I want you to help me collaborate and brainstorm an idea for a video game that I would like to develop. This conversation is going to be a back and forth between me and you, where you challenge me, tell me where I am being too ambitious or unrealistic with my expectations, ask questions, gain clarification, and truly act as a peer in this entire process to bring this product to a successful birth. This is going to be a long process and the goals and plan may change throughout so be ready for these updates and new ideas on a consistent basis. I will now begin to explain the main concept of the game that I want to develop.

The basis of the game is a virtual farm simulation for cannabis crops. The vision I have is a mix between a city building simulation (Cities Skylines, SimCity), farm simulation (Farming Simulator, Stardew Valley), genetic modeling and breeding simulation (CryptoKitties, APICO), real world search and finding (Pokemon GO, Ingress), and collectable marketplace trading (Runescape, EVE Online), all combined into a single and cohesive game. The graphics should be generally high quality but do not need to be hyper realistic. There should be a natural progression to the game with players starting off simple with basic options and layouts, then transitioning into more complex systems and build outs later on in the game. Their journey of upgrading their farm system should also align with their journey of finding, creating, and trading for new genetics/breeds/strains/phenotypes. The goal of the game is to create the ultimate cannabis genetics which can only be done by dialing in the optimal growing conditions along with the optimal strains and breeding protocols. We need to do extensive research in many areas to create accurate and well structured gameplay including cannabis genetics, cannabis breeding practices, and cannabis cultivation practices just to name a few. I will now go into more depth for each of the different feature sets I described above.

City Building Simulation (eg. Cities Skylines II, SimCity): The concepts I want to take from these types of games are the extensive and detailed options for building your own world from the ground up. These are things like placing sewer pipes and electric lines, placing and building out roadways with various options for sizes and types of roads, building placement and zoning, landscaping and terrain modification, and sophisticated options for controlling finances/utilities/laws. We need to take these concepts and apply this same level of planning and detail to our cannabis cultivation game. Players need to have the ability to decide farm/grow room dimensions, material, geographical location, and other characteristics. Players need to have the ability to decide on growing medium, pot size, start from seed or clone, and add-ins to growing medium (peat, perlite, etc.). Players need to have the ability to decide on irrigation/fertigation systems and have extreme flexibility as far as placement and buildout. This would involve placement of batch tanks and mix tanks for fertilizers, placement and connection of irrigation plumbing pipes and system, choice of pipe diameter and material, choice of ball valves/solenoids/cut-offs/outlets/etc. Players need to have the ability to decide their choice of lighting either natural sunlight or artificial or a combination of the both. This also involves choices for types of artificial lighting (LED, HPS, HID, etc.), spectrum of the lighting, and layout/placement of the lighting. Players need to have the choice of HVAC and ventilation systems including fans, dehumidifiers, A/C or heating units and the same level of detail as far as placement of ducting, hoses, piping and the size and material of it all. Players need to have the ability to build out dry rooms and have the same level of detail as far as equipment placement and design. Players will need to optimize all of these build out options and find the ultimate combination through experimentation and trial and error. Eventually I see a community of players discussing best techniques and strategies that worked for them. We will need to do extensive research to provide accurate and realistic simulations and physics for all of these different options and combinations. We need to research plumbing, flow rates, fluid dynamics, HVAC, air flow, lighting, electricity, cultivation, and so many more areas in order to gain an accurate real world representation and simulation for game play. Players should have the options to tweak all of the extra features and controls just as they could in the city building games. This is one of the most prominent and valuable features for the game so we really need to work on developing this concept and idea into everything it possibly can be,

Farm Simulation (Farming Simulator, Stardew Valley): The concepts I want to take from these games are the crop growing dynamics and gameplay. Time simulations can be changed and sped up or slowed down to allow players to expedite the growth cycle and quickly get through an entire growing season much quicker. Players should have this same option in our game but not without consequences. Just as speeding up could expedite growth of a healthy plant, it can also expedite the death or infection of an unhealthy plant and possibly an entire crop. There are also concepts around purchasing more land and eventually upgrading your operation to bigger and bigger possibilities. Players in this game will also have the option to allow them more space to experiment with more genetic options and possibilities.

Genetic Modeling and Breeding Simulation (CryptoKitties, APICO): The concepts I want to take from these games are the advanced and sophisticated genetics engines that drive the game. There are an insane amount of different traits with varying rarities and varying degrees of possible combinations. This concept applies perfectly to the culture and world of high end cannabis cultivation and the ultra competitive and defining value around cannabis genetics. Players should have this same ability to develop strains, develop ideas for breeding practices and crosses, and experiment in any way they see necessary to gain the ultimate genetics. We need to do extensive research into cannabis genetics and everything that surrounds it from the culture and naming to the biology and science behind it all. This is another defining and of utmost importance feature to develop accurately and correctly for this game to become what I envision. We need to develop our own genetics/breeding engine for this game that allows for dynamic, entertaining, challenging, and fun game play. There needs to be structure and consistency as well as randomness and chance integrated in an elegant and useful way. We also need to research and look into a way of developing the Evo 2 AI model by the Arc Institute into the game somehow.

Real World Search and Find (Pokemon GO, Ingress): The concepts I want to take from these games are the feature of real world searching and capture or finding of digital items for use in the game. I envision players being able to find digital seeds or possibly digital plants to take cuttings off of in locations in the real world similar to the gameplay of Pokemon GO. We need to brainstorm this idea further to really define it better and get the feature into an awesome and practical concept for our game play. I would really like to incorporate the concept of “landrace” strains into this search and find feature. Maybe let this search and find feature be strictly around this landrace idea. These strains could be less optimal overall but each with a very unique and useful attribute that can be used to cross breed into something much better. This idea and this entire search and find real world feature need to be much further developed and thought through in subsequent sessions.

Collectable Marketplace Trading (Runescape, EVE Online): The concepts I want to take from these games are their extensive and active in-game marketplaces that allow users to trade and purchase useful or rare items in the game. This obviously has many transferable ideas to what we are designing in this game and I want to bring that to life. Players should be able to buy, sell and trade all different attributes within the game, not just plant genetics. Plant genetics would be the biggest marketplace item I would predict but I also see the ability to trade growing equipment and anything else used in the game. Seeds and cuttings would be the largest segment of the marketplace but this also allows us opportunities to monetize and create a business from this game. We need to do research on how we can monetize the game and provide opportunities for us as the developers to profit from all of the work we will put into building this for the users.

Let’s now take all of these features and ideas and start our massive brainstorming and collaborative development session. Lets go step by step and gradually develop and research all aspects that have been laid out until we have a fully functional and working game. I believe we

can do this together but it will take our combined minds and a lot of time and back and forth. I am ready and excited to begin.

