shall not terminate and shall remain in full force and effect.

11. *Absence of Fiduciary Relationship.* The Company acknowledges and agrees that:

- (a) each Underwriter's responsibility to the Company is solely contractual in nature, the Representatives have been retained solely to act as underwriters in connection with the sale of the Securities and no fiduciary, advisory or agency relationship between the Company and the Representatives have been created in respect of any of the transactions contemplated by this Agreement, irrespective of whether any of the Representatives has advised or is advising the Company on other matters;
- (b) the price of each of the Securities set forth in this Agreement was established by the Company following discussions and arms-length negotiations with the Representatives, and the Company is capable of evaluating and understanding, and understands and accepts, the terms, risks and conditions of the transactions contemplated by this Agreement;
- (c) it has been advised that the Representatives and their affiliates are engaged in a broad range of transactions which may involve interests that differ from those of the Company and that the Representatives have no obligation to disclose such interests and transactions to the Company by virtue of any fiduciary, advisory or agency relationship; and
- (d) it waives, to the fullest extent permitted by law, any claims it may have against the Representatives for breach of fiduciary duty or alleged breach of fiduciary duty and agrees that the Representatives shall have no liability (whether direct or indirect) to the Company in respect of such a fiduciary duty claim or to any person asserting a fiduciary duty claim on behalf of or in right of the Company, including stockholders, employees or creditors of the Company.

12. *Successors; Persons Entitled to Benefit of Agreement.* This Agreement shall inure to the benefit of and be binding upon the several Underwriters, the Company and their respective successors and assigns. Nothing expressed or mentioned in this Agreement is intended or shall be construed to give any person, other than the persons mentioned in the preceding sentence, any legal or equitable right, remedy or claim under or in respect of this Agreement, or any provisions herein contained, this Agreement and all conditions and provisions hereof being intended to be and being for the sole and exclusive benefit of such persons and for the benefit of no other person; except that the representations, warranties, covenants, agreements and indemnities of the Company contained in this Agreement shall also be for the benefit of the Underwriter Indemnified Parties, and the indemnities of the several Underwriters shall be for the benefit of the Company Indemnified Parties. It is understood that each Underwriter's responsibility to the

Company is solely contractual in nature and the Underwriters do not owe the Company, or any other party, any fiduciary duty as a result of this Agreement. No purchaser of any of the Securities from any Underwriter shall be deemed to be a successor or assign by reason merely of such purchase.

13. *Survival of Indemnities, Representations, Warranties, etc.* The respective indemnities, covenants, agreements, representations, warranties and other statements of the Company and the several Underwriters, as set forth in this Agreement or made by them respectively, pursuant to this Agreement, shall remain in full force and effect, regardless of any investigation made by or on behalf of any Underwriter, the Company or any person controlling any of them and shall survive delivery of and payment for the Securities. Notwithstanding any termination of this Agreement, including without limitation any termination pursuant to Section 8 or Section 10, the indemnities, covenants, agreements, representations, warranties and other statements forth in Sections 2, 5, 7 and 9 and Sections 11 through 21, inclusive, of this Agreement shall not terminate and shall remain in full force and effect at all times.

14. *Recognition of the U.S. Special Resolution Regimes.*

(a) In the event that any Underwriter that is a Covered Entity becomes subject to a proceeding under a U.S. Special Resolution Regime, the transfer from such Underwriter of this Agreement, and any interest and obligation in or under this Agreement, will be effective to the same extent as the transfer would be effective under the U.S. Special Resolution Regime if this Agreement, and any such interest and obligation, were governed by the laws of the United States or a state of the United States.

(b) In the event that any Underwriter that is a Covered Entity or a BHC Act Affiliate of such Underwriter becomes subject to a proceeding under a U.S. Special Resolution Regime, Default Rights under this Agreement that may be exercised against such Underwriter are permitted to be exercised to no greater extent than such Default Rights could be exercised under the U.S. Special Resolution Regime if this Agreement were governed by the laws of the United States or a state of the United States.

15. *Notices.* All statements, requests, notices and agreements hereunder shall be in writing, and:

(a) if to the Underwriters, shall be delivered or sent by mail, telex, facsimile transmission or email to (i) Piper Sandler & Co., 800 Nicolette Mall, Minneapolis, Minnesota 55402, (ii) Stifel, Nicolaus & Company, Incorporated, One Montgomery Street, Suite 3700, San Francisco, California 94104, to the attention of General Counsel, Fax: 415-364-2618, and (iii) Cantor Fitzgerald & Co., 499 Park Avenue, New York, New York 10022, to the attention of Capital Markets; and

(b) if to the Company, shall be delivered or sent by mail, telex, facsimile transmission or email to X4 Pharmaceuticals, Inc., 61 North Beacon Street, 4<sup>th</sup> Floor, Boston, Massachusetts 02134, Attention: Adam S. Mostafa, Chief Financial Officer, Email: adam.mostafa@x4pharma.com, with a copy to Cooley LLP, 55 Hudson Yards, New York, NY 10001-2157, Attention: Daniel I. Goldberg, Esq., Fax: (212) 479-6275, Email: dgoldberg@cooley.com;

*provided, however,* that any notice to an Underwriter pursuant to Section 7 shall be delivered or sent by mail, or facsimile transmission to such Underwriter at its address set forth in its acceptance telex to the Representatives, which address will be supplied to any other party hereto by the Representatives upon request. Any such statements, requests, notices or agreements shall take effect at the time of receipt thereof.

16. *Definition of Certain Terms.* For purposes of this Agreement, (a) “*affiliate*” has the meaning set forth in Rule 405 under the Securities Act, (b) “*business day*” means any day on which the New York Stock Exchange, Inc. is open for trading and (c) “*subsidiary*” has the meaning set forth in Rule 405 of the Rules and Regulations; (d) “*BHC Act Affiliate*” has the meaning assigned to the term “*affiliate*” in, and shall be interpreted in accordance with, 12 U.S.C. § 1841(k), (e) “*Covered Entity*” means any of the following: (i) a “*covered entity*” as that term is defined in, and interpreted in accordance with, 12 C.F.R. § 252.82(b); (ii) a “*covered bank*” as that term is defined in, and interpreted in accordance with, 12 C.F.R. § 47.3(b); or (iii) a “*covered FSI*” as that term is defined in, and interpreted in accordance with, 12 C.F.R. § 382.2(b), (f) “*Default Right*” has the meaning assigned to that term in, and shall be interpreted in accordance with, 12 C.F.R. §§ 252.81, 47.2 or 382.1, as applicable, (g) “*U.S. Special Resolution Regime*” means each of (i) the Federal Deposit Insurance Act and the regulations promulgated thereunder and (ii) Title II of the Dodd-Frank Wall Street Reform and Consumer Protection Act and the regulations promulgated thereunder.

17. **Governing Law.** This Agreement shall be governed by and construed in accordance with the laws of the State of New York, including without limitation Section 5-1401 of the New York General Obligations. The Company irrevocably (a) submits to the exclusive jurisdiction of the Federal and state courts in the Borough of Manhattan in The City of New York for the purpose of any suit, action or other proceeding arising out of this Agreement or the transactions contemplated by this Agreement, the Registration Statement and any Preliminary Prospectus or the Prospectus, (b) agrees that all claims in respect of any such suit, action or proceeding may be heard and determined by any such court, (c) waives to the fullest extent permitted by applicable law, any immunity from the jurisdiction of any such court or from any legal process, (d) agrees not to commence any such suit, action or proceeding other than in such courts, and (e) waives, to the fullest extent permitted by applicable law, any claim that any such suit, action or proceeding is brought in an inconvenient forum. **THE COMPANY HEREBY WAIVES ALL RIGHT TO TRIAL BY JURY IN ANY LEGAL PROCEEDING (WHETHER BASED UPON CONTRACT, TORT OR OTHERWISE) IN ANY WAY ARISING OUT OF OR RELATING TO THIS AGREEMENT. THE COMPANY HEREBY AGREES THAT A FINAL JUDGMENT IN ANY SUCH LEGAL PROCEEDING BROUGHT IN ANY SUCH COURT SHALL BE CONCLUSIVE AND BINDING UPON THE COMPANY AND MAY BE ENFORCED IN ANY OTHER COURTS IN THE JURISDICTION OF WHICH THE COMPANY IS OR MAY BE SUBJECT, BY SUIT UPON SUCH JUDGMENT.**

18. **Underwriters' Information.** The parties hereto acknowledge and agree that, for all purposes of this Agreement, the Underwriters' Information consists solely of the following information in the Prospectus: (i) the last paragraph on the front cover page concerning the terms of the offering by the Underwriters; and (ii) the statements concerning the Underwriters contained in the second sentence of the eighth paragraph, the ninth paragraph and the first sentence of the thirteenth paragraph under the heading "Underwriting."

19. **Authority of the Representatives.** In connection with this Agreement, the Representatives will act for and on behalf of the several Underwriters, and any action taken under this Agreement by the Representatives will be binding on all the Underwriters.

20. **Partial Unenforceability.** The invalidity or unenforceability of any section, paragraph, clause or provision of this Agreement shall not affect the validity or enforceability of any other section, paragraph, clause or provision hereof. If any section, paragraph, clause or provision of this Agreement is for any reason determined to be invalid or unenforceable, there shall be deemed to be made such minor changes (and only such minor changes) as are necessary to make it valid and enforceable.

21. **General.** This Agreement constitutes the entire agreement of the parties to this Agreement and supersedes all prior written or oral and all contemporaneous oral agreements, understandings and negotiations with respect to the subject matter hereof. In this Agreement, the masculine, feminine and neuter genders and the singular and the plural include one another. The section headings in this Agreement are for the convenience of the parties only and will not affect the construction or interpretation of this Agreement. This Agreement may be amended or modified, and the observance of any term of this Agreement may be waived, only by a writing signed by the Company and the Representatives.

22. **Counterparts.** This Agreement may be signed in any number of counterparts, each of which shall be an original, including by facsimile, electronic mail (including pdf or any electronic signature complying with the U.S. federal E-SIGN Act of 2000, e.g., www.docusign.com or www.echosign.com) or other transmission method, with the same effect as if the signatures thereto and hereto were upon the same instrument.

[Signature pages follow]

If the foregoing is in accordance with your understanding please indicate your acceptance of this Agreement by signing in the space provided for that purpose below.

Very truly yours,  
X4 Pharmaceuticals, Inc.

By: /s/ Adam Mostafa  
Name: Adam Mostafa  
Title: Chief Financial Officer and Treasurer

Accepted as of  
the date first above written:

Piper Sandler & Co.

Stifel, Nicolaus & Company, Incorporated

Cantor Fitzgerald & Co.

Acting on their own behalf  
and as Representatives of the several  
Underwriters listed on Schedule A to this Agreement.

By: Piper Sandler & Co.

By: /s/ Mike Bassett

Name: Mike Bassett

Title: Managing Director

By: Stifel, Nicolaus & Company, Incorporated

By: /s/ Ken Clausman

Name: Ken Clausman

Title:

By: Cantor Fitzgerald & Co.

By: /s/ Sage Kelly

Name: Sage Kelly

Title: Head of Investment Banking

## SCHEDULE A

Name	Number of Firm Shares to be Purchased	Number of Pre-Funded Warrants to be Purchased	Number of Firm Class C Warrants to be Purchased
Piper Sandler & Co.	20,920,000	2,720,000	11,820,000
Stifel, Nicolaus & Company, Incorporated	20,920,000	2,720,000	11,820,000
Cantor Fitzgerald & Co.	10,460,000	1,360,000	5,910,000
Total	52,300,000	6,800,000	29,550,000

**SCHEDULE B**

General Use Free Writing Prospectuses

None

## SCHEDULE C

### Pricing Information

Firm Shares: 52,300,000 shares of Common Stock

Firm Class C Warrants: Warrant to purchase 29,550,000 shares of Common Stock; Exercise price \$1.50 per underlying share of Common Stock

Pre-Funded Warrants: Warrants to purchase 6,800,000 shares of Common Stock; Exercise price \$0.001 per underlying share of Common Stock

Optional Shares: 8,865,000 shares of Common Stock

Optional Class C Warrants: Warrant to purchase 4,432,500 shares of Common Stock; Exercise price \$1.50 per underlying share of Common Stock

Offering Price: \$1.10 per share of Common Stock and accompanying Class C Warrant; \$1.099 per Pre-Funded Warrant and accompanying Class C Warrant

Underwriting Discounts and Commissions: 6.00%

Estimated Net Proceeds to the Company (after underwriting discounts and commissions, but before transaction expenses): \$61,103,008



**SCHEDULE D**

Testing-the-Waters Communications

None.

**SCHEDULE E**

Subsidiaries

X4 Pharmaceuticals Securities Corporation

X4 Pharmaceuticals (Austria) GmbH

X4 Therapeutics, Inc.

**Exhibit I**  
**Form of Lock-Up Agreement**

[•], 2022

Piper Sandler & Co.  
Stifel, Nicolaus & Company, Incorporated  
Cantor Fitzgerald & Co.  
As Representatives of the several Underwriters

c/o Piper Sandler & Co.  
800 Nicollet Mall  
Minneapolis, Minnesota 55402

c/o Stifel, Nicolaus & Company, Incorporated  
One Montgomery Street, Suite 3700  
San Francisco, California 94104

c/o Cantor Fitzgerald & Co.  
499 Park Avenue  
New York, New York 10022

Re: X4 Pharmaceuticals, Inc. – Registration Statement on Form S-3 for Shares of Common Stock

Dear Sirs and Madams:

This letter agreement (the “Agreement”) is being delivered to you in connection with the proposed Underwriting Agreement (the “Underwriting Agreement”) among X4 Pharmaceuticals, Inc., a Delaware corporation (the “Company”) and Piper Sandler & Co. (“Piper”), Stifel, Nicolaus & Company, Incorporated (“Stifel”) and Cantor Fitzgerald & Co., as representatives (the “Representatives”) of a group of underwriters (collectively, the “Underwriters”), to be named therein, and the other parties thereto (if any), relating to the proposed public offering (the “Offering”) of shares of the common stock, par value \$0.001 per share (the “Common Stock”), of the Company.

In order to induce the Underwriters to enter into the Underwriting Agreement, and in light of the benefits that the Offering will confer upon the undersigned in his, her or its capacity as a securityholder and/or an officer, director or employee of the Company, and for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the undersigned agrees with each Underwriter that, during the period beginning on the date hereof through and including the date that is the 90th day after the date of the Underwriting Agreement (the “Lock-Up Period”), the undersigned will not, without the prior written consent of Piper and Stifel, directly or indirectly, (i) offer, sell, assign, transfer, pledge, contract to sell, or otherwise dispose of, or announce the intention to otherwise dispose of, any shares of Common Stock (including, without limitation, Common Stock which may be deemed to be beneficially owned by the undersigned in accordance with the rules and regulations promulgated under the Securities Act of 1933, as amended (the “Securities Act”) as the same may be amended or supplemented from time to time (such shares, the “Beneficially Owned Shares”)) or securities convertible into or exercisable or exchangeable for Common Stock, (ii) enter into any swap, hedge or similar agreement or arrangement that transfers in whole or in part, the economic risk of ownership of the Beneficially Owned Shares or securities convertible into or exercisable or exchangeable for Common Stock, whether now owned or hereafter acquired by the undersigned or with respect to which the undersigned has or hereafter acquires the power of disposition, or (iii) engage in any short selling of the Common Stock or securities convertible into or exercisable or exchangeable for Common Stock.

The restrictions set forth in the immediately preceding paragraph shall not apply to:

- (1) if the undersigned is a natural person, any transfers made by the undersigned (a) as a bona fide gift to any member of the immediate family (as defined below) of the undersigned or to a trust the beneficiaries of which are exclusively the undersigned or members of the undersigned's immediate family, (b) by will or intestate succession upon the death of the undersigned, (c) as a bona fide gift to a charity or educational institution, or (d) by operation of law pursuant to a domestic order or negotiated divorce settlement;
- (2) if the undersigned is a corporation, partnership, limited liability company or other business entity, any transfers to any stockholder, partner or member of, or owner of a similar equity interest in, the undersigned, as the case may be, if, in any such case, such transfer is not for value;
- (3) if the undersigned is a trust, any transfers to any beneficiary of the undersigned if such transfer is not for value;
- (4) if the undersigned is a corporation, partnership, limited liability company or other business entity, any transfer made by the undersigned (a) in connection with the sale or other bona fide transfer in a single transaction of all or substantially all of the undersigned's capital stock, partnership interests, membership interests or other similar equity interests, as the case may be, or all or substantially all of the undersigned's assets, in any such case not undertaken for the purpose of avoiding the restrictions imposed by this Agreement or (b) to another corporation, partnership, limited liability company or other business entity so long as the transferee is an affiliate (as defined below) of the undersigned and such transfer is not for value;
- (5) transactions relating to Common Stock or other securities convertible into or exercisable or exchangeable for Common Stock acquired in open market transactions after completion of the Offering, provided that no such transaction is required to be, or is, publicly announced (whether on Form 4, Form 5 or otherwise) during the Lock-Up Period;
- (6) the entry, by the undersigned, at any time on or after the date of the Underwriting Agreement, of any trading plan providing for the sale of Common Stock by the undersigned, which trading plan meets the requirements of Rule 10b5-1(c) under the Securities Exchange Act of 1934, as amended (the "Exchange Act"), provided, however, that such plan does not provide for, or permit, the sale of any Common Stock during the Lock-Up Period and no public announcement or filing is voluntarily made or required regarding such plan during the Lock-Up Period;
- (7) transfers to the Company pursuant to agreements in effect on the date hereof under which the Company has the option to repurchase such securities upon termination of the undersigned's service to the Company;
- (8) any transfers made by the undersigned to the Company to satisfy tax withholding obligations pursuant to the Company's equity incentive plans or arrangements disclosed in the Prospectus (as defined in the Underwriting Agreement);<sup>2</sup>
- (9) pursuant to a change of control of the Company (including, without limitation, the entering into any lock-up, voting or similar agreement pursuant to which the undersigned may agree to transfer, sell, tender or otherwise dispose of shares of Common Stock or other such securities in connection with such transaction, or vote any shares of Common Stock or other such securities in favor of any such transaction), provided that in the event that such transaction is not completed, such securities held by the undersigned shall remain subject to the provisions of this Agreement; and

provided, however, that (A) in the case of any transfer described in clause (1), (2), (3) or (4) above, it shall be a condition to the transfer that the transferee executes and delivers to the Representatives, acting on behalf of the Underwriters, not later than one business day prior to such transfer, a written agreement, in substantially the form of this Agreement (it being understood that any references to "immediate family" in the agreement executed by such transferee shall expressly refer only to the immediate family of the undersigned and not to the immediate family of the transferee) and otherwise satisfactory in form and substance to the Representatives, and (B) in the case of any transfer described in clause (1), (2), (3), (4), (7) or (8) above, if the undersigned is required to file a report under Section 16(a) of the Exchange Act reporting a reduction in beneficial ownership of shares of Common Stock or Beneficially Owned Shares

or any securities convertible into or exercisable or exchangeable for Common Stock or Beneficially Owned Shares during the Lock-Up Period, the undersigned shall include a statement in such report to the effect that, (A) in the case of any transfer pursuant to clause (1) above, such transfer is being made as a gift, by will or intestate succession or by operation of law, (B) in the case of any transfer pursuant to clause (2) above, such transfer is being made to a stockholder, partner or member of, or owner of a similar equity interest in, the undersigned and is not a transfer for value, (C) in the case of any transfer pursuant to clause (3) above, such transfer is being made to the beneficiaries of the undersigned and is not a transfer for value, (D) in the case of any transfer pursuant to clause (4) above, such transfer is being made either (a) in connection with the sale or other bona fide transfer in a single transaction of all or substantially all of the undersigned's capital stock, partnership interests, membership interests or other similar equity interests, as the case may be, or all or substantially all of the undersigned's assets or (b) to another corporation, partnership, limited liability company or other business entity that is an affiliate of the undersigned and such transfer is not for value, (E) in the case of any transfer pursuant to clause (7) above, such transfer is being made to the Company pursuant to an agreement in effect on the date hereof in connection with the termination of the undersigned's service to the Company and (F) in the case of any transfer pursuant to clause (8) above, such transfer is being made to satisfy tax withholding obligations. For purposes of this paragraph, "immediate family" shall mean a spouse, child, grandchild or other lineal descendant (including by adoption), father, mother, brother or sister of the undersigned; and "affiliate" shall have the meaning set forth in Rule 405 under the Securities Act. For the purposes of clause (9) above, "change of control" shall mean the consummation of any bona fide third party tender offer, merger, consolidation or other similar transaction, in one transaction or a series of related transactions, in each case, approved by the board of directors of the Company and the result of which is that any "person" (as defined in Section 13(d)(3) of the Exchange Act), or group of persons, other than the Company, becomes the beneficial owner (as defined in 13d-3 and 13d-5 of the Exchange Act) of 90% of the total voting power of the voting stock of the Company.

For avoidance of doubt, nothing in this Agreement prohibits the undersigned from exercising any options or warrants to purchase Common Stock (which exercises may be effected on a cashless basis to the extent the instruments representing such options or warrants permit exercises on a cashless basis), it being understood that any Common Stock issued upon such exercises will be subject to the restrictions of this Agreement.

In order to enable this covenant to be enforced, the undersigned hereby consents to the placing of legends or stop transfer instructions with the Company's transfer agent with respect to any Common Stock or securities convertible into or exercisable or exchangeable for Common Stock.

The undersigned further agrees that it will not, during the Lock-Up Period, make any demand or request for or exercise any right with respect to the registration under the Securities Act of any shares of Common Stock or other Beneficially Owned Shares or any securities convertible into or exercisable or exchangeable for Common Stock or other Beneficially Owned Shares.

This Agreement and all authority herein conferred are irrevocable and shall survive the death or incapacity of the undersigned (if a natural person) and shall be binding upon the heirs, personal representatives, successors and assigns of the undersigned.

The undersigned hereby represents and warrants that the undersigned has full power and authority to enter into this Agreement and that this Agreement has been duly authorized (if the undersigned is not a natural person), executed and delivered by the undersigned and is a valid and binding agreement of the undersigned.

This Agreement shall be governed by and construed in accordance with the internal laws of the State of New York applicable to agreements made and to be performed in such state.

If (i) the Company notifies the Representatives in writing that it does not intend to proceed with the Offering, (ii) the Underwriting Agreement is not executed by December 31, 2022, or (iii) the Underwriting Agreement (other than the provisions thereof which survive termination) shall terminate or be terminated for any reason prior to payment for and delivery of any Common Stock to be sold thereunder, then this Agreement shall immediately be terminated and the undersigned shall automatically be released from all of his, her or its obligations under this Agreement. The undersigned acknowledges and agrees that whether or not any public offering of Common Stock actually occurs depends on a number of factors, including market conditions.

[Signature page follows]

Very truly yours,

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(Name of Stockholder - Please Print)

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(Signature)

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(Name of Signatory if Stockholder is an entity - Please Print)

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(Title of Signatory if Stockholder is an entity - Please Print)

Address:

**Annex A**  
**Form of Pre-Funded Warrant**



**Annex B**  
**Form of Class C Warrant**

**Exhibit 4.1**

**FORM**

**X4 PHARMACEUTICALS, INC.**

**PRE-FUNDED WARRANT TO PURCHASE COMMON STOCK**

Number of Shares: [ ]  
(subject to adjustment)

Warrant No.: PF- 2022-[ ]

Original Issue Date: December 9, 2022

X4 Pharmaceuticals, Inc., a Delaware corporation (the “**Company**”), hereby certifies that, for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, [ ] or its registered assigns (the “**Holder**”), is entitled, subject to the terms set forth below, to purchase from the Company up to a total of [ ] shares of common stock, \$0.001 par value per share (the “**Common Stock**”), of the Company (each such share, a “**Warrant Share**” and all such shares, the “**Warrant Shares**”) at an exercise price per share equal to \$0.001 per share (as adjusted from time to time as provided in Section 9 herein, the “**Exercise Price**”), upon surrender of this Warrant to Purchase Common Stock (including any Warrants to Purchase Common Stock issued in exchange, transfer or replacement hereof, the “**Warrant**”) at any time and from time to time on or after the date hereof (the “**Original Issue Date**”), subject to the following terms and conditions:

1. **Definitions.** For purposes of this Warrant, the following terms shall have the following meanings:

(a) “**Affiliate**” means any Person directly or indirectly controlled by, controlling or under common control with, a Holder, but only for so long as such control shall continue. For purposes of this definition, “control” (including, with correlative meanings, “controlled by”, “controlling” and “under common control with”) means, with respect to a Person, possession, direct or indirect, of (a) the power to direct or cause direction of the management and policies of such Person (whether through ownership of securities or partnership or other ownership interests, by contract or otherwise), or (b) at least 50% of the voting securities (whether directly or pursuant to any option, warrant or other similar arrangement) or other comparable equity interests.

(b) “**Attribution Parties**” means, collectively, the following Persons and entities: (i) any direct or indirect Affiliates of the Holder, (ii) any Person acting or who could be deemed to be acting as a Group together with the Holder or any of the foregoing and (iii) any other Persons whose beneficial ownership of the Company’s Common Stock would or could be aggregated with the Holder’s and the other Attribution Parties for purposes of Section 13(d) or Section 16 of the Exchange Act. For clarity, the purpose of the foregoing is to subject collectively the Holder and all other Attribution Parties to the Maximum Percentage.

(c) “**Commission**” means the United States Securities and Exchange Commission.

(d) “**Closing Sale Price**” means, for any security as of any date, the last trade price for such security on the Principal Trading Market for such security, as reported by Bloomberg Financial Markets, or, if such Principal Trading Market begins to operate on an extended hours basis and does not designate the last trade price, then the last trade price of such security prior to 4:00 P.M., New York City time, as reported by Bloomberg Financial Markets, or if the foregoing do not apply, the last trade price of such security in the over-the-counter market on the electronic bulletin board for such security as reported by Bloomberg Financial Markets, or, if no last trade price is reported for such security by Bloomberg Financial Markets, the average of the bid and ask prices, of any market makers for such security as reported in the OTC Link or “pink sheets” by OTC Markets Group Inc. (formerly OTC Markets Inc.). If the Closing Sale Price cannot be calculated for a security on a particular date on any of the foregoing bases, the Closing Sale Price of such security on such date shall be the fair market value as mutually determined by the Company and the Holder. If the Company and the Holder are unable to agree upon the fair market value of such security, then the Board of Directors of the Company shall use its good faith judgment to determine the fair market value. The Board of Directors of the Company’s determination shall be binding upon all parties absent demonstrable error. All such determinations shall be appropriately adjusted for any stock dividend, stock split, stock combination or other similar transaction during the applicable calculation period.

(e) “**Exchange Act**” means the Securities Exchange Act of 1934, as amended.

(f) “**Person**” means an individual, a limited liability company, a partnership, a joint venture, a corporation, a trust, an unincorporated organization, any other entity and a government or any department or agency thereof.

- (g) “**Principal Trading Market**” means the national securities exchange or other trading market on which the Common Stock is primarily listed on and quoted for trading, which, as of the Original Issue Date, shall be the Nasdaq Capital Market.
- (h) “**Registration Statement**” means the Company’s Registration Statement on Form S-3 (File No. 333-249544), declared effective by the Commission on October 26, 2020.
- (i) “**Securities Act**” means the Securities Act of 1933, as amended.
- (j) “**Standard Settlement Period**” means the standard settlement period, expressed in a number of Trading Days, for the Company’s primary trading market or quotation system with respect to the Common Stock that is in effect on the date of delivery of an applicable Exercise Notice, which as of the Issuance Date was “T+2”.
- (k) “**Trading Day**” means any weekday on which the Principal Trading Market is normally open for trading.
- (l) “**Transfer Agent**” means Computershare Trust Company, N.A., the Company’s transfer agent and registrar for the Common Stock, and any successor appointed in such capacity.

2. Issuance of Securities; Registration of Warrants. The Warrant, as initially issued by the Company, is offered and sold pursuant to the Registration Statement. As of the Original Issue Date, the Warrant Shares are issuable under the Registration Statement. Accordingly, the Warrant and, assuming issuance pursuant to the Registration Statement or an exchange meeting the requirements of Section 3(a)(9) of the Exchange Act as in effect on the Original Issue Date, the Warrant Shares, are not “restricted securities” under Rule 144 promulgated under the Securities Act. The Company shall register ownership of this Warrant, upon records to be maintained by the warrant agent for that purpose (the “**Warrant Register**”), in the name of the record Holder (which shall include the initial Holder or, as the case may be, any assignee to which this Warrant is permissibly assigned hereunder) from time to time. The Company may deem and treat the registered Holder of this Warrant as the absolute owner hereof for the purpose of any exercise hereof or any distribution to the Holder, and for all other purposes, absent actual notice to the contrary.

3. Registration of Transfers. Subject to compliance with all applicable securities laws, the Company shall, or will cause its Transfer Agent to, register the transfer of all or any portion of this Warrant in the Warrant Register, upon surrender of this Warrant, and payment for all applicable transfer taxes (if any). Upon any such registration or transfer, a new warrant to purchase Common Stock in substantially the form of this Warrant (any such new warrant, a “**New Warrant**”) evidencing the portion of this Warrant so transferred shall be issued to the transferee, and a New Warrant evidencing the remaining portion of this Warrant not so transferred, if any, shall be issued to the transferring Holder. The acceptance of the New Warrant by the transferee thereof shall be deemed the acceptance by such transferee of all of the rights and obligations in respect of the New Warrant that the Holder has in respect of this Warrant. The Company shall, or will cause its Transfer Agent to, prepare, issue and deliver at the Company’s own expense any New Warrant under this Section 3. Until due presentment for registration of transfer, the Company may treat the registered Holder hereof as the owner and holder for all purposes, and the Company shall not be affected by any notice to the contrary.

#### 4. Exercise of Warrant.

(a) All or any part of this Warrant shall be exercisable by the registered Holder in any manner permitted by Section 10 of this Warrant at any time and from time to time on or after the Original Issue Date.

(b) The Holder may exercise this Warrant by delivering to the Company (i) an exercise notice, in the form attached as Schedule 1 hereto (the “**Exercise Notice**”), completed and duly signed, and (ii) payment of the Exercise Price for the number of Warrant Shares as to which this Warrant is being exercised (which may take the form of a “cashless exercise” if so indicated in the Exercise Notice pursuant to Section 10 below), and the date on which the last of such items is delivered to the Company (as determined in accordance with the notice provisions hereof) is an “**Exercise Date**.” The Holder shall not be required to deliver the original Warrant in order to effect an exercise hereunder. Execution and delivery of the Exercise Notice shall have the same effect as cancellation of the original Warrant and issuance of a New Warrant evidencing the right to purchase the remaining number of Warrant Shares, if any.

#### 5. Delivery of Warrant Shares.

(a) Upon exercise of this Warrant, the Company shall promptly (but in no event later than three (3) Trading Days after the Exercise Date), upon the request of the Holder, credit such aggregate number of shares of Common Stock to which the Holder is entitled pursuant to such exercise to the Holder’s or its designee’s balance account with The Depository Trust Company (“**DTC**”) through its Deposit Withdrawal Agent Commission system, or if the Transfer Agent is not participating in the Fast Automated Securities Transfer (FAST) Program or if the certificates are required to bear a legend regarding restriction on transferability, issue and dispatch by overnight courier to the address as specified in the Exercise Notice, a certificate, registered in the Company’s share register in the name of the Holder or its designee, for the number of shares of Common Stock to which the Holder is entitled pursuant to such exercise. The Holder, or any Person so designated by the Holder to receive Warrant Shares, shall be deemed to have become the holder of record of such Warrant Shares as of the Exercise Date, irrespective of the date such

Warrant Shares are credited to the Holder's DTC account or the date of delivery of the certificates evidencing such Warrant Shares, as the case may be.

(b) If within the Standard Settlement Period after the Exercise Date, the Company fails to deliver to the Holder or its designee the required number of Warrant Shares in the manner required pursuant to Section 5(a) or fails to credit the Holder's or its designee's balance account with DTC for such number of Warrant Shares to which the Holder is entitled (other than a failure caused by incorrect or incomplete information provided by the Holder to the Company), and if after such number of Trading Days comprising the Standard Settlement Period and prior to the receipt of such Warrant Shares, the Holder purchases (in an open market transaction or otherwise) shares of Common Stock to deliver in satisfaction of a sale by the Holder of the Warrant Shares which the Holder anticipated receiving upon such exercise (a "Buy-In"), then the Company shall, within two (2) Trading Days after the Holder's request and in the Holder's sole discretion, either (1) pay in cash to the Holder an amount equal to the Holder's total purchase price (including brokerage commissions, if any) for the shares of Common Stock so purchased, at which point the Company's obligation to issue such Warrant Shares shall terminate or (2) promptly honor its obligation to deliver to the Holder or its designee such Warrant Shares or credit the Holder's or its designee's balance account with DTC for such Warrant Shares and pay cash to the Holder in an amount equal to the excess (if any) of Holder's total purchase price (including brokerage commissions, if any) for the shares of Common Stock so purchased in the Buy-In over the product of (A) the number of shares of Common Stock purchased in the Buy-In, times (B) the Closing Sale Price of a share of Common Stock on the Exercise Date.