I want to research and learn about the use of AI to generate graphics, images, 3D models, renderings, animations, and anything else that goes into creating a visually pleasing and high quality video game. My video game revolves around farm building/layout, genetic modeling and breeding, MMO marketplaces, and other features all involved in the goal of creating the ultimate cannabis strain. I am working on developing the game's feature set and technical aspects in another chat. What I want from this chat is research purely on using the recent advancements and most up to date technology and tools available for generating this type of graphical and 3D content. Not only do we need to research the actual game play graphic generation but also the entire UI/UX layout for everything from the menus to the overlays to the color pallets to the fonts to the overall design and aesthetic of the game. These are all key research points that need to be addressed as well as any other areas you feel fit into this discussion. We need to do extremely thorough and in depth research, not leaving any stone unturned or any corner of the internet not searched. We need to develop the ultimate research report and game plan for pursuing this path of using AI tools to generate and create the entirety of the visual aspects for the game I want to create

Analyze the two documents that I attached. One is a detailed report on some of the current tools and systems available for generating visuals and UI/UX for video games with the use of AI. The other document is a prompt that breaks down a lot of the core details I envision for the game. What I want to do in this conversation is to merge the two and start going methodically step by step through all the parts of the AI graphics report to answer all the questions and ideas that were presented. I want to go deep into each part of the report, one by one, and dive even further into each of these sections. I want you to guide me through this, expanding into the depths of each of these proposed parts and help lead me into the ultimate game plan for generating and developing all of the visual aspects of my proposed game. This will not be about programming the actual game or generating any of the actual visuals in this chat but rather a very high level breakdown and planning process of how we can best use these tools to eventually get to that step. I want to consider low costs and high accuracy while compiling this plan and use any tool or combination of tools that will get me to this result. I really like the idea of combining multiple different tools, each with their own strengths, into an assembly line that I can use to generate what I want. Lets begin with you doing a very deep and thorough assessment of both documents and we can then begin going through the first part with extreme detail.

I would like to try tools with custom style training, but I am not sure how good they might be. I also would consider trying general models with prompt engineering and possible human refinement and editing to create multiple assets from a single AI generated asset. But these are all things we need to begin exploring and breaking down in much greater detail and then solidifying it into a reference-able game plan. I am unaware when it comes to most of this stuff, I just have an idea of what I want the game to be, I need you to do research and help figure out the best tools based on the ideas and feedback I give you. This is just the beginning

For the overall mood I like a combination of clinical & scientific, modern & high-tech, aspirational & professional, but all still with a relaxed & cozy vibe if the player chooses. For keywords describing the visual atmosphere I feel like realistic, clean, rewarding, engaging, and detailed are all great words. We can continue to brainstorm this section if you have more specific questions to gain a deeper insight into my mind.

The high-tech vs. cozy blend would come down to player preference and choice. If the player wanted to build out a super high-tech, top of the line, large scale facility with the intention of optimizing scientific and functional performance they could do that. But if a player also wanted to do a small scale closet or grow a tent or bed room with more amateur/low tech equipment and wanted to feel more relaxed and cozy with each individual plant then they can have that much more personable experience. I would also imagine different game modes for different levels of player commitment. There could be the hardcore super realistic mode with super tight budgets and profit margins, all the way to a super relaxed, unlimited money and resource mode of the game for less serious players to just have fun with. I envision multiple different modes in which players try to do specific growth challenges with different parameters, metrics, results, etc. and compete against each other on world wide leader boards.

Yes this is exactly what I mean by clean, but also in the asset visual sense. Even if it may be more realistic to add rust to an asset or a pile of dirt or spilled chemicals in an area, I would rather the game maintain a clean and pristine visual look despite its lack of realism. “Detailed” manifests in the intricate models of equipment and assets but mainly in the fine granular level of complexity and customization the player has in the setup and execution. The fine grained data visualizations in the UI are also a very important synergy to match. The visual complexity of plant models is much less important to me at this time, we will achieve this with AI procedural generation when the time comes. We will also start with a much more basic and stripped down version of the game to initially launch. This is in terms of number of assets, genetics, genetic variability, and many other parameters that we can upgrade later on, this is not in terms of visual asset realism or quality. These assets will be developed at this high quality visually but will just be limited by number and variability to begin.

I think to make the game feel rewarding we need to acknowledge and celebrate even in the smallest way, the completion, addition, upgrade, improvement, etc. every single time. Bigger achievements and tasks will get bigger acknowledgments and rewards compared to mundane tasks that get completed constantly, but still need to be acknowledged such as completing an irrigation line or planting a seed or cutting a clone. We need to visually represent upgrades, progress and success in the most intuitive way possible. Players need to be engaged through a plethora of metrics and conditions from environment to genetics to overall timing and strategy and everything else that players need to monitor, maintain, and optimize.

I think the visual complexity and sophistication should match the players desired mood and vibe for there current gaming session

For the clean, detailed look of the equipment, I definitely prefer the visuals of Satisfactory the best out of those three. I do not like the top down view or overall look of Factorio and Star Citizen looks a bit too futuristic and space/alien themed for what I am going for with my game. Satisfactory also has a bit of a futuristic look and I am not a fan of the outdoor environment for everything but the look of the actual machines and equipment is very much what I am going for. Another game that has a similar equipment visual aesthetic like the one I am going for is the Farming Simulator series.

For data visualization in the UI I prefer the look of Stellaris’ UI over EVE Online. To me EVE Online has too many words and lines of very small text that clutter up the screen the UI. A game that I think has a pretty good UI for visualizing data and resources and then controlling them is Cities: Skylines.

For the facility layout and room design, something like a more serious Two Point would be perfect. I like this blueprint/architectural visualization used in these Two Point games. I envision multiple different layouts and gameplay screens that players will interact with in a hierarchy type of system. There will be main overall facility views that I picture looking similar to the Two Point Hospital look. Then players would be able to dive deeper into any specific room and then they would see a different game play look that is specific to that room or area only. Players could then go another level deeper and view specific benches or tables, then another level deeper and view specific individual plants. Each of these would go into deeper granular detail with the view and with the data visualization of those areas. An example of this would be the tycoon games where players have different view levels with zoom and detail available depending on the actions they are trying to perform.

For the cozy feel I imagine a vibe similar to the game iGrow with a modest indoor bedroom, house, tent, closet, etc. types of setups. Less sophisticated equipment, more personal items/decorations in the grow space, warmer less intense lighting, and just a more relaxed overall feeling to the visuals while maintaining the same level of realism and graphics.

Outside of games, different real world examples of the visual style I am aiming for include Demeter Designs, Athena Nutrients, Jungle Boys, CannaCribs (and all of the facilities they cover), and Hanna Instruments just to name a few. Other examples outside of the cannabis industry include Apple, and Google.