(c) To the extent permitted by law and subject to Section 5(b), the Company's obligations to issue and deliver Warrant Shares in accordance with and subject to the terms hereof (including the limitations set forth in Section 11 below) are absolute and unconditional, irrespective of any action or inaction by the Holder to enforce the same, any waiver or consent with respect to any provision hereof, the recovery of any judgment against any Person or any action to enforce the same, or any setoff, counterclaim, recoupment, limitation or termination, or any breach or alleged breach by the Holder or any other Person of any obligation to the Company or any violation or alleged violation of law by the Holder or any other Person, and irrespective of any other circumstance that might otherwise limit such obligation of the Company to the Holder in connection with the issuance of Warrant Shares. Subject to Section 5(b), nothing herein shall limit the Holder's right to pursue any other remedies available to it hereunder, at law or in equity including, without limitation, a decree of specific performance and/or injunctive relief with respect to the Company's failure to timely deliver shares of Common Stock upon exercise of the Warrant as required pursuant to the terms hereof.

6. Charges, Taxes and Expenses. Issuance and delivery of shares of Common Stock upon exercise of this Warrant shall be made without charge to the Holder for any issue or transfer tax, transfer agent fee or other incidental tax or expense (excluding any applicable stamp duties) in respect of the issuance of such shares, all of which taxes and expenses shall be paid by the Company; provided, however, that the Company shall not be required to pay any tax that may be payable in respect of any transfer involved in the registration of any Warrant Shares or the Warrants in a name other than that of the Holder or an Affiliate thereof. The Holder shall be responsible for all other tax liability that may arise as a result of holding or transferring this Warrant or receiving Warrant Shares upon exercise hereof.

7. Replacement of Warrant. If this Warrant is mutilated, lost, stolen or destroyed, the Company shall issue or cause to be issued in exchange and substitution for and upon cancellation hereof, or in lieu of and substitution for this Warrant, a New Warrant, but only upon receipt of evidence reasonably satisfactory to the Company of such loss, theft or destruction (in such case) and, in each case, a customary and reasonable indemnity, if requested by the Company, but without any requirement that a surety bond be procured, provided or posted unless requested by a third party transfer agent. Applicants for a New Warrant under such circumstances shall also comply with such other reasonable regulations and procedures and pay such other reasonable third-party costs as the Company may prescribe. If a New Warrant is requested as a result of a mutilation of this Warrant, then the Holder shall deliver such mutilated Warrant to the Company as a condition precedent to the Company's obligation to issue the New Warrant.

8. Reservation of Warrant Shares. The Company covenants that it will, at all times while this Warrant is outstanding, reserve and keep available out of the aggregate of its authorized but unissued and otherwise unreserved Common Stock, solely for the purpose of enabling it to issue Warrant Shares upon exercise of this Warrant as herein provided, the number of Warrant Shares that are initially issuable and deliverable upon the exercise of this entire Warrant, free from preemptive rights or any other contingent purchase rights of persons other than the Holder (taking into account the adjustments and restrictions of Section 9). The failure of the Company to reserve and keep available out of the aggregate of its authorized but unissued and otherwise unreserved Common Stock a sufficient number of shares of Common Stock to enable it to issue Warrant Shares upon exercise of this Warrant as herein provided is referred to herein as an "**Authorized Share Failure**". The Company covenants that all Warrant Shares so issuable and deliverable shall, upon issuance and the payment of the applicable Exercise Price in accordance with the terms hereof, be duly and validly authorized, issued and fully paid and non-assessable. The Company will take all commercially reasonable actions as may be necessary to assure that such shares of Common Stock may be issued as provided herein without violation of any applicable law or regulation, or of any requirements of any securities exchange or automated quotation system upon which the Common Stock may be listed. The Company further

covenants that it will not, without the prior written consent of the Holder, take any actions to increase the par value of the Common Stock at any time while this Warrant is outstanding. In furtherance of the Company's obligations set forth in this Section 8, as soon as practicable after the date of the occurrence of an Authorized Share Failure, but in no event later than ninety (90) days after the occurrence of such Authorized Share Failure, the Company shall hold a meeting of its stockholders for the approval of an increase in the number of authorized shares of Common Stock. In connection with such meeting, the Company shall provide each stockholder with a proxy statement and shall use its commercially reasonable efforts to solicit its stockholders' approval of such increase in authorized shares of Common Stock and to cause its board of directors to recommend to the stockholders that they approve such proposal. Notwithstanding the foregoing, if any such time of an Authorized Share Failure, the Company is able to obtain the written consent of a majority of the shares of its issued and outstanding shares of Common Stock to approve the increase in the number of authorized shares of Common Stock, the Company may satisfy this obligation by obtaining such consent and submitting for filing with the Commission an Information Statement on Schedule 14C.

9. Certain Adjustments. The Exercise Price and number of Warrant Shares issuable upon exercise of this Warrant are subject to adjustment from time to time as set forth in this Section 9.

(a) Stock Dividends and Splits. If the Company, at any time while this Warrant is outstanding, (i) pays a stock dividend on its Common Stock or otherwise makes a distribution on any class of capital stock issued and outstanding on the Original Issue Date and in accordance with the terms of such stock on the Original Issue Date or as amended, as described in the Registration Statement, that is payable in shares of Common Stock, (ii) subdivides its outstanding shares of Common Stock into a larger number of shares of Common Stock, (iii) combines its outstanding shares of Common Stock into a smaller number of shares of

Common Stock or (iv) issues by reclassification of shares of capital stock any additional shares of Common Stock of the Company, then in each such case the Exercise Price shall be multiplied by a fraction, the numerator of which shall be the number of shares of Common Stock outstanding immediately before such event and the denominator of which shall be the number of shares of Common Stock outstanding immediately after such event. Any adjustment made pursuant to clause (i) of this paragraph shall become effective immediately after the record date for the determination of stockholders entitled to receive such dividend or distribution, provided, however, that if such record date shall have been fixed and such dividend is not fully paid on the date fixed therefor, the Exercise Price shall be recomputed accordingly as of the close of business on such record date and thereafter the Exercise Price shall be adjusted pursuant to this paragraph as of the time of actual payment of such dividends. Any adjustment pursuant to clause (ii) or (iii) of this paragraph shall become effective immediately after the effective date of such subdivision or combination.

(b) Pro Rata Distributions. If, on or after the Original Issue Date, the Company shall declare or make any dividend or other pro rata distribution of its assets (or rights to acquire its assets) to holders of shares of Common Stock, by way of return of capital or otherwise (including, without limitation, any distribution of cash, stock or other securities, property, options, evidence of indebtedness or any other assets by way of a dividend, spin off, reclassification, corporate rearrangement, scheme of arrangement or other similar transaction, but, for the avoidance of doubt, excluding any distribution of shares of Common Stock subject to Section 9(a), any distribution of Purchase Rights (as defined below) subject to Section 9(c) and any Fundamental Transaction (as defined below) subject to Section 9(d)) (a "**Distribution**") then, in each such case, the Holder shall be entitled to participate in such Distribution to the same extent that the Holder would have participated therein if the Holder had held the number of shares of Common Stock acquirable upon complete exercise of this Warrant (without regard to any limitations or restrictions on exercise of this Warrant, including without limitation, the Maximum Percentage (as defined below)) immediately before the date on which a record is taken for such Distribution, or, if no such record is taken, the date as of which the record holders of shares of Common Stock are to be determined for the participation in such Distribution (provided, that to the extent that the Holder's right to participate in any such Distribution would result in the Holder and the other Attribution Parties exceeding the Maximum Percentage, then the Holder shall not be entitled to participate in such Distribution to such extent (and shall not be entitled to beneficial ownership of such shares of Common Stock as a result of such Distribution (and beneficial ownership) to such extent) and the portion of such Distribution shall be held in abeyance for the benefit of the Holder until such time or times as its right thereto would not result in the Holder and the other Attribution Parties exceeding the Maximum Percentage, at which time or times the Holder shall be granted such Distribution (and any Distributions declared or made on such initial Distribution or on any subsequent Distribution held similarly in abeyance) to the same extent as if there had been no such limitation).

(c) Purchase Rights. If at any time on or after the Original Issue Date, the Company grants, issues or sells any Options, Convertible Securities or rights to purchase stock, warrants, securities or other property, in each case pro rata to the record holders of any class of Common Stock (the "**Purchase Rights**"), then the Holder will be entitled to acquire, upon the terms applicable to such Purchase Rights, the aggregate Purchase Rights which the Holder could have acquired if the Holder had held the number of shares of Common Stock acquirable upon complete exercise of this Warrant (without regard to any limitations or restrictions on exercise of this Warrant, including without limitation, the Maximum Percentage) immediately before the date on which a record is taken for the grant, issuance or sale of such Purchase Rights, or, if no such record is taken, the date as of which the record holders of Common

Stock are to be determined for the grant, issuance or sale of such Purchase Rights (provided, that to the extent that the Holder's right to participate in any such Purchase Right would result in the Holder and the other Attribution Parties exceeding the Maximum Percentage, then the Holder shall not be entitled to participate in such Purchase Right to such extent (and shall not be entitled to beneficial ownership of such Common Stock as a result of such Purchase Right (and beneficial ownership) to such extent) and such Purchase Right to such extent shall be held in abeyance for the benefit of the Holder until such time or times as its right thereto would not result in the Holder and the other Attribution Parties exceeding the Maximum Percentage, at which time or times the Holder shall be granted such right (and any Purchase Right granted, issued or sold on such initial Purchase Right or on any subsequent Purchase Right to be held similarly in abeyance) to the same extent as if there had been no such limitation). As used in this Section 9(c), (i) "**Options**" means any rights, warrants or options to subscribe for or purchase shares of Common Stock or Convertible Securities and (ii) "**Convertible Securities**" mean any stock or securities (other than Options) directly or indirectly convertible into or exercisable or exchangeable for shares of Common Stock.

(d) **Fundamental Transactions.** If, at any time while this Warrant is outstanding (i) the Company effects any merger or consolidation of the Company with or into another Person, in which the Company is not the surviving entity or the stockholders of the Company immediately prior to such merger or consolidation do not own, directly or indirectly, at least 50% of the voting power of the surviving entity immediately after such merger or consolidation, (ii) the Company effects any sale to another Person of all or substantially all of its assets in one or a series of related transactions, (iii) pursuant to any tender offer or exchange offer (whether by the Company or another Person), holders of capital stock who tender shares representing more than 50% of the voting power of the capital stock of the Company and the Company or such other Person, as applicable, accepts such tender for payment, (iv) the Company consummates a stock purchase agreement or other business combination (including, without limitation, a reorganization, recapitalization, spin-off or scheme of arrangement) with another Person whereby such other Person acquires more than the 50% of the voting power of the capital stock of the Company (except for any such transaction in which the stockholders of the Company immediately prior to such transaction maintain, in substantially the same proportions, the voting power of such Person immediately after the transaction) or (v) the Company effects any reclassification of the Common Stock or any compulsory share exchange pursuant to which the Common Stock is effectively converted into or exchanged for other securities, cash or property (other than as a result of a subdivision or combination of shares of Common Stock covered by Section 9(a) above) (in any such case, a "**Fundamental Transaction**"), then following such Fundamental Transaction the Holder shall have the right to receive, upon exercise of this Warrant, the same amount and kind of securities, cash or property as it would have been entitled to receive upon the occurrence of such Fundamental Transaction if it had been, immediately prior to such Fundamental Transaction, the holder of the number of Warrant Shares then issuable upon exercise in full of this Warrant without regard to any limitations on exercise contained herein (the "**Alternate Consideration**"). The Company shall not effect any Fundamental Transaction in which the Company is not the surviving entity or the Alternate Consideration includes securities of another Person unless (i) the Alternate Consideration is solely cash and the Company provides for the simultaneous "cashless exercise" of this Warrant pursuant to Section 10 below or (ii) prior to or simultaneously with the consummation thereof, any successor to the Company, surviving entity or other Person (including any purchaser of assets of the Company) shall assume the obligation to deliver to the Holder such Alternate Consideration as, in accordance with the foregoing provisions, the Holder may be entitled to receive, and the other obligations under this Warrant. The provisions of this paragraph (d) shall similarly apply to subsequent transactions analogous of a Fundamental Transaction type.

(e) **Number of Warrant Shares.** Simultaneously with any adjustment to the Exercise Price pursuant to paragraph (a) of this Section 9, the number of Warrant Shares that may be purchased upon exercise of this Warrant shall be increased or decreased proportionately, so that after such adjustment the aggregate Exercise Price payable hereunder for the increased or decreased number of Warrant Shares shall be the same as the aggregate Exercise Price in effect immediately prior to such adjustment.

(f) **Calculations.** All calculations under this Section 9 shall be made to the nearest one-tenth of one cent or the nearest share, as applicable.

(g) **Notice of Adjustments.** Upon the occurrence of each adjustment pursuant to this Section 9, the Company at its expense will, at the written request of the Holder, promptly compute such adjustment, in good faith, in accordance with the terms of this Warrant and prepare a certificate setting forth such adjustment, including a statement of the adjusted Exercise Price and adjusted number or type of Warrant Shares or other securities issuable upon exercise of this Warrant (as applicable), describing the transactions giving rise to such adjustments and showing in detail the facts upon which such adjustment is based. Upon written request, the Company will promptly deliver a copy of each such certificate to the Holder and to the Company's transfer agent.

(h) **Notice of Corporate Events.** If, while this Warrant is outstanding, the Company (i) declares a dividend or any other pro rata distribution of cash, securities or other property in respect of its Common Stock, including, without limitation, any granting of rights or warrants to subscribe for or purchase any capital stock of the Company or any subsidiary, (ii) authorizes or approves, enters into any agreement contemplating or solicits stockholder approval for any Fundamental Transaction or (iii) authorizes the voluntary dissolution, liquidation or winding up of the affairs of the Company, then the Company shall deliver to the Holder a notice of such transaction at least ten (10) days prior to

the applicable record or effective date on which a Person would need to hold Common Stock in order to participate in or vote with respect to such transaction; provided, however, that the failure to deliver such notice or any defect therein shall not affect the validity of the corporate action required to be described in such notice. In addition, if while this Warrant is outstanding, the Company authorizes or approves, enters into any agreement contemplating or solicits stockholder approval for any Fundamental Transaction contemplated by Section 9(d), other than a Fundamental Transaction under clause (iii) of Section 9(d), the Company shall deliver to the Holder a notice of such Fundamental Transaction at least thirty (30) days prior to the date such Fundamental Transaction is consummated. The Holder agrees to maintain any information disclosed pursuant to this Section 9(h) in confidence until such information is publicly available, and shall comply with applicable law with respect to trading in the Company's securities following receipt of any such information.

10. Payment of Exercise Price. Notwithstanding anything contained herein to the contrary, the Holder may, in its sole discretion, satisfy its obligation to pay the Exercise Price through a "cashless exercise", in which event the Company shall issue to the Holder the number of Warrant Shares in an exchange of securities effected pursuant to Section 3(a)(9) of the Securities Act, determined as follows:

$$X = Y [(A-B)/A]$$

where:

"X" equals the number of Warrant Shares to be issued to the Holder;

"Y" equals the total number of Warrant Shares with respect to which this Warrant is then being exercised;

"A" equals the Closing Sale Price of the shares of Common Stock (as reported by Bloomberg Financial Markets) as of the Trading Day on the date immediately preceding the Exercise Date; and

"B" equals the Exercise Price then in effect for the applicable Warrant Shares at the time of such exercise.

For purposes of Rule 144 promulgated under the Securities Act, it is intended, understood and acknowledged that the Warrant Shares issued in a "cashless exercise" transaction shall be deemed to have been acquired by the Holder, and the holding period for the Warrant Shares shall be deemed to have commenced, on the date this Warrant was originally issued (provided that the Commission continues to take the position that such treatment is proper at the time of such exercise). In the event that the Registration Statement or another registration statement registering the issuance of Warrant Shares is, for any reason, not effective at the time of exercise of this Warrant, then the Warrant may only be exercised through a cashless exercise, as set forth in this Section 10. Except as set forth in Section 5(b) and Section 12, in no event will the exercise of this Warrant be settled in cash.

#### 11. Limitations on Exercise.

(a) Notwithstanding anything to the contrary contained herein, the Company shall not effect the exercise of any portion of this Warrant, and the Holder shall not have the right to exercise any portion of this Warrant, pursuant to the terms and conditions of this Warrant and any such exercise shall be null and void and treated as if never made, to the extent that immediately prior to or after giving effect to such exercise, the Holder together with the other Attribution Parties collectively would beneficially own in excess of 9.99% (the "**Maximum Percentage**") of the number of shares of Common Stock outstanding immediately after giving effect to such exercise. For purposes of the foregoing sentence, the aggregate number of shares of Common Stock beneficially owned by the Holder and the other Attribution Parties shall include the number of shares of Common Stock held by the Holder and all other Attribution Parties plus the number of shares of Common Stock issuable upon exercise of this Warrant with respect to which the determination of such sentence is being made, but shall exclude the number of shares of Common Stock which would be issuable upon (A) exercise of the remaining, unexercised portion of this Warrant beneficially owned by the Holder or any of the other Attribution Parties and (B) exercise or conversion of the unexercised or unconverted portion of any other securities of the Company (including, without limitation, any convertible notes or convertible preferred stock or warrants, including the other Warrants) beneficially owned by the Holder or any other Attribution Party subject to a limitation on conversion or exercise analogous to the limitation contained in this Section 11(a). For purposes of this Section 11(a), beneficial ownership shall be calculated in accordance with Section 13(d) of the Exchange Act, it being acknowledged by the Holder that the Company is not representing to the Holder that such calculation is in compliance with Section 13(d) of the Exchange Act and the Holder is solely responsible for any schedules required to be filed in accordance therewith. To the extent that the limitation contained in this Section 11(a) applies, the determination of whether this Warrant is exercisable (in relation to other securities owned by the Holder together with any Affiliates and Attribution Parties) and of which portion of this Warrant is exercisable shall be in the sole discretion of the Holder, and the Company shall have no obligation to verify or confirm the accuracy of such determination. In addition, a determination as to any group status as contemplated above shall be determined in accordance with Section 13(d) of the Exchange Act and the rules and regulations

promulgated thereunder. For purposes of this Warrant, in determining the number of outstanding shares of Common Stock the Holder may acquire upon the exercise of this Warrant without exceeding the Maximum Percentage, the Holder may rely on the number of outstanding shares of Common Stock as reflected in (x) the Company's most recent Annual Report on Form 10-K, Quarterly Report on Form 10-Q and Current Reports on Form 8-K or other public filing with the SEC, as the case may be, (y) a more recent public announcement by the Company or (z) any other written notice by the Company setting forth the number of shares of Common Stock outstanding (the "**Reported Outstanding Share Number**"). If the Company receives an Exercise Notice from the Holder at a time when the actual number of outstanding shares of Common Stock is less than the Reported Outstanding Share Number, the Company shall (i) notify the Holder in writing of the number of shares of Common Stock then outstanding and, to the extent that such Exercise Notice would otherwise cause the Holder's beneficial ownership, as determined pursuant to this Section 11(a), to exceed the Maximum Percentage, the Holder must notify the Company of a reduced number of Warrant Shares to be purchased pursuant to such Exercise Notice (the number of shares by which such purchase is reduced, the "**Reduction Shares**") and (ii) as soon as reasonably practicable, the Company shall return to the Holder any exercise price paid by the Holder for the Reduction Shares. For any reason at any time, upon the written or oral request of the Holder, the Company shall within one (1) Business Day confirm orally and in writing or by electronic mail to the Holder the number of shares of Common Stock then outstanding. In any case, the number of outstanding shares of Common Stock shall be determined after giving effect to the conversion or exercise of securities of the Company, including this Warrant, by the Holder and any other Attribution Party since the date as of which the Reported Outstanding Share Number was reported. In the event that the issuance of Common Stock to the Holder upon exercise of this Warrant results in the Holder and the other Attribution Parties being deemed to beneficially own, in the aggregate, more than the Maximum Percentage of the number of outstanding shares of Common Stock (as determined under Section 13(d) of the Exchange Act), the number of shares so issued by which the Holder's and the other Attribution Parties' aggregate beneficial ownership exceeds the Maximum Percentage (the "**Excess Shares**") shall be deemed null and void and shall be cancelled ab initio, and the Holder shall not have the power to vote or to transfer the Excess Shares. As soon as reasonably practicable after the issuance of the Excess Shares has been deemed null and void, the Company shall return to the Holder the exercise price paid by the Holder for the Excess Shares. Upon delivery of a written notice to the Company, the Holder may from time to time increase or decrease the Maximum Percentage to any other percentage (not in excess of 19.99% of the issued and outstanding shares of Common Stock immediately after giving effect to the issuance of the shares of Common Stock issuable upon exercise of this Warrant if exceeding that limit would result in a change of control under Nasdaq Listing Rule 5636(b) or any successor rule) as specified in such notice; provided that (i) any such increase in the Maximum Percentage will not be effective until the sixty-first (61st) day after such notice is delivered to the Company and (ii) any such increase or decrease will apply only to the Holder and the other Attribution Parties and not to any other holder of Warrants that is not an Attribution Party of the Holder, and (iii) no such decrease shall affect the validity of any prior exercise of Warrants by Holder or any Attribution Party. For purposes of clarity, the shares of Common Stock issuable pursuant to the terms of this Warrant in excess of the Maximum Percentage shall not be deemed to be beneficially owned by the Holder for any purpose including for purposes of Section 13(d) of the Exchange Act or Rule 16a-1(a)(1) promulgated under the Exchange Act. No prior inability to exercise this Warrant pursuant to this paragraph shall have any effect on the applicability of the provisions of this paragraph with respect to any subsequent determination of exercisability. The provisions of this paragraph shall be construed and implemented in a manner otherwise than in strict conformity with the terms of this Section 11(a) to the extent necessary to correct this paragraph or any portion of this paragraph which may be defective or inconsistent with the intended beneficial ownership limitation contained in this Section 11(a) or to make changes or supplements necessary or desirable to properly give effect to such limitation. The limitation contained in this paragraph may not be waived and shall apply to a successor holder of this Warrant.

(b) This Section 11 shall not restrict the number of shares of Common Stock which a Holder may receive or beneficially own in order to determine the amount of securities or other consideration that such Holder may receive in the event of a Fundamental Transaction as contemplated in Section 9(d) of this Warrant.

12. No Fractional Shares. No fractional Warrant Shares will be issued in connection with any exercise of this Warrant. In lieu of any fractional shares that would otherwise be issuable, the number of Warrant Shares to be issued shall be rounded down to the next whole number and the Company shall pay the Holder in cash the fair market value (based on the Closing Sale Price) for any such fractional shares.

13. Notices. Whenever notice is required to be given under this Warrant, including, without limitation, an Exercise Notice, unless otherwise provided herein, such notice shall be given in writing, (i) if delivered (a) from within the domestic United States, by first-class registered or certified airmail, or nationally recognized overnight express courier, postage prepaid, electronic mail or by facsimile or (b) from outside the United States, by International Federal Express, electronic mail or facsimile, and (ii) will be deemed given (A) if delivered by first-class registered or certified mail domestic, three (3) Business Days after so mailed, (B) if delivered by nationally recognized overnight carrier, one (1) Business Day after so mailed, (C) if delivered by International Federal Express, two (2) Business Days after so mailed and (D) at the time of transmission, if delivered by electronic mail to the email address specified in this Section 13 prior to 5:00 p.m. (New York time) on a Trading Day, (E) the next Trading Day



after the date of transmission, if delivered by electronic mail to the email address specified in this Section 13 on a day that is not a Trading Day or later than 5:00 p.m. (New York time) on any Trading Day and (F) if delivered by facsimile, upon electronic confirmation of delivery of such facsimile, and will be delivered and addressed as follows:

(i) If to the Company, to:

X4 Pharmaceuticals, Inc.  
61 North Beacon Street, 4th Floor  
Boston, MA 02134  
Attention: Adam Mostafa  
Email: adam.mostafa@x4pharma.com

with a copy (which shall not constitute notice) to:

Cooley LLP  
55 Hudson Yards  
New York, NY 10001  
Attention: Daniel I. Goldberg  
Email: dgoldberg@cooley.com

(ii) if to the Holder, at such address or other contact information delivered by the Holder to Company or as is on the books and records of the Company.

14. Warrant Agent. The Company shall initially serve as warrant agent under this Warrant. Upon thirty (30) days' notice to the Holder, the Company may appoint a new warrant agent. Any corporation into which the Company or any new warrant agent may be merged or any corporation resulting from any consolidation to which the Company or any new warrant agent shall be a party or any corporation to which the Company or any new warrant agent transfers substantially all of its corporate trust or shareholders services business shall be a successor warrant agent under this Warrant without any further act. Any such successor warrant agent shall promptly cause notice of its succession as warrant agent to be mailed (by first class mail, postage prepaid) to the Holder at the Holder's last address as shown on the Warrant Register.

#### 15. Miscellaneous.

(a) No Rights as a Stockholder. Except as otherwise set forth in this Warrant, the Holder, solely in such Person's capacity as a holder of this Warrant, shall not be entitled to vote or receive dividends or be deemed the holder of share capital of the Company for any purpose, nor shall anything contained in this Warrant be construed to confer upon the Holder, solely in such Person's capacity as the Holder of this Warrant, any of the rights of a stockholder of the Company or any right to vote, give or withhold consent to any corporate action (whether any reorganization, issue of stock, reclassification of stock, consolidation, merger, amalgamation, conveyance or otherwise), receive notice of meetings, receive dividends or subscription rights, or otherwise, prior to the issuance to the Holder of the Warrant Shares which such Person is then entitled to receive upon the due exercise of this Warrant. In addition, nothing contained in this Warrant shall be construed as imposing any liabilities on the Holder to purchase any securities (upon exercise of this Warrant or otherwise) or as a stockholder of the Company, whether such liabilities are asserted by the Company or by creditors of the Company.

(b) Authorized Shares. (i) Except and to the extent as waived or consented to by the Holder, the Company shall not by any action, including, without limitation, amending its certificate or articles of incorporation or through any reorganization, transfer of assets, consolidation, merger, dissolution, issue or sale of securities or any other voluntary action, avoid or seek to avoid the observance or performance of any of the terms of this Warrant, but will at all times in good faith assist in the carrying out of all such terms and in the taking of all such actions as may be necessary or appropriate to protect the rights of Holder as set forth in this Warrant against impairment. Without limiting the generality of the foregoing, the Company will (a) not increase the par value of any Warrant Shares above the amount payable therefor upon such exercise immediately prior to such increase in par value, (b) take all such action as may be necessary or appropriate in order that the Company may validly and legally issue fully paid and non-assessable Warrant Shares upon the exercise of this Warrant, and (c) use commercially reasonable efforts to obtain all such authorizations, exemptions or consents from any public regulatory body having jurisdiction thereof as may be necessary to enable the Company to perform its obligations under this Warrant.

(ii) Before taking any action which would result in an adjustment in the number of Warrant Shares for which this Warrant is exercisable or in the Exercise Price, the Company shall obtain all such authorizations or exemptions thereof, or consents thereto, as may be necessary from any public regulatory body or bodies having jurisdiction thereof.

(c) Successors and Assigns. Subject to compliance with applicable securities laws, this Warrant may be transferred or assigned by the Holder. This Warrant may not be assigned by the Company without the written consent of the Holder, except to a successor in the event of a Fundamental Transaction. This Warrant shall be binding on and inure to the benefit of the Company and the Holder and their respective successors and assigns. Subject to the preceding sentence, nothing in this Warrant shall be construed to give to any Person other than the Company and the Holder any legal or equitable right, remedy or cause of action under this Warrant. This Warrant may be amended only in writing signed by the Company and the Holder, or their successors and assigns.

(d) Amendment and Waiver. Except as otherwise provided herein, the provisions of the Warrants may be amended and the Company may take any action herein prohibited, or omit to perform any act herein required to be performed by it, only if the Company has obtained the written consent of the Holder.

(e) Acceptance. Receipt of this Warrant by the Holder shall constitute acceptance of and agreement to all of the terms and conditions contained herein.

(f) Governing Law; Jurisdiction. ALL QUESTIONS CONCERNING THE CONSTRUCTION, VALIDITY, ENFORCEMENT AND INTERPRETATION OF THIS WARRANT SHALL BE GOVERNED BY AND CONSTRUED AND ENFORCED IN ACCORDANCE WITH THE LAWS OF THE STATE OF NEW YORK WITHOUT REGARD TO THE PRINCIPLES OF CONFLICTS OF LAW THEREOF. EACH OF THE COMPANY AND THE HOLDER HEREBY IRREVOCABLY SUBMITS TO THE EXCLUSIVE JURISDICTION OF THE STATE AND FEDERAL COURTS SITTING IN THE CITY OF NEW YORK, BOROUGH OF MANHATTAN FOR THE ADJUDICATION OF ANY DISPUTE HEREUNDER OR IN CONNECTION HERewith OR WITH ANY TRANSACTION CONTEMPLATED HEREBY OR DISCUSSED HEREIN (INCLUDING WITH RESPECT TO THE ENFORCEMENT OF ANY OF THE TRANSACTION DOCUMENTS), AND HEREBY IRREVOCABLY WAIVES, AND AGREES NOT TO ASSERT IN ANY SUIT, ACTION OR PROCEEDING, ANY CLAIM THAT IT IS NOT PERSONALLY SUBJECT TO THE JURISDICTION OF ANY SUCH COURT. EACH OF THE COMPANY AND THE HOLDER HEREBY IRREVOCABLY WAIVES PERSONAL SERVICE OF PROCESS AND CONSENTS TO PROCESS BEING SERVED IN ANY SUCH SUIT, ACTION OR PROCEEDING BY MAILING A COPY THEREOF VIA REGISTERED OR CERTIFIED MAIL OR OVERNIGHT DELIVERY (WITH EVIDENCE OF DELIVERY) TO SUCH PERSON AT THE ADDRESS IN EFFECT FOR NOTICES TO IT AND AGREES THAT SUCH SERVICE SHALL CONSTITUTE GOOD AND SUFFICIENT SERVICE OF PROCESS AND NOTICE THEREOF. NOTHING CONTAINED HEREIN SHALL BE DEEMED TO LIMIT IN ANY WAY ANY RIGHT TO SERVE PROCESS IN ANY MANNER PERMITTED BY LAW. EACH OF THE COMPANY AND THE HOLDER HEREBY WAIVES ALL RIGHTS TO A TRIAL BY JURY.

(h) Headings. The headings herein are for convenience only, do not constitute a part of this Warrant and shall not be deemed to limit or affect any of the provisions hereof.

(i) Severability. In case any one or more of the provisions of this Warrant shall be invalid or unenforceable in any respect, the validity and enforceability of the remaining terms and provisions of this Warrant shall not in any way be affected or impaired thereby, and the Company and the Holder will attempt in good faith to agree upon a valid and enforceable provision which shall be a commercially reasonable substitute therefor, and upon so agreeing, shall incorporate such substitute provision in this Warrant.

**[Signature Page Follows]**

**IN WITNESS WHEREOF**, the Company has caused this Pre-Funded Warrant to be duly executed by its authorized officer as of the date first indicated above.

**X4 PHARMACEUTICALS, INC.**

By:  
Name:  
Title:

**SCHEDULE 1**

**FORM OF EXERCISE NOTICE**

**[To be executed by the Holder to purchase shares of Common Stock under the Warrant]**

Ladies and Gentlemen:

- (1) The undersigned is the Holder of Warrant No. PF- 2022-\_\_\_\_\_ (the “**Warrant**”) issued by X4 Pharmaceuticals, Inc., a Delaware corporation (the “**Company**”). Capitalized terms used herein and not otherwise defined herein have the respective meanings set forth in the Warrant.
- (2) The undersigned hereby exercises its right to purchase Warrant Shares pursuant to the Warrant.
- (3) The Holder intends that payment of the Exercise Price shall be made as (check one):
- Cash Exercise
  - “Cashless Exercise” under Section 10 of the Warrant
- (4) If the Holder has elected a Cash Exercise, the Holder shall pay the sum of \$ \_\_\_\_\_ in immediately available funds to the Company in accordance with the terms of the Warrant.
- (5) Pursuant to this Exercise Notice, the Company shall deliver to the Holder Warrant Shares determined in accordance with the terms of the Warrant.
- (6) By its delivery of this Exercise Notice, the undersigned represents and warrants to the Company that in giving effect to the exercise evidenced hereby the Holder will not beneficially own in excess of the number of shares of Common Stock (as determined in accordance with Section 13(d) of the Securities Exchange Act of 1934, as amended) permitted to be owned under Section 11(a) of the Warrant to which this notice relates.