I would prefer a slightly stylized but still grounded look. It doesn’t need to be photorealistic but still high quality and clean graphics. The lighting should be soft and ambient most of the time but some super high tech, sophisticated facilities could be more harsh and functional with their lighting dynamics. Overall the vibe of the game should be more soft and ambient though.

For primary colors I prefer an elegant, sophisticated palette with expansive greys, mature and majestic greens, possibly light blues/whites, and an overall emphasis on easy readability, beautiful contrast, deep colors, and a darker overall motif for the UI elements reminiscent of dark mode on certain programs.

For secondary colors I like charcoal and off black contrasting colors as well as deep, dark blues or purples.

Accent colors I love the brighter energetic feel such as yellow, orange, reds, pinks, purples. Let’s try to take inspiration from the variety of brighter colors expressed by different cannabis genetics.

For the cozy I vibe I love warmer, earthy tones like beige, cream, light browns, wood tones, light greens and blues, and other softer earth tones.

Functional colors should be used wherever it makes sense. I like the idea of reinforcing specific UI colors with repeated use through different functions that are related. We shouldn’t reserve any colors specifically for warnings or alerts or rewards but maybe use a different overall palette and vibe from the main UI color scheme in order to really grab players attention, but it may also be a more cohesive experience if we use a systematic palette throughout the entire game. Maybe we should experiment with both options.

Overall I want to maintain a modern, clean, and beautiful aesthetic and color combination throughout the entire game.

To finish off section 4 I like the idea of a superfamily better and out of those three candidates, Poppins is my favorite but it still feels a bit sterile. We can further refine this later on for now we can finalize these ideas and move onto section 5.

For LOD I want this to be a relatively high level of geometric detail and texture resolution. It doesn’t need to be anywhere near the outer limits of the highest tech Unreal Engine renderings but still at a level that is up to par with modern graphic standards and expectations. I envision assets, equipment, plants, and layouts to be pretty high-res with a fine attention to detail and visual sophistication without needing to be life-like or the far end of realism available today.

Material definition should be as high as possible, I want there to be a high contrast between materials and for their relationships to be ultra realistic, the actual visual 1:1 realism of the material compared to the real world material isn’t as important to me.

I think any visual effects that make sense to use should be used. We don’t need to force any more post processing or visual effects than are needed but a nice, elegant, pleasing, and comparable visual effects to the rest of the games realism and graphical sophistication should be matched.

Yes we will need good anti-aliasing.

I think we need to consider performance to begin with, and larger more complex builds and therefore more complex graphical performance requirements will be something we can continue to build on with each future upgrade. For now I would rather limit players from a full end-vision experience in the game in order to maintain a higher level of graphical and visual content and allow the game to grow and build out more advanced features and capabilities as the users and popularity of the game grow.

For grow room/facility interiors, basic structural elements should have a variety of looks that align with their relative real life material. Players will have the option to build out their facilities with a variety of different materials and styles. I envision more of a sandbox with the player having the ability to build out and customize their grow as they see fit. For the most “zoomed out” high level view of this sandbox I imagine different starting points based on the players current status in the game. To begin the players may start in a small residential house and this highest level zoomed out view would be the house just sitting in an endless white abyss and the player could spin around the house and view it from all different angles. Then the player could click on the house and get the next level deep view which I imagine looking something similar to the Two Point Hospital blueprint view we discussed in earlier sections. From here only the first, smallest, “beginner” room would be available (possibly just a closet in a bedroom) but the player would be able to see the rest of this “map” that is available to them to unlock with future advancements. From here the player could then tap/click on the available/unlocked rooms and zoom down to the next level deeper where I envision an interior more POV view of inside that particular closet/room/facility area. This would be the actual sandbox and point where the player could start building out their system. It would be the same idea for high levels such as the warehouse or large scale facilities and we can further discuss in far more detail the individual looks and ideas I have for the different “maps” and “rooms” that would be available if you would like to generate some questions and queries about this.

For the utility elements I imagine them to be visible in the initial beginning levels such as the closet/house grow and for them to be more hidden and tucked away in more advanced levels (behind walls, buried underground, or installed in roofs) where the facilities are built from the ground up to be dedicated only to cultivation purposes. For levels where the utilities could be hidden, I imagine players having the ability to toggle specific views to see and edit their utilities such as water piping, electrical wiring, or HVAC ducting. I imagine the walls, roofs, ground, all becoming opec and see through in this toggled view. We can implement this view toggle for multiple different features throughout the game; this is just one example. For the actual visual elements of the utilities I imagine the same level of realism and scale as the rest of the assets in the game. This means different looks for different materials of piping, different sizes for different size piping or duct work, with possible animation to show flow of water, electricity, or air. This doesn’t need to be a realistic simulated animation but rather a visual representation to help aid and guide players. Maybe once the electrical circuit, or water piping has completed a full route or loop then the flow animation triggers showing players that it has been implemented properly and is now flowing.

I want to try to avoid visual clutter as stated before with the grunge factor but as far as additional assets and features for overall look and aesthetic we can implement these where necessary. I think as long as everything is kept to scale and we allow for ample space within the “maps” then we shouldn’t run into an issue of clutter. We can assess this further as the game develops and builds out more.

Players in these more cozy settings would have a lot more options for personal and “decoration” items. I think the overall look and graphical content of the “map” itself would be more of a set in stone thing that is the same for all players such as the wall/floor material of the beginning maps as growers on this scale in real life wouldn’t have much options for changing or customizing the foundational features of their space, they can make cosmetic and personal touches. The overall map would be smaller and on a less advanced scale with more of the initial structure already being built for the player allowing a more relaxed and cozy experience. As they expand to larger more complex “maps” I envision much more customizable and unique build outs with the ability to design rooms and facilities completely from the ground up to whatever dimensions or materials they see fit.

For the most part I want to keep the outside world or environments out of the game as much as possible. I envision the different “maps” and sandboxes as the extent to which the exterior world will be represented. These will all just sit in the vast white never ending expanse I described earlier, reminiscent of “purgatory” where god comes and talks to people in movies.

I imagine a grid based system that is scaled to real world dimensions and kept in scale with all of the equipment and “maps”. Possibly some type of 1’x1’ or 1m x 1m square grid or possibly even a scalable grid depending on the level of zoom the player currently is in the game. If they are in the highest level zoom out, maybe they have a yard by yard grid and then the next level down they have foot by foot grid and then the next level zoomed down they have inch by inch grid. This is just an example and we can use whatever measurement system we want as long as everything is kept to scale with each other. Players on higher levels building out entire facilities from the walls up would have more of an architectural building system that allows them to build walls in any direction to any length, height, or width. Players could build out however they want within the sandbox that we give them. I imagine similar mechanics to city building games for laying out utilities and major layout decisions, all the way to more of a Sketch-Up type of build out options. Assets I imagine being a drag and drop type of placement system but we can explore different options and mechanics for all of this in later development.