Dated:

Name of Holder:

By:

Name:

Title:

(Signature must conform in all respects to name of Holder as specified on the face of the Warrant)

## Exhibit 4.2

### X4 PHARMACEUTICALS, INC.

#### CLASS C WARRANT TO PURCHASE COMMON STOCK

Warrant No.:

Warrant Shares:

Initial Exercise Date: December 9, 2022

THIS CLASS C WARRANT TO PURCHASE COMMON STOCK (this "Warrant") certifies that, for value received, \_\_\_\_\_ or its assigns (the "Holder") is entitled, upon the terms and subject to the limitations on exercise and the conditions hereinafter set forth, at any time on or after the date hereof (the "Initial Exercise Date") and on or prior to 5:00 p.m. (New York City time) on December 9, 2027 (the "Termination Date") but not thereafter, to subscribe for and purchase from X4 Pharmaceuticals, Inc., a Delaware corporation (the "Company"), up to \_\_\_\_\_ shares (as subject to adjustment hereunder, the "Warrant Shares") of Common Stock. The purchase price of one share of Common Stock under this Warrant shall be equal to the Exercise Price, as defined in Section 2(b), and shall require the exercise of two Warrants. This Warrant shall initially be issued and maintained in the form of a security held in book-entry form and the Depository Trust Company or its nominee ("DTC") shall initially be the sole registered holder of this Warrant, subject to a Holder's right to elect to receive a Warrant in certificated form pursuant to the terms of the Warrant Agency Agreement, in which case this sentence shall not apply.

**Section 1. Definitions.** Capitalized terms used and not otherwise defined herein shall have the meanings set forth in that certain Underwriting Agreement (the "Underwriting Agreement"), dated December 7, 2022, among the Company and Piper Sandler & Co., Stifel, Nicolaus & Company, Incorporated and Cantor Fitzgerald & Co., as representatives of the several underwriters named therein.

#### **Section 2. Exercise.**

a) **Exercise of Warrant.** Exercise of the purchase rights represented by this Warrant may be made, in whole or in part, at any time or times on or after the Initial Exercise Date and on or before the Termination Date by delivery to the Company of a duly executed PDF copy submitted by e-mail (or e-mail attachment) of the Notice of Exercise in the form annexed hereto (the "Notice of Exercise"). Within the earlier of (i) two (2) Trading Days and (ii) the number of Trading Days comprising the Standard Settlement Period (as defined in Section 2(d)(i) herein) following the date of exercise as aforesaid, the Holder shall deliver the aggregate Exercise Price to the Company for the shares specified in the applicable Notice of Exercise by wire transfer or cashier's check drawn on a United States bank unless the cashless exercise procedure specified in Section 2(c) below is specified in the applicable Notice of Exercise. No ink-original Notice of Exercise shall be required, nor shall any medallion guarantee (or other type of guarantee or notarization) of any Notice of Exercise be required. Notwithstanding anything herein to the contrary, the Holder shall not be required to physically surrender this Warrant to the Company until the Holder has purchased all of the Warrant Shares available hereunder and this Warrant has been exercised in full, in which case, the Holder shall surrender this Warrant to the Company for cancellation as soon as reasonably practicable after the date on which the final Notice of Exercise is delivered to the Company. Partial exercises of this Warrant resulting in purchases of a portion of the total number of Warrant Shares available hereunder shall have the effect of lowering the outstanding number of Warrant Shares purchasable hereunder in an amount equal to the applicable number of Warrant Shares purchased. The Holder and the Company shall maintain records showing the number of Warrant Shares purchased and the date of such purchases. The Company shall deliver any objection to any Notice of Exercise within one (1) Business Day of receipt of such notice. **The Holder and any assignee, by acceptance of this Warrant, acknowledge and agree that, by reason of the provisions of this paragraph, following the purchase of a portion of the Warrant Shares hereunder, the number of Warrant Shares available for purchase hereunder at any given time may be less than the amount stated on the face hereof.**

Notwithstanding the foregoing in this Section 2(a), a holder whose interest in this Warrant is a beneficial interest in certificate(s) representing this Warrant held in book-entry form through DTC (or another established clearing corporation performing similar functions), shall effect exercises made pursuant to this Section 2(a) by delivering to DTC (or such other clearing corporation, as applicable) the appropriate instruction form for exercise, complying with the procedures to effect exercise that are required by DTC (or such other clearing corporation, as applicable), subject to a Holder's right to elect to receive a Warrant in certificated form pursuant to the terms of the Warrant Agency Agreement, in which case this sentence shall not apply.

b) **Exercise Price.** The exercise price per share of Common Stock under this Warrant shall be \$1.50, subject to adjustment hereunder (the "Exercise Price"), and shall require the exercise of two Warrants.

c) **Cashless Exercise.** If, and only if, at the time of exercise hereof there is no effective registration statement registering, or the prospectus contained therein is not available for the issuance of the Warrant Shares to the Holder, then this Warrant may only be exercised, in whole or in part, at such time by means of a “cashless exercise” in which the Holder shall be entitled to receive a number of Warrant Shares equal to the quotient obtained by dividing [(A-B) (X)] by (A), where:

- (A) = as applicable: (i) the VWAP on the Trading Day immediately preceding the date of the applicable Notice of Exercise if such Notice of Exercise is (1) both executed and delivered pursuant to Section 2(a) hereof on a day that is not a Trading Day or (2) both executed and delivered pursuant to Section 2(a) hereof on a Trading Day prior to the opening of “regular trading hours” (as defined in Rule 600(b) of Regulation NMS promulgated under the federal securities laws) on such Trading Day, (ii) at the option of the Holder, either (y) the VWAP on the Trading Day immediately preceding the date of the applicable Notice of Exercise or (z) the Bid Price of the Common Stock on the principal Trading Market as reported by Bloomberg L.P. (“Bloomberg”) as of the time of the Holder’s execution of the applicable Notice of Exercise if such Notice of Exercise is executed during “regular trading hours” on a Trading Day and is delivered within two (2) hours thereafter (including until two (2) hours after the close of “regular trading hours” on a Trading Day) pursuant to Section 2(a) hereof or (iii) the VWAP on the date of the applicable Notice of Exercise if the date of such Notice of Exercise is a Trading Day and such Notice of Exercise is both executed and delivered pursuant to Section 2(a) hereof after the close of “regular trading hours” on such Trading Day;
- (B) = the Exercise Price of this Warrant, as adjusted hereunder; and
- (X) = the number of Warrant Shares that would be issuable upon exercise of this Warrant in accordance with the terms of this Warrant if such exercise were by means of a cash exercise rather than a cashless exercise.

If Warrant Shares are issued in such a cashless exercise, the parties acknowledge and agree that in accordance with Section 3(a)(9) of the Securities Act, the Warrant Shares shall take on the registered characteristics of the Warrants being exercised. The Company agrees not to take any position contrary to this Section 2(c).

“Bid Price” means, for any date, the price determined by the first of the following clauses that applies: (a) if the Common Stock is then listed or quoted on a Trading Market, the bid price of the Common Stock for the time in question (or the nearest preceding date) on the Trading Market on which the Common Stock is then listed or quoted as reported by Bloomberg (based on a Trading Day from 9:30 a.m. (New York City time) to 4:02 p.m. (New York City time)), (b) if OTCQB or OTCQX is not a Trading Market, the volume weighted average price of the Common Stock for such date (or the nearest preceding date) on OTCQB or OTCQX as applicable, (c) if the Common Stock is not then listed or quoted for trading on OTCQB or OTCQX and if prices for the Common Stock are then reported on The Pink Open Market (or a similar organization or agency succeeding to its functions of reporting prices), the most recent bid price per share of the Common Stock so reported, or (d) in all other cases, the fair market value of a share of Common Stock as determined by an independent appraiser selected in good faith by the Company’s Board of Directors and reasonably acceptable to the Holders or the beneficial owners of Warrants representing more than 50% of the Warrant Shares issuable under the Warrants then-outstanding, the fees and expenses of which shall be paid by the Company.

“VWAP” means, for any date, the price determined by the first of the following clauses that applies: (a) if the Common Stock is then listed or quoted on a Trading Market, the daily volume weighted average price of the Common Stock for such date (or the nearest preceding date) on the Trading Market on which the Common Stock is then listed or quoted as reported by Bloomberg (based on a Trading Day from 9:30 a.m. (New York City time) to 4:02 p.m. (New York City time)), (b) if OTCQB or OTCQX is not a Trading Market, the volume weighted average price of the Common Stock for such date (or the nearest preceding date) on OTCQB or OTCQX as applicable, (c) if the Common Stock is not then listed or quoted for trading on OTCQB or OTCQX and if prices for the Common Stock are then reported on The Pink Open Market (or a similar organization or agency succeeding to its functions of reporting prices), the most recent bid price per share of the Common Stock so reported, or (d) in all other cases, the fair market value of a share of Common Stock as determined by an independent appraiser selected in good faith by the Company’s Board of Directors and reasonably acceptable to the Holders or the beneficial owners of Warrants representing more than 50% of the Warrant Shares issuable under the Warrants then-outstanding, the fees and expenses of which shall be paid by the Company.

Notwithstanding anything herein to the contrary, on the Termination Date, this Warrant shall be automatically exercised via cashless exercise pursuant to this Section 2(c).

d) Mechanics of Exercise.

i. Delivery of Warrant Shares Upon Exercise. The Company shall cause the Warrant Shares purchased hereunder to be transmitted by the Transfer Agent to the Holder by crediting the account of the Holder's or its designee's balance account with The Depository Trust Company through its Deposit or Withdrawal at Custodian system ("DWAC") if the Company is then a participant in such system and either (A) there is an effective registration statement permitting the issuance of the Warrant Shares to or resale of the Warrant Shares by Holder or (B) this Warrant is being exercised via cashless exercise, and otherwise by physical delivery of a certificate, registered in the Company's share register in the name of the Holder or its designee, for the number of Warrant Shares to which the Holder is entitled pursuant to such exercise to the address specified by the Holder in the Notice of Exercise by the date that is the earliest of (i) two (2) Trading Days after the delivery to the Company of the Notice of Exercise, (ii) one (1) Trading Day after delivery of the aggregate Exercise Price to the Company and (iii) the number of Trading Days comprising the Standard Settlement Period after the delivery to the Company of the Notice of Exercise (such date, the "Warrant Share Delivery Date"). Upon delivery of the Notice of Exercise, the Holder shall be deemed for all corporate purposes to have become the holder of record of the Warrant Shares with respect to which this Warrant has been exercised, irrespective of the date of delivery of the Warrant Shares, provided that payment of the aggregate Exercise Price (other than in the case of a cashless exercise) is received within the earlier of (i) two (2) Trading Days and (ii) the number of Trading Days comprising the Standard Settlement Period following delivery of the Notice of Exercise. Notwithstanding the foregoing, the Holder may, to the extent permitted under Section 2(e), exercise this Warrant into pre-funded warrants of the Company (the "Pre-Funded Warrants") with an exercise price of \$0.001 in substantially the same form of Pre-Funded Warrant included in the Company's Current Report on Form 8-K filed with the Securities and Exchange Commission in connection with the transactions contemplated by that certain Underwriting Agreement dated as of December 7, 2022, in lieu of Warrant Shares. The Company agrees to maintain a transfer agent that is a participant in the FAST program so long as this Warrant remains outstanding and exercisable. As used herein, "Standard Settlement Period" means the standard settlement period, expressed in a number of Trading Days, on the Company's primary Trading Market with respect to the Common Stock as in effect on the date of delivery of the Notice of Exercise.

ii. Delivery of New Warrants Upon Exercise. If this Warrant shall have been exercised in part, the Company shall, at the request of a Holder and upon surrender of this Warrant certificate, at the time of delivery of the Warrant Shares, deliver to the Holder a new Warrant evidencing the rights of the Holder to purchase the unpurchased Warrant Shares called for by this Warrant, which new Warrant shall in all other respects be identical with this Warrant.

iii. Rescission Rights. If the Company fails to cause the Transfer Agent to transmit to the Holder the Warrant Shares pursuant to Section 2(d)(i) by the Warrant Share Delivery Date, then the Holder will have the right to rescind such exercise.

iv. Compensation for Buy-In on Failure to Timely Deliver Warrant Shares Upon Exercise. In addition to any other rights available to the Holder, if the Company fails to cause the Transfer Agent to transmit to the Holder the Warrant Shares in accordance with the provisions of Section 2(d)(i) above pursuant to an exercise on or before the Warrant Share Delivery Date and, if the Company has provided the Holder with wire transfer instructions on Company letterhead signed by an executive officer of the Company, the Holder has paid any required Exercise Price for the portion of this Warrant being exercised on or prior to such Warrant Share Delivery Date (or utilized cashless exercise, if available), other than a failure caused by incorrect or incomplete information provided by the Holder to the Company, and if after such date the Holder is required by its broker to purchase (in an open market transaction or otherwise) or the Holder's brokerage firm otherwise purchases, shares of Common Stock to deliver in satisfaction of a sale by the Holder of the Warrant Shares which the Holder anticipated receiving upon such exercise (a "Buy-In"), then the Company shall (A) pay in cash to the Holder the amount, if any, by which (x) the Holder's total purchase price (including customary brokerage commissions, if any) for the shares of Common Stock so purchased exceeds (y) the amount obtained by multiplying (1) the number of Warrant Shares that the Company was required to deliver to the Holder in connection with the exercise at issue times (2) the price at which the sell order giving rise to such purchase obligation was executed, and (B) at the option of the Holder, either reinstate the portion of the Warrant and equivalent number of Warrant Shares for which such exercise was not honored (in which case such exercise shall be deemed rescinded) or deliver to the Holder the number of shares of Common Stock that would have been issued had the Company timely complied with its exercise and delivery obligations hereunder. For example, if the Holder purchases shares of Common Stock having a total purchase price of \$11,000 to cover a Buy-In with respect to an attempted exercise of shares of Common Stock with an aggregate sale price giving rise to such purchase obligation of \$10,000, under clause (A) of the immediately preceding sentence the Company shall be required to pay the Holder \$1,000. The Holder shall provide the Company written notice within three (3) Trading Days after the occurrence of a Buy-In, indicating the amounts payable to the Holder in respect of the Buy-In and, upon request of the Company, evidence of the amount of such loss. Nothing herein shall limit a Holder's right to pursue any other remedies available to it hereunder, at law or in equity including, without limitation, a decree of specific performance and/or injunctive relief with respect to the Company's failure to timely deliver shares of Common Stock upon exercise of the Warrant as required pursuant to the terms hereof.

- v. No Fractional Shares or Scrip. No fractional shares or scrip representing fractional shares shall be issued upon the exercise of this Warrant. As to any fraction of a share which the Holder would otherwise be entitled to purchase upon such exercise, the Company shall, at its election, either pay a cash adjustment in respect of such final fraction in an amount equal to such fraction multiplied by the Exercise Price or round up to the next whole share.
- vi. Charges, Taxes and Expenses. Issuance of Warrant Shares shall be made without charge to the Holder for any issue or transfer tax or other incidental expense in respect of the issuance of such Warrant Shares, all of which taxes and expenses shall be paid by the Company, and such Warrant Shares shall be issued in the name of the Holder or in such name or names as may be directed by the Holder; provided, however, that, in the event that Warrant Shares are to be issued in a name other than the name of the Holder, this Warrant when surrendered for exercise shall be accompanied by the Assignment Form attached hereto duly executed by the Holder and the Company may require, as a condition thereto, the payment of a sum sufficient to reimburse it for any transfer tax incidental thereto. The Company shall pay all Transfer Agent fees required for same-day processing of any Notice of Exercise and all fees to the Depository Trust Company (or another established clearing corporation performing similar functions) required for same-day electronic delivery of the Warrant Shares.
- vii. Closing of Books. The Company will not close its stockholder books or records in any manner which prevents the timely exercise of this Warrant, pursuant to the terms hereof.
- e) Holder's Exercise Limitations. The Company shall not effect any exercise of this Warrant, and a Holder shall not have the right to exercise any portion of this Warrant, pursuant to Section 2 or otherwise, to the extent that after giving effect to such issuance after exercise as set forth on the applicable Notice of Exercise, the Holder (together with the Holder's Affiliates, and any other Persons acting as a group together with the Holder or any of the Holder's Affiliates (such Persons, collectively, "Attribution Parties")), would beneficially own in excess of the Beneficial Ownership Limitation (as defined below). For purposes of the foregoing sentence, the number of shares of Common Stock beneficially owned by the Holder and its Affiliates and Attribution Parties shall include the number of shares of Common Stock held by the Holder, its Affiliates and Attribution Parties plus the number of shares of Common Stock issuable upon exercise of this Warrant with respect to which such determination is being made, but shall exclude the number of shares of Common Stock which would be issuable upon (i) exercise of the remaining, nonexercised portion of this Warrant beneficially owned by the Holder or any of its Affiliates or Attribution Parties and (ii) exercise or conversion of the unexercised or nonconverted portion of any other securities of the Company (including, without limitation, any other Common Stock Equivalents) subject to a limitation on conversion or exercise analogous to the limitation contained herein beneficially owned by the Holder or any of its Affiliates or Attribution Parties. Except as set forth in the preceding sentence, for purposes of this Section 2(e), beneficial ownership shall be calculated in accordance with Section 13(d) of the Exchange Act and the rules and regulations promulgated thereunder, it being acknowledged by the Holder that the Company is not representing to the Holder that such calculation is in compliance with Section 13(d) of the Exchange Act and the Holder is solely responsible for any schedules required to be filed in accordance therewith. To the extent that the limitation contained in this Section 2(e) applies, the determination of whether this Warrant is exercisable (in relation to other securities owned by the Holder together with any Affiliates and Attribution Parties) and of which portion of this Warrant is exercisable shall be in the sole discretion of the Holder, and the submission of a Notice of Exercise shall be deemed to be the Holder's determination of whether this Warrant is exercisable (in relation to other securities owned by the Holder together with any Affiliates and Attribution Parties) and of which portion of this Warrant is exercisable, in each case subject to the Beneficial Ownership Limitation. To ensure compliance with this restriction, each Holder will be deemed to represent to the Company each time it delivers a Notice of Exercise that such Notice of Exercise has not violated the restrictions set forth in this paragraph, and the Company shall have no obligation to verify or confirm the accuracy of such determination. In addition, a determination as to any group status as contemplated above shall be determined in accordance with Section 13(d) of the Exchange Act and the rules and regulations promulgated thereunder. For purposes of this Section 2(e), in determining the number of outstanding shares of Common Stock, a Holder may rely on the number of outstanding shares of Common Stock as reflected in (A) the Company's most recent periodic or annual report filed with the Commission, as the case may be, (B) a more recent public announcement by the Company or (C) a more recent written notice by the Company or the Transfer Agent setting forth the number of shares of Common Stock outstanding (the "Reported Outstanding Share Number"). If the Company receives an Exercise Notice from the Holder at a time when the actual number of outstanding shares of Common Stock is less than the Reported Outstanding Share Number, the Company shall (i) promptly notify the Holder in writing of the number of shares of Common Stock then outstanding and, to the extent that such Exercise Notice would otherwise cause the Holder's beneficial ownership, as determined pursuant to this Section 2(e), to exceed the lesser of the Beneficial Ownership Limitation and Maximum Percentage, the Holder must notify the Company of a reduced number of Warrant Shares to be purchased pursuant to such Exercise Notice (the number of shares by which such purchase is reduced, the "Reduction Shares") and (ii) as soon as reasonably practicable, return to the Holder any exercise price paid by the Holder for the Reduction Shares. Upon the written or oral request of a Holder, the Company shall within two (2) Trading Days confirm orally and in writing to the Holder the number of shares of Common Stock then outstanding. In any case, the number of outstanding shares of Common Stock shall be determined after giving effect to the conversion or exercise of securities of the Company, including this Warrant, by the Holder or its Affiliates or Attribution Parties since the date as of which such number of outstanding shares of Common Stock was reported. The "Beneficial Ownership Limitation" shall be 4.99% (or, upon election by a Holder



prior to the issuance of any Warrants, 9.99%) of the number of shares of the Common Stock outstanding immediately after giving effect to the issuance of shares of Common Stock issuable upon exercise of this Warrant. The Holder, upon notice to the Company, may increase or decrease the Beneficial Ownership Limitation provisions of this Section 2(e), provided that the Beneficial Ownership Limitation in no event exceeds 9.99% of the number of shares of the Common Stock outstanding immediately after giving effect to the issuance of shares of Common Stock upon exercise of this Warrant held by the Holder and the provisions of this Section 2(e) shall continue to apply. Any increase in the Beneficial Ownership Limitation will not be effective until the 61<sup>st</sup> day after such notice is delivered to the Company. The provisions of this paragraph shall be construed and implemented in a manner otherwise than in strict conformity with the terms of this Section 2(e) to correct this paragraph (or any portion hereof) which may be defective or inconsistent with the intended Beneficial Ownership Limitation herein contained or to make changes or supplements necessary or desirable to properly give effect to such limitation. The limitations contained in this paragraph shall apply to a successor holder of this Warrant. If the Holder is not permitted to exercise this Warrant for Warrant Shares due to the Beneficial Ownership Limitation described in this Section 2(e), then the Holder may exercise this Warrant for an equivalent number of Pre-Funded Warrants. For the avoidance of doubt, the Holder may not exercise this Warrant into Pre-Funded Warrants in lieu of Warrant Shares under circumstances other than those expressly set forth in this Section 2(e).

### Section 3. Certain Adjustments.

- a) Stock Dividends and Splits. If the Company, at any time while this Warrant is outstanding: (i) pays a stock dividend or otherwise makes a distribution or distributions on shares of its Common Stock or any other equity or equity equivalent securities payable in shares of Common Stock (which, for avoidance of doubt, shall not include any shares of Common Stock issued by the Company upon exercise of this Warrant), (ii) subdivides outstanding shares of Common Stock into a larger number of shares, (iii) combines (including by way of reverse stock split) outstanding shares of Common Stock into a smaller number of shares, or (iv) issues by reclassification of shares of the Common Stock any shares of capital stock of the Company, then in each case the Exercise Price shall be multiplied by a fraction of which the numerator shall be the number of shares of Common Stock (excluding treasury shares, if any) outstanding immediately before such event and of which the denominator shall be the number of shares of Common Stock (excluding treasury shares, if any) outstanding immediately after such event, and the number of shares issuable upon exercise of this Warrant shall be proportionately adjusted such that the aggregate Exercise Price of this Warrant shall remain unchanged. Any adjustment made pursuant to this Section 3(a) shall become effective immediately after the record date for the determination of stockholders entitled to receive such dividend or distribution and shall become effective immediately after the effective date in the case of a subdivision, combination or re-classification.
- b) Subsequent Rights Offerings. In addition to any adjustments pursuant to Section 3(a) above, if at any time the Company grants, issues or sells any Common Stock Equivalents or rights to purchase stock, warrants, securities or other property pro rata to the record holders of any class of shares of Common Stock (the "Purchase Rights"), then the Holder will be entitled to acquire, upon the terms applicable to such Purchase Rights, the aggregate Purchase Rights which the Holder could have acquired if the Holder had held the number of shares of Common Stock acquirable upon complete exercise of this Warrant (without regard to any limitations on exercise hereof, including without limitation, the Beneficial Ownership Limitation) immediately before the date on which a record is taken for the grant, issuance or sale of such Purchase Rights, or, if no such record is taken, the date as of which the record holders of shares of Common Stock are to be determined for the grant, issue or sale of such Purchase Rights (provided, however, that, to the extent that the Holder's right to participate in any such Purchase Right would result in the Holder exceeding the Beneficial Ownership Limitation, then the Holder shall not be entitled to participate in such Purchase Right to such extent (or beneficial ownership of such shares of Common Stock as a result of such Purchase Right to such extent) and such Purchase Right to such extent shall be held in abeyance for the Holder until such time, if ever, as its right thereto would not result in the Holder exceeding the Beneficial Ownership Limitation).
- c) Pro Rata Distributions. During such time as this Warrant is outstanding, if the Company shall declare or make any dividend or other distribution of its assets (or rights to acquire its assets) to holders of shares of Common Stock, other than as in Section 3(a), by way of return of capital or otherwise (including, without limitation, any distribution of cash, stock or other securities, property or options by way of a dividend, spin off, reclassification, corporate rearrangement, scheme of arrangement or other similar transaction) (a "Distribution"), at any time after the issuance of this Warrant, then, in each such case, the Holder shall be entitled to participate in such Distribution to the same extent that the Holder would have participated therein if the Holder had held the number of shares of Common Stock acquirable upon complete exercise of this Warrant (without regard to any limitations on exercise hereof, including without limitation, the Beneficial Ownership Limitation) immediately before the date of which a record is taken for such Distribution, or, if no such record is taken, the date as of which the record holders of shares of Common Stock are to be determined for the participation in such Distribution (provided, however, that, to the extent that the Holder's right to participate in any such Distribution would result in the Holder exceeding the Beneficial Ownership Limitation, then the Holder shall not be entitled to participate in such Distribution to such extent (or in the beneficial ownership of any shares of Common Stock as a result of such Distribution to such extent) and the portion of such

Distribution shall be held in abeyance for the benefit of the Holder until such time, if ever, as its right thereto would not result in the Holder exceeding the Beneficial Ownership Limitation).

d) Fundamental Transaction. If, at any time while this Warrant is outstanding, (i) the Company, directly or indirectly, in one or more related transactions effects any merger or consolidation of the Company with or into another Person, (ii) the Company, directly or indirectly, effects any sale, lease, license, assignment, transfer, conveyance or other disposition of all or substantially all of its assets in one or a series of related transactions, (iii) any, direct or indirect, purchase offer, tender offer or exchange offer (whether by the Company or another Person) is completed pursuant to which holders of Common Stock are permitted to sell, tender or exchange their shares for other securities, cash or property and has been accepted by the holders of more than 50% of the outstanding Common Stock or more than 50% of the voting power of the common equity of the Company, (iv) the Company, directly or indirectly, in one or more related transactions effects any reclassification, reorganization or recapitalization of the Common Stock or any compulsory share exchange pursuant to which the Common Stock is effectively converted into or exchanged for other securities, cash or property, or (v) the Company, directly or indirectly, in one or more related transactions consummates a stock or share purchase agreement or other business combination (including, without limitation, a reorganization, recapitalization, spin-off, merger or scheme of arrangement) with another Person or group of Persons whereby such other Person or group acquires more than 50% of the outstanding shares of Common Stock or more than 50% of the voting power of the common equity of the Company (each a "Fundamental Transaction"), then, upon any subsequent exercise of this Warrant, the Holder shall have the right to receive, for each Warrant Share that would have been issuable upon such exercise immediately prior to the occurrence of such Fundamental Transaction, at the option of the Holder (without regard to any limitation in Section 2(e) on the exercise of this Warrant), the number of shares of Common Stock of the successor or acquiring corporation or of the Company, if it is the surviving corporation, and any additional consideration (the "Alternate Consideration") receivable as a result of such Fundamental Transaction by a holder of the number of shares of Common Stock for which this Warrant is exercisable immediately prior to such Fundamental Transaction (without regard to any limitation in Section 2(e) on the exercise of this Warrant). For purposes of any such exercise, the determination of the Exercise Price shall be appropriately adjusted to apply to such Alternate Consideration based on the amount of Alternate Consideration issuable in respect of one share of Common Stock in such Fundamental Transaction, and the Company shall apportion the Exercise Price among the Alternate Consideration in a reasonable manner reflecting the relative value of any different components of the Alternate Consideration. If holders of Common Stock are given any choice as to the securities, cash or property to be received in a Fundamental Transaction, then the Holder shall be given the same choice as to the Alternate Consideration it receives upon any exercise of this Warrant following such Fundamental Transaction. Notwithstanding anything to the contrary, in the event of a Fundamental Transaction, the Company or any Successor Entity (as defined below) shall, at the Holder's option, exercisable at any time concurrently with, or within 30 days after, the consummation of the Fundamental Transaction (or, if later, the date of the public announcement of the applicable Fundamental Transaction), purchase this Warrant from the Holder by paying to the Holder an amount of cash equal to the Black Scholes Value (as defined below) of the remaining unexercised portion of this Warrant on the date of the consummation of such Fundamental Transaction; provided, however, that, if the Fundamental Transaction is not within the Company's control, including not approved by the Company's Board of Directors, the Holder shall only be entitled to receive from the Company or any Successor Entity the same type or form of consideration (and in the same proportion), at the Black Scholes Value of the unexercised portion of this Warrant, that is being offered and paid to the holders of Common Stock of the Company in connection with the Fundamental Transaction, whether that consideration be in the form of cash, stock or any combination thereof, or whether the holders of Common Stock are given the choice to receive from among alternative forms of consideration in connection with the Fundamental Transaction; provided, further, that if holders of Common Stock of the Company are not offered or paid any consideration in such Fundamental Transaction, such holders of Common Stock will be deemed to have received common stock of the Successor Entity (which Entity may be the Company following such Fundamental Transaction) in such Fundamental Transaction. "Black Scholes Value" means the value of this Warrant calculated using the Black-Scholes Option Pricing Model obtained from the "OV" function on Bloomberg determined as of the day immediately following the public announcement of the applicable contemplated Fundamental Transaction, or, if such contemplated Fundamental Transaction is not publicly announced, the date such Fundamental Transaction has occurred or is consummated, for pricing purposes and reflecting (A) a risk-free interest rate corresponding to the U.S. Treasury rate for a period equal to the time between the date of the public announcement of the applicable Fundamental Transaction and the Termination Date, (B) an expected volatility equal to the greater of 100% and the 100 day volatility obtained from the HVT function on Bloomberg (determined utilizing a 365 day annualization factor) as of the Trading Day immediately following the public announcement of the applicable contemplated Fundamental Transaction, (C) the underlying price per share used in such calculation shall be the greater of (i) the sum of the price per share being offered in cash, if any, plus the value of any non-cash consideration, if any, being offered in such Fundamental Transaction and (ii) the highest VWAP during the period beginning on the Trading Day immediately preceding the public announcement of the applicable contemplated Fundamental Transaction (or the consummation of the applicable Fundamental Transaction, if earlier) and ending on the Trading Day of the Holder's request pursuant to this Section 3(d) and (D) a remaining option time equal to the time between the date of the public announcement of the applicable contemplated Fundamental Transaction and the Termination Date and (E) a

zero cost of borrow. The payment of the Black Scholes Value will be made by wire transfer of immediately available funds (or such other consideration) within the later of (i) five Business Days of the Holder's election and (ii) the date of consummation of the Fundamental Transaction. The Company shall cause any successor entity in a Fundamental Transaction in which the Company is not the survivor (the "Successor Entity") to assume in writing all of the obligations of the Company under this Warrant in accordance with the provisions of this Section 3(d) pursuant to written agreements in form and substance reasonably satisfactory to the Required Holders (as defined below) and approved by the Required Holders (without unreasonable delay) prior to such Fundamental Transaction and shall, at the option of the Holder, deliver to the Holder in exchange for this Warrant a security of the Successor Entity evidenced by a written instrument substantially similar in form and substance to this Warrant which is exercisable for a corresponding number of shares of capital stock of such Successor Entity (or its parent entity) equivalent to the shares of Common Stock acquirable and receivable upon exercise of this Warrant (without regard to any limitations on the exercise of this Warrant) prior to or concurrent with such Fundamental Transaction, and with an exercise price which applies the exercise price hereunder to such shares of capital stock (but taking into account the relative value of the shares of Common Stock pursuant to such Fundamental Transaction and the value of such shares of capital stock, such number of shares of capital stock and such exercise price being for the purpose of protecting the economic value of this Warrant immediately prior to the consummation of such Fundamental Transaction), and which is reasonably satisfactory in form and substance to the Holder. Upon the occurrence of any such Fundamental Transaction, the Successor Entity shall be added to the term "Company" under this Warrant (so that from and after the occurrence or consummation of such Fundamental Transaction, each and every provision of this Warrant referring to the "Company" shall refer instead to each of the Company and the Successor Entity or Successor Entities, jointly and severally), and the Successor Entity or Successor Entities, jointly and severally with the Company, may exercise every right and power of the Company prior thereto and the Successor Entity or Successor Entities shall assume all of the obligations of the Company prior thereto under this Warrant with the same effect as if the Company and such Successor Entity or Successor Entities, jointly and severally, had been named as the Company herein.