We can use this as a guide to begin our environmental design parameters and mechanics.

The plants themselves should be the thing in the game. We strive to be as realistic and close to real life biology as possible. The plants should be extremely detailed with leaves, bud sites, trichomes, stems and branches, growing mediums, pests and pathogens, deficiencies and excesses, as possible. We should strive for as detailed and close to real life cannabis plants as possible without causing a jarring contrast with the rest of the visuals in the game.

For visual indicators we should be representing every and all of them. All of the ones mentioned here in this section and then more. Not only that but we need to visually represent the combination and interconnectivity of all of these different factors within a player's particular setup. I want to strive for an endless amount of procedural driven subtle differences all based on the actual plant and growing factors, as well as a very very light touch of randomness thrown in. We need to represent this as much as possible visually without causing every plant to look drastically different. They need to be almost exactly the same but with slight variances based on taking into account and combining all the different simulation factors into a cohesive visual representation.

For the color pallet of the plants we need to strive for realism and accuracy to biology and genetic traits. There should be a large variety of colors to represent the large variety of genetic expressions seen in cannabis plants. We need to do extensive research on genetics and strain characteristics to create procedural effects based on real world examples of that strain and genetics. This goes for all visual aspects of the plant from size to structure to color expression to bud formation to trichome amount and everything else involved in making each cannabis strain its own unique creature. This also all needs to be combined with the deep environment simulation to create the almost endless number of combinations possible for a player to experience with their plants based on how they set up their grow and with what genetics and then what strategies they continue to implement throughout the growing cycle. A plant's visuals should change and adapt over time to match this all based on the data from the environment, grow and genetic simulations. These parameters will obviously start off basic and limited but this is the overall end vision that I see. For now we can focus on our current scope and how that will apply to the plants visuals, but as the simulations in the game continue to advance then the visual variability of the plants and their accuracy to the simulations based off of real world science should also advance.

We need to be consistent with all of this and not allow all of these possible factors to cause plants of the same family to look dramatically different. We need to find a balance of consistency and cohesion with the procedural driven possibilities and overall simulation factors being considered.

The overall style for the UI panels and buttons should feel more material design-inspired with subtle depth and shadows and then icons can be a simplistic flat approach.

The overall icon style should be abstract but realistic symbols representing their individual category or piece. They don’t need to be super detailed. I am even envisioning a realistic, modern and sophisticated line art type of approach using the same bright vibrant colors discussed in the color pallet section.

Data visualization will be extremely important as this is a crucial feature of the game play. We need to have graphs, charts, and any other data set expressed in intuitive, easy to read, yet modern and beautiful visually stunning ways. Use of subtle gradients, accent colors, and logical repetitive color schemes to provide highly understandably and user friendly data sets in a visually stunning way. We need to emphasize and highlight key data points without this UI becoming overwhelming or burdensome for the user. It needs to be helpful and a useful tool for the player and not just a gimmick for representing numbers in a visual way.

I think we need to have subtle animations and transitions to maintain an engaging feel but we should not be over barring on the player with excessive responses and delays in the game play due to this. Players should not have their stream of flow in the game play interrupted by having to wait for a transition or animation to finish playing. We need to have subtle and engaging interactivity and guides/confirmation of actions for the user without causing an over stimulating experience with too many things happening at once and popping up for the user to enjoy themselves or get done what they need to get done.

We need to always prioritize a clean, user friendly, easy to understand screen space over an over cluttered and complex set of UI elements. We need to definitely have effective use of dark space and subtle highlighting to draw attention. We should use all approaches of layered tabs, collapsible sections, and pop-up tooltips/windows where each one logically and visually makes sense for the particular feature or game element. We need to use each type and each example where each one makes most sense and not limit ourselves to only one specific one.

I foresee this section needing much revisioning and updating as game development progresses and we start actually seeing these visual elements being laid out and utilized. These are my initial thoughts right now but we can adapt and change and upgrade anywhere we need to along the way when we see a spot for improvement. This should be enough to at least get us started on the UI/UX aesthetics though.

I don’t envision any visualized characters of any kind at this time. This is not something I currently have planned for the future either so I think we can remove this section altogether.

I have no idea about polygon counts or any of these technical aspects, this is where I am relying entirely on AI. I am merely here to generate ideas and help describe and explain my vision but when it comes to answering specific technical questions I will have absolutely no idea. I will be honest I don’t have much of an answer for any of your questions in this section.

After review of the style guide, I have confirmed that it still aligns with my current goals and vision for the game.

To summarize what are the most important visual goals for the farm equipment/building are number one to create a cohesive, coherent, and systematic aesthetic to all of the assets. The second most important visual goal for the equipment and buildings is to create beautiful and visually satisfying assets that really help engage players.

The most critical aspects of how the cannabis plants must look is realism and biological accuracy to the relative real world visual characteristics of each variety. Indica plants must be shorter and bushier, sativa plants must be taller and more stringy appearing just as the real world genetics behave. This is just an example of a very high level strain characteristic but we need to strive for accuracy across all prominent cannabis genetic traits. The second most critical aspect is the ability for the plants to adapt and change over time as the growing stage develops, as the players cross breeds with more and more varieties, as the player experiments with different growing techniques, and as environmental factors fluctuate and adapt over time. This needs to be a reinforcing loop of plant being affected by growing conditions and then growing conditions being affected by plant physiology evolving over time in the game (smaller cuttings have much less effect on grow room environment compared to a large plant late in the flower that transpires a lot more thus creating a more humid environment, etc., etc.) All of this needs to be reflected in plant visuals and behavior but without becoming unrealistic or too dramatic.

All 3D assets must be viewable from a variety of angles, must be placeable in a variety of positions, alignments, and orientations, must be accurately scaled to all other assets within the game to provide spatial cohesion, must be playable and adaptable, must be able to evolve and upgrade over time, must be able to combine and interface with other 3D assets, and there's probably some more I am not even aware or thinking of right now.

For Test Case 1 I tried to use the widest variety of tools for this one. I used Meshy, Sloyd, and Rodin by Hyper3D. For the first example prompt Sloyd by far did the worst by creating an army tank 3D model which in itself wasn't even that detailed. Upon getting this result I decided to continue testing Sloyd with further prompts or test cases. Meshy was able to create 4 different tank models that look pretty good but there were still a lot of logical errors and inconsistencies with the prompt. Rodin was able to create by far the best models for this prompt and all other prompts. The model was not only accurate compared to real world examples but it followed the prompt almost exactly. The ability to preview and regenerate these previews before actually committing to generating the full 3D model and spending credits, is a very valuable feature in my eyes. For example 2 Meshy was able to do a better job with this than the first example and it created some pretty good models, although I fear the price of Meshy may reach a point where it gets too high depending on the number of revisions and assets that we need to create through it. Rodin again knocked it out of the park with these models, creating ultra realistic and beautifully designed pieces of equipment incorporating a variety of materials, textures, colors and realism into the assets that the other models were not able to match. I even tried an Image-to-3D feature with Rodin using a picture of a pump we generated in the Part 2 planning, and it did an amazing job at almost perfectly recreating it as a 3D model. This is potentially an asset generation pipeline if we run into trouble just prompting the 3D models themselves, we can try generating images with other models such as Imagen and then using those outputs to create a 3D model in Rodin.

For Test Case 2 Meshy fell pretty short here not creating accurately looking cannabis plants for the first example prompt. Rodin was able to create a very good representation of an early stage cannabis plant that would provide satisfactory output for our games needs. For example 2 both models were able to create pretty realistic basic plant models but Rodin had a better looking pot compared to real world examples and a better overall model appearance. It did a good job at creating these organic structures.

For Test Case 3 Meshy had much less, at least for the free tier, options as far as customizing what the texture would be. It sort of just auto generates the texture without really any text input from the user. Rodin gives great options for applying textures with a full text-to-texture AI feature, an image-to-texture feature, and even sliders for the PBR strength and adherence to the reference picture. With these tools Rodin was able to create very realistic and convincing textures that seem to be almost endlessly customizable by user prompts and example images.

I decided not to use scanning technologies or attempt to implement Luma AI as I did not see it as necessary after the results I got from the first 3 test cases. Therefore I decided to skip Test Case 4 all together.

Rodin was able to match my style requirements very well, it seems extremely adaptable based on prompts or references given to the system, thus allowing it to easily match whatever stylistic choice the user desires.

Rodin did a good job here but I could see the limitations on using it to create the infinite variations we desire for our game play aspects. This is where your third option here is to use it to create base plant meshes and high quality textures to be used within a procedural system. I do not see it currently being able to fully replace the need for this entirely. Maybe something where we use Rodin to generate the base models of the most basic set of plant genetics, stages of growth, etc. and then use these models within a highly developed procedural system to generate the almost infinite variations we will need. This means we will need to go into extensive research and development into this procedural system as it will be a critical factor in successfully implementing this system. The complexity and accuracy of this procedural system will directly reflect on the games playability and enjoyment so it is of utmost importance that this procedural system is built with as much care and attention to detail as possible. This will need to be a highly organized and demanding project that will proceed at a later time, it is just important to acknowledge these ideas now. I feel this approach with a highly sophisticated and complex procedural system, although very challenging and complex to make, will lead us to a much more elegant and efficient system overall. I am very excited to engage on this project as these challenges intrigue me and are why I like doing activities such as this. We will continue on our current evaluation for now with the thought in the back of our mind that one day we will need to come back to this procedural system project.

As far as technical readiness Rodin has amazing capabilities here. Not only does it offer a wide variety of export formats including game-ready formats like you mentioned, but users have full customization over polygon type, count, UV mapping, LOD, and an insane amount of other features I don't even know how to explain. Not only this but Hyper3D offers an entire tool bag for 3D called OmniCraft which has an amazing suite of products and features. We need to do a deep dive and research project just on Hyper3D and all of the amazing tools that they offer because I feel like this is the groundbreaking tool set we need to fully bring our game development to life. I mean there's even plugins to bring Rodin 3D generation directly into Blender, Unreal Engine, Unity Engine, and ComfyUI all through MCP's or API's. This is an amazing discovery that could potentially shatter how we develop this game and bring these complex ideas and features that I have proposed in my brainstorming document. I will compile a very complete and detailed research report for Hyper3D and all of its available tools and share the results with you.

I feel Rodin is very controllable and its variation is very good. Its ability to follow prompts even for slight changes is remarkably good.

Rodin is extremely advanced as far as texturing is concerned. I feel like it will be able to fulfill our needs quite well.

This feels like a very usable workflow but I would rather use it as back up as it does involve extra steps and time that may not be needed.

Rodin has costs associated but I feel like its feature set is robust and useful enough to justify the potential costs, I will provide more detail on this in my research report that is attached.

Let's go step by step through section 4 to gain a better grasp of how this applies to our game and the process we will be implementing. But before we begin we need to establish that there will need to be zero animating of characters, animals (besides plant pests), humans/humanoids, players, and anything else of this sort. There will be absolutely no characters or anything like this involved in this game so anything involving this or animating for this is obsolete and we can disregard it. That being said we can remove any of these sections or anything referencing this from Section 4 and continue moving forward with a much deeper dive into part by part of Section 4 to fully compile a great report for the use of AI in animating aspects of this game. The ways in which animation will be needed in this game are as follows, subtle plant movement from breeze or fans, growing medium changing as a watering event happens, water flowing in a hydro system, water spinning in a mix tank, and any other necessary real world movements of our assets that we will need to think about. Another big source of needed animation will be all of the UI/UX aspects. Pushing buttons, moving assets around, cosmetic visualization of resource movement, acknowledgment of completion or different construction references, different menus and pages moving around/opening and closing, sliders, and anything else that could be thought of in this UI/UX context. It is from these vantage points that we need to design the game plan for utilizing AI for animation within this game's development. Now let's begin our deep dive of Part 4.

Style guide alignment was pretty good. Within Uizard there is an option to add your own branding which allows for great adherence to custom styles. The models adhered pretty good to specific colors and design requirements. For elements I was able to get the best matching results from ChatGPT actually. It was able to constantly follow the prompts the best. For layouts Uizard and UX Pilot both do a very good job.

The generated elements were pretty clear of artifacts and issues but they would still require small amounts of cleanup. ChatGPT was again the best in this regard with the only refinement needed is seperating elements within the same generated image or removing backgrounds but these are all pretty easy steps to follow up with.

Yes the generated lineups were very logically organized and provided beautiful looking designs. The proposed flow seems pretty intuitive but I definitely need to learn the workflows and full abilities of these layout tools much better to really utilize them to their full potential. For now I can see that they are capable but I lack the knowledge and skill set required to fully take advantage of these capabilities. To me Uizard had a more intuitive layout and workflow as well as a better looking interface and AI system. I feel these tools will be able to do a very good job at handling the complexity and density of the data although I did not test this to the most challenging limits of our game.

I am not entirely sure of the role of Figma in all of this but I do know that Uizard has direct implementation with Figma.

When generating sets, ChatGPT was able to create very consistent style, quality, and detail in all of its elements.