e) Calculations. All calculations under this Section 3 shall be made to the nearest cent or the nearest 1/100th of a share, as the case may be. For purposes of this Section 3, the number of shares of Common Stock deemed to be issued and outstanding as of a given date shall be the sum of the number of shares of Common Stock (excluding treasury shares, if any) issued and outstanding.

f) Notice to Holder.

i. Adjustment to Exercise Price. Whenever the Exercise Price is adjusted pursuant to any provision of this Section 3, the Company shall promptly deliver to the Holder by email a notice setting forth the Exercise Price after such adjustment and any resulting adjustment to the number of Warrant Shares and setting forth a brief statement of the facts requiring such adjustment.

ii. Notice to Allow Exercise by Holder. If (A) the Company shall declare a dividend (or any other distribution in whatever form) on the Common Stock, (B) the Company shall declare a special nonrecurring cash dividend on or a redemption of the Common Stock, (C) the Company shall authorize the granting to all holders of the Common Stock rights or warrants to subscribe for or purchase any shares of capital stock of any class or of any rights, (D) the approval of any stockholders of the Company shall be required in connection with any reclassification of the Common Stock, any consolidation or merger to which the Company (or any of its Subsidiaries) is a party, any sale or transfer of all or substantially all of its assets, or any compulsory share exchange whereby the Common Stock is converted into other securities, cash or property, or (E) the Company shall authorize the voluntary or involuntary dissolution, liquidation or winding up of the affairs of the Company, then, in each case, the Company shall cause to be delivered by email to the Holder at its last email address as it shall appear upon the Warrant Register of the Company, at least 10 calendar days prior to the applicable record or effective date hereinafter specified, a notice stating (x) the date on which a record is to be taken for the purpose of such dividend, distribution, redemption, rights or warrants, or if a record is not to be taken, the date as of which the holders of the Common Stock of record to be entitled to such dividend, distributions, redemption, rights or warrants are to be determined or (y) the date on which such reclassification, consolidation, merger, sale, transfer or share exchange is expected to become effective or close, and the date as of which it is expected that holders of the Common Stock of record shall be entitled to exchange their shares of the Common Stock for securities, cash or other property deliverable upon such reclassification, consolidation, merger, sale, transfer or share exchange; provided that the failure to deliver such notice or any defect therein or in the delivery thereof shall not affect the validity of the corporate action required to be specified in such notice. To the extent that any notice provided in this Warrant constitutes, or contains, material, non-public information regarding the Company or any of the Subsidiaries, the Company shall simultaneously file such notice with the Commission pursuant to a Current Report on Form 8-K. The Holder shall remain entitled to exercise this Warrant during the period commencing on the date of such notice to the effective date of the event triggering such notice except as may otherwise be expressly set forth herein.

g) Voluntary Adjustment By Company. Subject to the rules and regulations of the Trading Market, the Company may at any time during the term of this Warrant reduce the then current Exercise Price to any amount and for any period of time deemed appropriate by the Board of Directors of the Company. The Company may extend the

duration of this Warrant by delaying the Termination Date; provided, however, that the Company will provide notice of not less than ten (10) days to the Holder.

#### Section 4. Transfer of Warrant.

a) Transferability. Subject to compliance with any applicable securities laws, this Warrant and all rights hereunder (including, without limitation, any registration rights) are transferable, in whole or in part, upon surrender of this Warrant at the principal office of the Company or its designated agent, together with a written assignment of this Warrant substantially in the form attached hereto duly executed by the Holder or its agent or attorney and funds sufficient to pay any transfer taxes payable upon the making of such transfer. Upon such surrender and, if required, such payment, the Company shall execute and deliver a new Warrant or Warrants in the name of the assignee or assignees, as applicable, and in the denomination or denominations specified in such instrument of assignment, and shall issue to the assignor a new Warrant evidencing the portion of this Warrant not so assigned, and this Warrant shall promptly be cancelled. Notwithstanding anything herein to the contrary, the Holder shall not be required to physically surrender this Warrant to the Company unless the Holder has assigned this Warrant in full, in which case, the Holder shall surrender this Warrant to the Company within three (3) Trading Days of the date on which the Holder delivers an assignment form to the Company assigning this Warrant in full. The Warrant, if properly assigned in accordance herewith, may be exercised by a new holder for the purchase of Warrant Shares without having a new Warrant issued.

b) New Warrants. If this Warrant is not held in global form through DTC (or any successor depository), this Warrant may be divided or combined with other Warrants upon presentation hereof at the aforesaid office of the Company, together with a written notice specifying the names and denominations in which new Warrants are to be issued, signed by the Holder or its agent or attorney. Subject to compliance with Section 4(a), as to any transfer which may be involved in such division or combination, the Company shall execute and deliver a new Warrant or Warrants in exchange for the Warrant or Warrants to be divided or combined in accordance with such notice. All Warrants issued on transfers or exchanges shall be dated the initial issuance date of this Warrant and shall be identical with this Warrant except as to the number of Warrant Shares issuable pursuant thereto.

c) Warrant Register. The Warrant Agent shall register this Warrant, upon records to be maintained by the Warrant Agent for that purpose (the “Warrant Register”), in the name of the record Holder hereof from time to time. The Company and the Warrant Agent may deem and treat the registered Holder of this Warrant as the absolute owner hereof for the purpose of any exercise hereof or any distribution to the Holder, and for all other purposes, absent actual notice to the contrary.

#### Section 5. Miscellaneous.

a) No Rights as Stockholder Until Exercise; No Settlement in Cash. This Warrant does not entitle the Holder to any voting rights, dividends or other rights as a stockholder of the Company prior to the exercise hereof as set forth in Section 2(d)(i), except as expressly set forth in Section 3. Without limiting any rights of a Holder to receive Warrant Shares on a “cashless exercise” pursuant to Section 2(c) or to receive cash payments pursuant to Section 2(d)(i) and Section 2(d)(iv) herein, in no event shall the Company be required to net cash settle an exercise of this Warrant.

b) Loss, Theft, Destruction or Mutilation of Warrant. The Company covenants that upon receipt by the Company of evidence reasonably satisfactory to it of the loss, theft, destruction or mutilation of this Warrant or any stock certificate relating to the Warrant Shares, and in case of loss, theft or destruction, of indemnity or security reasonably satisfactory to it, and upon surrender and cancellation of such Warrant or stock certificate, if mutilated, the Company will make and deliver a new Warrant or stock certificate of like tenor and dated as of such cancellation, in lieu of such Warrant or stock certificate.

c) Saturdays, Sundays, Holidays, etc. If the last or appointed day for the taking of any action or the expiration of any right required or granted herein shall not be a Business Day, then such action may be taken or such right may be exercised on the next succeeding Business Day.

d) Authorized Shares.

The Company covenants that, during the period this Warrant is outstanding, it will reserve from its authorized and unissued Common Stock a sufficient number of shares to provide for the issuance of the Warrant Shares upon the exercise of any purchase rights under this Warrant. The Company further covenants that its issuance of this Warrant shall constitute full authority to its officers who are charged with the duty of issuing the necessary Warrant Shares upon the exercise of the purchase rights under this Warrant. The Company will take all such reasonable action as may be necessary to assure that such Warrant Shares may be issued as provided herein without violation of any applicable law or regulation, or of any requirements of the Trading Market upon which the Common Stock may be listed. The Company covenants that all Warrant Shares which may be issued upon the exercise of the purchase rights

represented by this Warrant will, upon exercise of the purchase rights represented by this Warrant and payment for such Warrant Shares in accordance herewith, be duly authorized, validly issued, fully paid and nonassessable and free from all taxes, liens and charges created by the Company in respect of the issue thereof (other than taxes in respect of any transfer occurring contemporaneously with such issue).

Except and to the extent as waived or consented to by the Holder, the Company shall not by any action, including, without limitation, amending its certificate of incorporation or through any reorganization, transfer of assets, consolidation, merger, dissolution, issue or sale of securities or any other voluntary action, avoid or seek to avoid the observance or performance of any of the terms of this Warrant, but will at all times in good faith assist in the carrying out of all such terms and in the taking of all such actions as may be necessary or appropriate to protect the rights of Holder as set forth in this Warrant against impairment. Without limiting the generality of the foregoing, the Company will (i) not increase the par value of any Warrant Shares above the amount payable therefor upon such exercise immediately prior to such increase in par value, (ii) take all such action as may be necessary or appropriate in order that the Company may validly and legally issue fully paid and nonassessable Warrant Shares upon the exercise of this Warrant and (iii) use commercially reasonable efforts to obtain all such authorizations, exemptions or consents from any public regulatory body having jurisdiction thereof, as may be, necessary to enable the Company to perform its obligations under this Warrant.

Before taking any action which would result in an adjustment in the number of Warrant Shares for which this Warrant is exercisable or in the Exercise Price, the Company shall obtain all such authorizations or exemptions thereof, or consents thereto, as may be necessary from any public regulatory body or bodies having jurisdiction thereof.

e) Governing Law. All questions concerning the construction, validity, enforcement and interpretation of this Warrant shall be governed by and construed and enforced in accordance with the internal laws of the State of New York, without regard to the principles of conflicts of law thereof. Each party agrees that all legal proceedings concerning the interpretations, enforcement and defense of the transactions contemplated by this Warrant (whether brought against a party hereto or their respective affiliates, directors, officers, shareholders, partners, members, employees or agents) shall be commenced exclusively in the state and federal courts sitting in the City of New York. Each party hereby irrevocably submits to the exclusive jurisdiction of the state and federal courts sitting in the City of New York, Borough of Manhattan for the adjudication of any dispute hereunder or in connection herewith or with any transaction contemplated hereby or discussed herein, and hereby irrevocably waives, and agrees not to assert in any suit, action or proceeding, any claim that it is not personally subject to the jurisdiction of any such court, that such suit, action or proceeding is improper or is an inconvenient venue for such proceeding. Each party hereby irrevocably waives personal service of process and consents to process being served in any such suit, action or proceeding by mailing a copy thereof via registered or certified mail or overnight delivery (with evidence of delivery) to such party at the address in effect for notices to it under this Warrant and agrees that such service shall constitute good and sufficient service of process and notice thereof. Nothing contained herein shall be deemed to limit in any way any right to serve process in any other manner permitted by law. If either party shall commence an action, suit or proceeding to enforce any provisions of this Warrant, the prevailing party in such action, suit or proceeding shall be reimbursed by the other party for their reasonable attorneys' fees and other costs and expenses incurred with the investigation, preparation and prosecution of such action or proceeding.

f) Restrictions. The Holder acknowledges that the Warrant Shares acquired upon the exercise of this Warrant, if not registered, and the Holder does not utilize cashless exercise, will have restrictions upon resale imposed by state and federal securities laws.

g) Nonwaiver and Expenses. No course of dealing or any delay or failure to exercise any right hereunder on the part of Holder shall operate as a waiver of such right or otherwise prejudice the Holder's rights, powers or remedies. Without limiting any other provision of this Warrant, if the Company willfully and knowingly fails to comply with any provision of this Warrant, which results in any material damages to the Holder, the Company shall pay to the Holder such amounts as shall be sufficient to cover any costs and expenses including, but not limited to, reasonable attorneys' fees, including those of appellate proceedings, incurred by the Holder in collecting any amounts due pursuant hereto or in otherwise enforcing any of its rights, powers or remedies hereunder.

h) Notices. Any and all notices or other communications or deliveries to be provided by the Holders hereunder including, without limitation, any Notice of Exercise, shall be in writing and delivered personally, by e-mail, or sent by a nationally recognized overnight courier service, addressed to the Company, at 61 North Beacon Street, 4<sup>th</sup> Floor, Boston, Massachusetts, 02134, Attention: Chief Financial Officer, email address: adam.mostafa@x4pharma.com, or such other email address or address as the Company may specify for such purposes by notice to the Holders. Any and all notices or other communications or deliveries to be provided by the Company hereunder shall be in writing and delivered personally, by e-mail, or sent by a nationally recognized overnight courier service addressed to each Holder at the e-mail address or address of such Holder appearing on the books of the Company. Any notice or other communication or deliveries hereunder shall be deemed given and effective on the earliest of (i) the date of transmission, if such notice or communication is delivered via e-mail at the e-mail address set forth in this Section prior to 5:30 p.m. (New York City time) on any date, (ii) the next Trading Day after the date of transmission, if such notice or communication is delivered via e-mail at the e-mail address set

forth in this Section on a day that is not a Trading Day or later than 5:30 p.m. (New York City time) on any Trading Day, (iii) the second Trading Day following the date of mailing, if sent by U.S. nationally recognized overnight courier service, or (iv) upon actual receipt by the party to whom such notice is required to be given. Notwithstanding any other provision of this Warrant, as to any Warrant not held in certificated form, where this Warrant provides for notice of any event to a Holder, such notice shall be sufficiently given if given to DTC (or any successor depository) pursuant to the procedures of DTC (or such successor depository).

i) Limitation of Liability. No provision hereof, in the absence of any affirmative action by the Holder to exercise this Warrant to purchase Warrant Shares, and no enumeration herein of the rights or privileges of the Holder, shall give rise to any liability of the Holder for the purchase price of any Common Stock or as a stockholder of the Company, whether such liability is asserted by the Company or by creditors of the Company.

j) Remedies. The Holder, in addition to being entitled to exercise all rights granted by law, including recovery of damages, will be entitled to specific performance of its rights under this Warrant. The Company agrees that monetary damages would not be adequate compensation for any loss incurred by reason of a breach by it of the provisions of this Warrant and hereby agrees to waive and not to assert the defense in any action for specific performance that a remedy at law would be adequate.

k) Successors and Assigns. Subject to applicable securities laws, this Warrant and the rights and obligations evidenced hereby shall inure to the benefit of and be binding upon the successors and permitted assigns of the Company and the successors and permitted assigns of Holder. The provisions of this Warrant are intended to be for the benefit of any Holder from time to time of this Warrant and shall be enforceable by the Holder or holder of Warrant Shares.

l) Amendment. This Warrant may be modified or amended or the provisions hereof waived with the written consent of the Company, on the one hand, and the Holders or the beneficial owners of Warrants representing more than 50% of the Warrant Shares issuable under the Warrants then-outstanding (the "Required Holders") as of the date such consent is sought, on the other hand; provided, that if any amendment or modification disproportionately and adversely impacts a Holder (or group of Holders), the consent of such disproportionately impacted Holder (or group of Holders) shall also be required; provided further, that if any such amendment or modification shall affect the rights, immunities, liabilities, duties or obligations of the Warrant Agent, the Warrant Agent's written consent to modify or amend the provisions hereof will be required.

m) Severability. Wherever possible, each provision of this Warrant shall be interpreted in such manner as to be effective and valid under applicable law, but if any provision of this Warrant shall be prohibited by or invalid under applicable law, such provision shall be ineffective to the extent of such prohibition or invalidity, without invalidating the remainder of such provisions or the remaining provisions of this Warrant.

n) Headings. The headings used in this Warrant are for the convenience of reference only and shall not, for any purpose, be deemed a part of this Warrant.

o) Warrant Agency Agreement. If this Warrant is held in global form through DTC (or any successor depository), this Warrant is issued subject to the Warrant Agency Agreement. To the extent any provision of this Warrant conflicts with the express provisions of the Warrant Agency Agreement, the provisions of this Warrant shall govern and be controlling; provided, however, that the express terms of the Warrant Agency Agreement shall control and supersede any provision in this Warrant concerning the rights, duties, obligations, protections, immunities and liability of the Warrant Agent.

\*\*\*\*\*

*(Signature Page Follows)*

IN WITNESS WHEREOF, the Company has caused this Warrant to be executed by its officer thereunto duly authorized as of the date first above indicated.

**X4 PHARMACEUTICALS,  
INC.**

By: \_\_\_\_\_  
Name:  
Title:

**NOTICE OF EXERCISE**

TO: X4 PHARMACEUTICALS, INC.

Form of Exercise. The Holder intends that payment of the Exercise Price shall be made as:

- a "Cash Exercise" with respect to Warrant Shares;
- a "Cashless Exercise" with respect to Warrant Shares;
- a "Cash Exercise" with respect to Pre-Funded Warrants; and/or
- a "Cashless Exercise" with respect to Pre-Funded Warrants

Payment of Exercise Price.

(1) The undersigned hereby elects to purchase \_\_\_\_\_ Warrant Shares and/or Pre-Funded Warrants of the Company pursuant to the terms of the attached Warrant, and tenders herewith payment of the exercise price in the sum of \$\_\_\_\_\_, together with all applicable transfer taxes, if any.