Gemini, ChatGPT and Leonardo are much easier to use and are quite intuitive. The UI tools are a bit more complex to use and have a much steeper learning curve. The tools are very responsive to the prompts. A bit of engineering is needed but not too much. I had pretty good control over the final input.

Yes, based on these results the proposed hybrid workflow seems feasible for Project Chimera. Gemini Imagen struggled a lot with the icon generation and therefore I pivoted to ChatGPT which gave me much better and more accurate results. I tried Layer AI for the first time in this step and it was actually very very impressive and quite possibly my favorite given the advanced options available within it. I think Uizard/UX Pilot are very useful to get ideas out and visualize these complex UI elements in a very user friendly and visually pleasing program. Especially when I have very little experience or knowledge in creating these UI/UX elements, the more examples and visual feedback that can be generated for me by AI the better because the one thing I am very good at is describing what I want the final result to look like, I just need as much help as possible for generating ideas and realizing what is actually possible with my limited experience. I'm not really sure how these compare to Figma or how they could potentially integrate and build upon a workflow that utilizes Figma.

I feel like I need to clarify my vision for this better and we can regenerate this breakdown of Section 6.1 and the rest of Section 6 to follow.

So my overall vision for this aspect of design and building farm layouts is different than I feel like is being described above. I envision pre-made "levels" or "maps" that all players will progress through. These levels will all be exactly the same for all players, thus limiting the scope of our initial environmental generations. All of these levels will essentially be sandbox, player construction playgrounds that are composed of the exact same "base" starting points that the players customize themselves in game. This is one of the main and most entertaining components of my envisioned gameplay is the tedious and rewarding project of designing and constructing your own grow setup the best way each individual user sees fit. This is what will generate the diverse farm layouts & building styles, is the users engaging in this main game play aspect. What we need to design and build are these different sandbox environments for the players to be able to experiment within. The most visually demanding "level" I envision is the starting level. This will be the smallest map in the game consisting of just the area of a residential house existing in the great white expanse I described before. Not only will this map be very small in this regard but this residential house model will be exactly the same for all users in appearance and functionality. I am not sure if players will ever even have the ability to actually view the entire house from an outside "birds eye" view as this isn't necessary for game play. Players will need to have the Two Point Hospital/Campus layout type of view of this house, but again this layout and structure will be exactly the same for all players. I envision a layout "blueprint" view of a residential house consisting of a few bedrooms, closets, bathrooms, garage, and other basic elements of a typical household composition. Each "room" in the layout will be another area that the players can utilize as a "grow space". To begin, only a small bedroom or closet will be unlocked for the player to access and this will be their first true sandbox and building environment. Once they click on the unlocked area in the house, the game will transition to this now sandbox construction mode within this room where the player will have ultimate control and choice over how this build out goes within the game's features. Players would be limited to just the dimensions of this room to move around in and build within and as they progress and gain more points or whatever we decide then other rooms in this house will become unlocked, and therefore giving the player more grow space to expand their operation. To transition to another room within the house the player would have to toggle back to the layout view and then click on the room they want to transition into from there. There will be a zoning feature of the game for players to dedicate specific areas of their grow to specific needs such as Veg, Flower, Moms, Clones, Dry Room, Cure Room, etc. Each zone would serve its own unique purpose and it would be up to players to strategically design their grow spaces to optimize for these different zones. They could gain benefits from proper zone placement such as higher efficiency (yield or potency) or they could be punished for improper zone placement such as lower efficiency, higher risk for pests or viruses, etc. This is the basic concept for the environment of this first map without going into drastic detail over assets placement or decorations and visual eye candy type of stuff. I believe our current toolset is more than robust enough to generate all of the assets needed for this. It is just a matter of designing what we need, generating the assets, and building it out in an actual game engine. I envision this house existing within this game engine that supplies all of the environmental physics and algorithms that we will need to create. I feel that all these different maps or levels will all reside within this all encompassing game engine environment allowing us to re-use these same settings and configurations across the entire game. Once players exhaust this residential house level to its fullest extent by unlocking all of the rooms in its layout, then a new level/map would be unlocked. This would introduce a whole new dimension to the game's building and construction aspects. For this level I envision giving players just a giant open warehouse to build their grow completely from the ground up. This warehouse would exist in this same endless white abyss discussed earlier and to begin in will just be an open roof, massive concrete warehouse floor with big metal support pillars spread out in a grid pattern throughout, reminiscent of a real world large scale warehouse. From here players could build however they want from placing walls and building rooms completely from scratch to designing and placing large scale indoor growing setups from equipment to plumbing to electrical to HVAC. The same zoning concept would apply at this level. What we would need to generate would be the assets for the players to use in building out their setups and in this case that includes walls of different materials and sizes, roofs of different materials and sizes, piping and ducting of different materials and sizes, and the very large amount of assets needed to give players a variety of options to build whatever kind of setup they want. We need to figure out a way to build these types of sandbox environments for players that still adhere to our desired physics, game mechanics, genetic and biological procedural systems, and everything else that will go into this. The only other expansion outside of this warehouse level that I see besides increasing the size of a players warehouse footprint would be to add the option for outdoor setups but I think this would be better left for a later game update with the amount of development it would take to accurately implement that. So with all of that brain dump on my thoughts on the high level game environment vision I would like to hear your feedback and regeneration of Section 6.1 and Section 6 as a whole.

I am in the process of researching the development of a video game I want to create. At this point I have brainstormed my overall thoughts and vision for the game, created a detailed research report on the use of AI to assist with visual aspects of the game (including a general style guide), and now I am ready to continue on the journey of formulating a game plan for the execution of this games development. I want to leverage AI tools as much as possible for this project as my knowledge and skill set with game development, programming/coding, marketing, and everything else that is involved from taking an idea from scratch to a fully functional and deployable video game for the world to enjoy. I have a very good grasp on the ideas for the game and the overall logic that will support all of the mechanics within the game. I just need help leveraging AI tools to bring these ideas and thoughts into the actual game development process. I want you to analyze my documents that I have created so far and then decide on where we are in the overall project development cycle and proceed to create a highly detailed, extremely in depth, maximum resolution research & game plan for developing this product to its fullest potential. I have a pretty well established pipeline and workflow for generating and compiling the visual aspects of the game in my initial report that is attached but from here we need to take it to a whole new level deeper and really break down the core mechanics of digital game development through the leveraging of the most recent and advanced AI tools. Like I said I have a very good grasp and idea of what my vision is for this game so any clarifying questions you may have or any details that I need to fill in for you is something I want to do and I encourage you to ask me questions and challenge my ideas so that together we can produce the best possible plan for development moving forward.

This is a great breakdown, I will answer all of your clarifying questions in Phase 1 Section 3 to my fullest ability, allowing you to update this plan based off of that and then I would like for you to generate these same types of clarifying questions for the rest of the phases. I understand that we may need to set the foundation in earlier Phases before we can begin to think about the proper questions to ask in the later Phases but lets do our best to go Phase by Phase one at a time to fully break each one down and compile the most comprehensive plan possible.

For the physics abstraction I am very comfortable and prefer approaching this with the more basic approach. I would rather have a larger number of physics parameters that can interplay off of each other and the plant biology than a fewer number of physics parameters that accurately simulate real world CFD. Granular simulation can be something we progress towards in much much later versions down the road. For now I would rather predefined calculations for everything and ensure that we can logically build a system that incorporates all of these parameters into one environment. The calculations can start off more abstract and less accurate and gain sophistication over time as we start to develop actual game play systems and can truly test the playability of these different calculations. At the end of the day I want to create a fun and engaging game for the players to enjoy and I am willing to throw real world physics out the window in initial versions in order to properly develop a fun and challenging set of physics parameters when everything else is taken into account. I will work on creating a document that outlines all of the proposed physics parameters that we will need to figure out calculations for and what main categories they would be group together in. For the genetic complexity model I would like to take the opposite approach as what I just described with the physics parameters. I would like to begin with a much more limited set of genetics for the players to use but these genetics will have close to the full complexity that I fully envision. We can start with weighted averages and probabilistic outcomes but I would really like to take the time and effort to develop this aspect of the game into something major. I would rather focus on a really really good implementation of a basic set of genetics (no more than 5 different genetics total) and then allow use time to develop more and more as we upgrade the game. I also see this as a strategic marketing move as it will constantly keep players engaged by them, always eagerly waiting for the next "drop" of new genetics to be available in the game. There is also the idea I have that a few basic genetics to begin with can lead to a massive pool of varieties through player breeding and cross pollination. Although this could quickly become overwhelming and take away from the core game mechanics if we let this run too wild, it could also be a very interesting and valuable feature if we can implement it correctly. The more complex this simulation is while still positively benefiting the user experience, the more entertaining and fun this game will be. For the marketplace, the more I think about it, the more I feel like this entire feature can wait until a later version of the game to be implemented. Although it is a very valuable and unique feature, I feel like it is not fully necessary for initial launch and will be an awesome upgrade feature to please players after initial launch and they start to look for new things to do. I want the marketplace to be super in depth and useful for players. I would rather wait and develop this system to its fullest abilities when the proper time comes for this game. For player progression I am at a bit of a stump when it comes to this. I have played and enjoyed games with all of these different progression types and therefore I can see the value and entertainment they can bring. I would like to take more time to really consider this aspect of the game and all of the possible paths we could travel down. I know this will need to be implemented in the initial game launch so it is something we will need to decide sooner than later but for right now I am not ready to commit to one particular method. I think this would be another great area for further research, reporting, analyzing, and planning to really engineer a complete and cohesive progression system that is rewarding, challenging, and entertaining. For the cozy vs professional I guess I may have overstated this aspect. Although I want players to have different and unique experiences in the game and for them to decide on the level of professionalism or lack thereof that they choose. I do not see these as fundamentally different gameplay paths mechanically, nor do I see it as a different set of challenges or parameters. Its merely just a slightly different aesthetic/scale, all decided by the player. Outside of the questions you asked, other general points I would like to make are that I plan to scrap the AR feature entirely as I do not see it cohesively fitting into this game play as I begin to plan it all more and more. For the game engine I have pretty much decided on Unreal Engine unless you think this would be the wrong way to go. For AI coding assistants I plan on primarily using Cursor with the TaskMaster MCP to generate, compile, organize, test, and debug all of my code for this project. This is my initial feedback for this version of Phase 1.

Well it will be different for each player based on their progression in the game but the main idea for the immediate feedback and satisfaction a player will get is the ability to observe the plants they are meticulously growing and just through visual cues alone get instant feedback and possible satisfaction on the plants health, development, genetic expression, recovery, and just general condition of their plants. I say possible satisfaction because if they player had messed something up with their grow and didn’t catch the mistake in time, then upon coming back to their grow for a gameplay session they would observe their plants in a worse condition than before and thus creating a not so satisfying feeling but rather creating a new challenge and a core gameplay lesson to be learned and improved for next time and next grow cycle if they mistake is that severe. For players just starting the game for the first time or for experienced players starting a new “save” then this initial gameplay session will be a bit of a different experience, especially for the first time player with a lot of core game play logic and rules being explained and offered up to the players to learn without actually having to make them go through a tutorial, exactly how the document explaining Satisfactory’s core gameplay learning and development process except applied to the cannabis growing theme for my game. Experienced players starting a new save may not have as much help after this initial very first starting round but this is something that can be developed further later on. For the players already with a developed game coming back for another session, I imagine the main things they will very likely be doing are the basic cultivation check-ups and routines of checking overall health and condition of the plants, moisture levels to determine the need for watering, plant work and typical maintenance, and other core cultivation practices. The feedback and satisfaction the player will get will be based off of trying to optimize for the different parameters they feel lead to the best outcome they are looking for in that particular crop. They will have the feedback of seeing moisture percentage, grow temperature, humidity levels, pH & nutrient levels, and all the other parameters involved in advanced cannabis cultivation. These parameters will start off basic and limited and progress and unlock deeper and more complex features and systems as the player also progresses in the game thus allowing the players to use these deeper and more complex parameter optimizations to further enhance and optimize the crop that they are growing in the quest to always improve and grow a better plant and genetic. Players should be able to over time and over the course of the crops life cycle to see the steady and constant development and progress of the plant itself and use a lot of these visual aspects to really determine possible issues or positives that the player is experimenting with. This combined with the growing parameters constantly needing to be kept dialed in will be the core immediate feedback and satisfaction that players will get in this game. Before, during, and after a grow cycle, players will also be able to see all aspects of the plants biological parameters not only visually by looking at the plant but also scientifically by looking at data from the plant such as cannabinoid levels, terpene levels, yield, stress and pest tolerance, and any other factors that we decide to develop. This will be the main thing in the game that drives players decisions for plant and genetic selection. Deepening on what specific characteristic the player is looking for, they can observe the level in the plants they are currently growing and make their decision based off of that and breed and select plants using that. This scientific data and ability to see and test different plant attributes will also be something that starts of basic and progress naturally with the players progress in the game giving them more sophisticated and advanced testing abilities and this giving them more data and information to make their decisions from and hopefully in return grow better or more optimized plants for what they specifically want. The key factor through all of this is deep uniqueness for each player depending on the choices they make and the path they go down genetically and with building out their grows, this allowing new possibilities for every player to explore based off of the experience they want to get out of the game. This will also tie into one of the main competitive and also entertain aspects of the game the propose and that is online leaderboards comparing players plants and grows and recognizing the best. This can be highest THC, highest yield, most efficient use of resources in grow, most plants, most total weight out of a grow, highest terpenes, best overall (THC & Terpene level) and so many more that we can brainstorm later or eventually let the community of players decide on what they think the best competitive metrics would be after they play the game and gain an understanding of the mechanics and what would be fun challenges.