(2) Payment shall take the form of (check applicable box):

- in lawful money of the United States; or
- if permitted the cancellation of such number of Warrant Shares and/or Pre-Funded Warrants as is necessary, in accordance with the formula set forth in subsection 2(c), to exercise this Warrant with respect to the maximum number of Warrant Shares and/or Pre-Funded Warrants purchasable pursuant to the cashless exercise procedure set forth in subsection 2(c).

Delivery of Warrant Shares and/or Pre-Funded Warrants.

(1) Please issue said Warrant Shares and/or Pre-Funded Warrants in the name of the undersigned or in such other name as is specified below:

\_\_\_\_\_

(2) The Warrant Shares shall be delivered to the following DWAC Account Number:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(3) The Company shall deliver to the Holder Pre-Funded Warrants in accordance with the terms of the Warrant Agency Agreement.



[SIGNATURE OF HOLDER]

Name of Investing Entity: \_\_\_\_\_

*Signature of Authorized Signatory of Investing Entity:* \_\_\_\_\_

Name of Authorized Signatory: \_\_\_\_\_

Title of Authorized Signatory: \_\_\_\_\_

Date: \_\_\_\_\_

**ASSIGNMENT FORM**

*(To assign the foregoing Warrant, execute this form and supply required information. Do not use this form to purchase shares.)*

FOR VALUE RECEIVED, the foregoing Warrant and all rights evidenced thereby are hereby assigned to

Name: \_\_\_\_\_  
(Please Print)

Address: \_\_\_\_\_  
(Please Print)

Phone Number: \_\_\_\_\_

Email Address: \_\_\_\_\_

Dated: \_\_\_\_\_, \_\_\_\_\_

Holder's Signature: \_\_\_\_\_

Holder's Address: \_\_\_\_\_

Daniel I. Goldberg  
+1 212 479 6722  
dgoldberg@cooley.com

EXHIBIT 5.1

December 9, 2022

X4 Pharmaceuticals, Inc.  
61 North Beacon Street, 4th Floor  
Boston, MA 02134

Ladies and Gentlemen:

We have acted as counsel to X4 Pharmaceuticals, Inc., a Delaware corporation (the "**Company**"), in connection with the offering by the Company of (i) 61,165,000 shares (the "**Shares**") of common stock, par value \$0.001 per share, of the Company (the "**Common Stock**"), (ii) pre-funded warrants (the "**Pre-Funded Warrants**") to purchase up to 6,800,000 shares of Common Stock, and (iii) warrants to purchase shares of the Common Stock, or in lieu of such shares Pre-Funded Warrants (such shares and shares underlying Pre-Funded Warrants totaling up to 33,982,500 shares of Common Stock) (the "**Class C Warrants**" and together with the Pre-Funded Warrants, the "**Warrants**" and, any shares issuable upon the conversion thereof, the "**Warrant Shares**"), pursuant to a Registration Statement on Form S-3 (Registration No. 333-249544) (the "**Registration Statement**"), filed with the Securities and Exchange Commission (the "**Commission**") under the Securities Act of 1933, as amended (the "**Securities Act**"), the base prospectus included in the Registration Statement (the "**Base Prospectus**") and the prospectus supplement dated December 7, 2022, filed with the Commission pursuant to Rule 424(b) under the Act (together with the Base Prospectus, the "**Prospectus**").

In connection with this opinion, we have examined and relied upon the Registration Statement, the Prospectus, the forms of Pre-Funded Warrant and Class C warrant to be filed as exhibits to a current report of the Company on Form 8-K, the Company's certificate of incorporation and bylaws, each as currently in effect, and originals or copies certified to our satisfaction of such other records, documents, certificates, memoranda and other instruments as in our judgment are necessary or appropriate to enable us to render the opinion expressed below. We have assumed the genuineness of all signatures; the authenticity of all documents submitted to us as originals; the conformity to originals of all documents submitted to us as copies; the accuracy, completeness and authenticity of certificates of public officials; and the due authorization, execution and delivery of all documents by all persons other than the Company where authorization, execution and delivery are prerequisites to the effectiveness of such documents. As to certain factual matters, we have relied upon a certificate of an officer of the Company and have not independently verified such matters.

Our opinion is expressed only with respect to the General Corporation Law of the State of Delaware and, as to the Warrants constituting valid and binding obligations of the Company, the laws of the State of New York. We express no opinion to the extent that any other laws are applicable to the subject matter hereof and express no opinion and provide no assurance as to compliance with any federal or state securities law, rule or regulation.



With regard to our opinion concerning the Warrants constituting valid and binding obligations of the Company:

(i) Our opinion is subject to, and may be limited by, (a) applicable bankruptcy, reorganization, insolvency, moratorium, fraudulent conveyance, debtor and creditor, and similar laws which relate to or affect creditors' rights generally, and (b) general principles of equity (including, without limitation, concepts of materiality, reasonableness, good faith and fair dealing) regardless of whether considered in a proceeding in equity or at law.

(ii) Our opinion is subject to the qualification that the availability of specific performance, an injunction or other equitable remedies is subject to the discretion of the court before which the request is brought.

(iii) We express no opinion as to any provision of the Warrants that: (a) provides for liquidated damages, buy-in damages, monetary penalties, prepayment or make-whole payments or other economic remedies to the extent such provisions may constitute unlawful penalties, (b) relates to advance waivers of claims, defenses, rights granted by law, or notice, opportunity for hearing, evidentiary requirements, statutes of limitations, trial by jury, or procedural rights, (c) restricts non-written modifications and waivers, (d) provides for the payment of legal and other professional fees where such payment is contrary to law or public policy, (e) relates to exclusivity, election or accumulation of rights or remedies, or (f) provides that provisions of the Warrants are severable to the extent an essential part of the agreed exchange is determined to be invalid and unenforceable.

(iv) We express no opinion as to whether a state court outside of the State of New York or a federal court of the United States would give effect to the choice of New York law provided for in the Warrants.

With respect to the Warrant Shares, we express no opinion to the extent that future issuances of securities, of the Company and/or adjustments to outstanding securities of the Company cause the Warrants to be exercisable for more shares of Common Stock than the number that remain available for issuance. Further, we have assumed the exercise price of the Warrants will not be adjusted to an amount below the par value per share of the Common Stock.

On the basis of the foregoing, and in reliance thereon, we are of the opinion that (i) the Shares, when sold and issued in accordance with the Registration Statement and the Prospectus, will be validly issued, fully paid and nonassessable, (ii) the Warrants, when duly executed and delivered by the Company and duly delivered to the purchasers thereof against payment therefor as contemplated in the Registration Statement and the Prospectus, will be valid and binding obligations of the Company, and (iii) the Warrant Shares, when sold and issued against payment therefor in accordance with the terms of the Warrants, will be validly issued, fully paid and nonassessable.

Our opinion is limited to the matters stated herein and no opinion is implied or may be inferred beyond the matters expressly stated. Our opinion is based on these laws as in effect on the date hereof, and we disclaim any obligation to advise you of facts, circumstances, events or developments which hereafter may be brought to our attention and which may alter, affect or modify the opinion expressed herein.

Cooley LLP 55 Hudson Yards New York, NY 10001-2157

t: (212) 479-6000 f: (212) 479-6275 cooley.com



We consent to the reference to our firm under the caption “Legal Matters” in the Prospectus and to the filing of this opinion as an exhibit to a current report of the Company on Form 8-K to be filed with the Commission for incorporation by reference into the Registration Statement. In giving such consent, we do not thereby admit that we are in the category of persons whose consent is required under Section 7 of the Securities Act, or the rules and regulations of the Commission thereunder.

*[Signature page follows]*

Cooley LLP 55 Hudson Yards New York, NY 10001-2157

t: (212) 479-6000 f: (212) 479-6275 cooley.com



Very truly yours,

**Cooley llp**

By:     /s/ Daniel I. Goldberg      
Daniel I. Goldberg, Partner

Cooley LLP 55 Hudson Yards New York, NY 10001-2157  
t: (212) 479-6000 f: (212) 479-6275 cooley.com

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## X4 Pharmaceuticals Announces Proposed Public Offering

BOSTON, Dec. 06, 2022 (GLOBAL NEWS WIRE)— **X4 Pharmaceuticals, Inc.** (Nasdaq: XFOR), a leader in the discovery and development of novel small-molecule therapeutics to benefit people with diseases of the immune system, announced today that it has commenced an underwritten public offering of shares of its common stock (or pre-funded warrants to purchase its common stock in lieu thereof) and accompanying warrants to purchase shares of its common stock (or pre-funded warrants). In addition, X4 expects to grant the underwriters a 30-day option to purchase additional shares of its common stock and/or warrants to purchase shares of its common stock at the public offering price, less the underwriting discounts and commissions. All of the securities in the offering will be sold by X4. The offering is subject to market and other conditions, and there can be no assurance as to whether or when the offering may be completed or as to the actual size or terms of the offering.

Piper Sandler, Stifel and Cantor are acting as joint book-running managers for the offering.

The offering will be made only by means of a written prospectus and related prospectus supplement forming part of a shelf registration statement on Form S-3 that was originally filed with the Securities and Exchange Commission (SEC) on October 19, 2020 and declared effective by the SEC on October 26, 2020. A preliminary prospectus supplement and accompanying prospectus relating to and describing the terms of the offering will be filed with the SEC and will be available at the SEC's website located at [www.sec.gov](http://www.sec.gov), copies of which may be obtained, when available, from: Piper Sandler & Co., 800 Nicollet Mall, J12S03, Minneapolis, Minnesota 55402, Attention: Prospectus Department, by telephone at (800) 747-3924 or by email at [prospectus@psc.com](mailto:prospectus@psc.com); Stifel, Nicolaus & Company, Incorporated, Attention: Syndicate, One Montgomery Street, Suite 3700, San Francisco, California 94104, or by telephone at 415-364-2720 or by email at [syndprospectus@stifel.com](mailto:syndprospectus@stifel.com); or Cantor Fitzgerald & Co., Attention: Capital Markets, 499 Park Avenue, 4th Floor, New York, New York 10022, or by email at [prospectus@cantor.com](mailto:prospectus@cantor.com).

This press release shall not constitute an offer to sell or a solicitation of an offer to buy, nor shall there be any sale of these securities in any state or other jurisdiction in which such an offer, solicitation or sale would be unlawful prior to registration or qualification under the securities laws of any such state or other jurisdiction.

### About X4 Pharmaceuticals

X4 Pharmaceuticals is a late-stage clinical biopharmaceutical company leading the discovery and development of novel therapies for people with diseases of the immune system. Our lead clinical candidate is mavorixafor, a small molecule antagonist of chemokine receptor CXCR4 that is being developed as an oral, once-daily therapy. Due to mavorixafor's ability to antagonize CXCR4 and improve the mobilization of white blood cells, we believe that mavorixafor has the potential to provide therapeutic benefit across a variety of immune system diseases, including a range of chronic neutropenic disorders, including WHIM syndrome, a rare, primary immunodeficiency. We continue to leverage our insights into CXCR4 and immune system biology at our corporate headquarters in Boston, Massachusetts and at our research center of excellence in Vienna, Austria.

### Forward-Looking Statements

This press release contains forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995, as amended. The words "may," "will," "could," "would," "should," "expect," "plan," "anticipate," "intend," "believe," "estimate," "predict," "project," "potential,"

“continue,” “target” and similar expressions are intended to identify forward-looking statements, although not all forward-looking statements contain these identifying words. Forward-looking statements include statements regarding the terms and completion of the proposed public offering and our beliefs regarding the therapeutic benefits of mavorixafor. These statements are subject to various risks and uncertainties, actual results could differ materially from those projected and X4 cautions investors not to place undue reliance on the forward-looking statements in this press release. These risks and uncertainties include, without limitation, risks and uncertainties related to whether or not X4 will be able to raise capital through the sale of shares of common stock (or pre-funded warrants to purchase common stock in lieu thereof) and accompanying warrants or otherwise; the final terms of the proposed offering; market conditions; satisfaction of customary closing conditions related to the public offering; uncertainties inherent in the initiation and completion of clinical trials and clinical development; the risk that trials and studies may not have satisfactory outcomes; the risk that the outcomes of preclinical studies or earlier clinical trials will not be predictive of later clinical trial results; the risk that initial or interim results from a clinical trial may not be predictive of the final results of the trial or the results of future trials; the potential adverse effects arising from the testing or use of mavorixafor or other product candidates; the risk that the FDA may not support and accept a regulatory submission for mavorixafor; and the risk that X4’s interactions with the FDA may not have satisfactory outcomes. There can be no assurance that X4 will be able to complete the public offering on the anticipated terms, or at all. Any forward-looking statements in this press release are based on management’s current expectations and beliefs and are subject to a number of risks, uncertainties and important factors that may cause actual events or results to differ materially from those expressed or implied by any forward-looking statements contained in this press release, including, without limitation, the risks and uncertainties described in the section entitled “Risk Factors” in X4’s Quarterly Report on Form 10-Q for the quarter ended September 30, 2022 filed with the Securities and Exchange Commission (SEC) on November 3, 2022, and in other filings X4 makes with the SEC from time to time. X4 undertakes no obligation to update the information contained in this press release to reflect subsequently occurring events or circumstances, except as required by law.

#### **Investors and Media:**

Daniel Ferry (Investors)  
Managing Director, LifeSci Advisors  
daniel@lifesciadvisors.com  
(617) 430-7576

Cherilyn Cecchini, M.D. (Media)  
LifeSci Communications  
ccecchini@lifescicomms.com





## X4 Pharmaceuticals Prices \$65.0 Million Public Offering

BOSTON, Dec. 07, 2022 (GLOBAL NEWS WIRE) – **X4 Pharmaceuticals, Inc.** (Nasdaq: XFOR), a leader in the discovery and development of novel small-molecule therapeutics to benefit people with diseases of the immune system, announced today the pricing of its previously announced underwritten public offering of 52,300,000 shares of its common stock and, in lieu of common stock, pre-funded warrants to purchase 6,800,000 shares of its common stock, and accompanying Class C warrants to purchase 29,550,000 shares of its common stock at an exercise price of \$1.50 per share of common stock (or, for investors who so choose, pre-funded warrants to purchase shares of its common stock) at a price to the public of \$1.10 per share and accompanying Class C warrant (or \$1.099 per pre-funded warrant and accompanying Class C warrant). X4 has also granted the underwriters a 30-day option to purchase up to an additional 8,865,000 shares of its common stock and/or Class C warrants to purchase up to an additional 4,432,500 shares of its common stock at the public offering price, less underwriting discounts and commissions. X4's gross proceeds from this offering are expected to be approximately \$65.0 million (or approximately \$74.8 million if the underwriters exercise their option in full), before deducting underwriting discounts and estimated offering expenses and any proceeds from the exercise of the warrants to be issued in the offering. All of the securities in the offering are being sold by X4. The offering is expected to close on or about December 9, 2022, subject to customary closing conditions.

Piper Sandler, Stifel and Cantor are acting as joint book-running managers for the offering. H.C. Wainwright & Co. and Brookline Capital Markets (a division of Arcadia Securities, LLC) are acting as financial advisors for the offering.

The offering is being made only by means of a written prospectus and related prospectus supplement forming part of a shelf registration statement on Form S-3 that was originally filed with the Securities and Exchange Commission (SEC) on October 19, 2020 and declared effective by the SEC on October 26, 2020. The preliminary prospectus supplement and accompanying prospectus relating to and describing the terms of the offering were filed with the SEC on December 7, 2022. The final prospectus supplement and accompanying prospectus will be filed with the SEC and will be available at the SEC's website located at [www.sec.gov](http://www.sec.gov), copies of which may be obtained, when available, from: Piper Sandler & Co., 800 Nicollet Mall, J12S03, Minneapolis, Minnesota 55402, Attention: Prospectus Department, by telephone at (800) 747-3924 or by email at [prospectus@psc.com](mailto:prospectus@psc.com); Stifel, Nicolaus & Company, Incorporated, Attention: Syndicate, One Montgomery Street, Suite 3700, San Francisco, California 94104, or by telephone at 415-364-2720 or by email at [syndprospectus@stifel.com](mailto:syndprospectus@stifel.com); or Cantor Fitzgerald & Co., Attention: Capital Markets, 499 Park Avenue, 4th Floor, New York, New York 10022, or by email at [prospectus@cantor.com](mailto:prospectus@cantor.com).

This press release shall not constitute an offer to sell or a solicitation of an offer to buy, nor shall there be any sale of these securities in any state or other jurisdiction in which such an offer, solicitation or sale would be unlawful prior to registration or qualification under the securities laws of any such state or other jurisdiction.

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