I envision the game having different “modes” possibly differentiated by different views. So for general gameplay and the core cultivation mechanics I plan on this being the main “mode” and area of the game that players spend the most time in. This will have different predefined view points (I envision a system similar to Google Earth, where players can scroll to zoom in or out on the overall grow, then if they want to perform actions or see this individual plant UI that we are planning right now then they click into that grow tent/room/row/bench/etc. very similar to how Google Earth street view works and if players had a big enough grow and need to go down to the next section of plants then it would automatically jump a predefined amount down to the next section in the same way Google Earth street view jumps to the available spots that are already predefined) that the player can go between depending on what they want to see and what actions they want to take. The single plant UI would come up if a player was in the “street view” mode and clicked on a specific plant. The UI would be to the side so that the plant was still visible and the most prominent on the players screen. The UI itself would contain basic information in the early game if the players had no equipment for testing or ability to get this data then it would just be simple information such as plants age, strain name, overall health status bar (1-10 scale) and any other entry level data points that could be collected without any tools or equipment. As the player progresses and unlocks new tools and equipment such as sensors or meters then this UI will reflect these data points in relation to the tools available to player and also the players action of using or setting up the tools. All manual data will appear in this UI with the date and time taken so that the player will know how long its been since that manual data has been collected and if it still has any relevance to the current plants data points. If the data points become too overwhelming or too extensive we can think about developing specific tabs in the UI for different categories of data such as “water” “nutrients” “temp” and anything else that fits into this idea. I envision players having an inventory of tools and equipment that will extensively grow and evolve as the player progresses in the game. Each tool or piece of equipment would have a specific action and the player would select this tool from their inventory then perform this action on the specific part of their plant or grow that it applies to. These specific actions and mechanics of all the different tools and equipment can get developed and brainstormed later, this is just a general high level explanation of my general ideas for this aspect of the game. For interacting with environmental assets and equipment I envision the same process for having its own specially view and “mode” where if a player clicks on a piece of equipment it toggles a specific close up, interactive, predefined view for that piece of equipment and all of its necessary controls and functions would be accessible in this view and mode. When a player triggers a change or turns something on or opens or closes something then there should be logical, elegant, and subtle animations or changes in the UI/visuals for the player. It should happen at a logical and natural speed for whatever action the animation is representing. For example a fan turning on should start of slow and build up to a consistent speed, but a small LED light on a piece of equipment should turn on instantly when toggled or turn off instantly when toggled, so it should match would real life animations of these assets would look like.

I envision the level of this initial overall health status bar to be completely determined by the game based off of its underlying simulation factors. The game should have its own reference for how healthy each plant is based off of all of its simulation factors even if these factors aren’t yet addressable or apparent to the player in this stage. This is part of the challenge of this stage of the game and also part of the exploration and learning process for the players. They have to rely more on their ability and skill to visually determine issues with their plants and not rely on meters or tools to give them the answer. This is also part of the initial repetitive manual action tasks that the player has to deal with in the begging stages of the game and what helps drive them to build more sophisticated and automated systems in the future so that they can have a more clear understand and precise details on their plants health and hopefully be able to better adjust based off of this and progress in the quality and health of the plants they are able to grow with this development in the game progress. That is where the comparison to the progression and natural teaching through gameplay that Satisfactory provides is really big. The plant helath indicator will just be a basic helping tool given to the players in the early stages of the game to help guide them through a more optimized growing cycle and help them learn the positives and negatives of the different actions they can take. The visual appearance of the plant should match this plant health indicator bar and visually should match the reasons behind the level of the indicator. If the indicator is at the low side because the plants are too dry and need water then the visual appearance of the plant should be wilting and dry with its severity of the visual stress being correlated to the level of the health indicator. Or if the plant is not receiving enough nutrients then the plant should appear yellowing and with a nutrient deficiencies to a correlated level to the health indicator. Underlying in the games system, these will all be ways to represent the same situation and that is the health of the plant and all of the visual health factors should be accurately correlated to all of the scientific, data driven, and UI based health indicators so that the underlying understanding for the games system is a certain set of functions to calculate the overall health for that plant and then the visual representations if thats the plant itself or within the UI are just derived from these functions and accurately track with them as the player changes parameters and experiments. Obviously taking a logical and natural amount of time to take effect based of real plant biology and physical growing parameters. The health indicator bar level is determined by the games simulations and underlying algorithms, it has nothing to do with the players own thoughts on health, but it should very much accurately reflect real world health visualizations for cannabis plants. I really like the idea of including a visual observation log into the individual plant UI feature, that is a great idea.

For organizing the visuals and adding these manual data entries into the plant information UI maybe we could consider having sections for these parameters already dedicated on the main UI page but leave the value blank until the player has the ability to collect that type of data. This way it shows the players that there is more information and data that is possible to collect and use but they need to figure out and progress more into the game to learn how they get those numbers. I feel like the main UI page should only display the most recently collected data for each category and then we can have tabs for the specific categories that have all the previous collection points and have more intuitive and visually dynamic ways of view the data such as graphs and charts.

I do not like the idea of visual indicators on the plants themselves. I want the challenge of monitoring and identifying issues within your crop as part of the initial difficulty and game play system. This initial inconvenience of having to manually monitor your plant health will keep players from expanding to bigger setups than they can manage without any automated data collecting tools. It’s also part of reinforcing the importance of dialing in and monitoring your environmental and growing conditions by forcing players to manually monitor the visual health of their plants and seeing what effects their actions have. The goal isn’t to have players grow top tier, amazing crops on their first cycle, in fact it should be impossible for them to do this and it should be part of the challenge and the motivation to continue progressing to further in the game so that they can gain the tools and equipment and ability and knowledge of proper plant condition indicators to grow the best possible crop they can. As players progress in the game their will be more tools and equipment available to them to allow them to quickly scan a crop of hundreds of plants and see of any are dry or need nutrients or anything else such as this but in the beginning stages of the game this is a core limitation for players.

For tool interaction flow, I imagine it being very similar to how you laid it out with the player identifying a need, selecting the appropriate tool from their inventory, the tool would appear in view of the player as if they were holding it and then the player can interact with any other asset that the specific tool allows for. Some tools may interact with plants while some may interact with equipment or the grow space itself, this will be decided in the development of each individual asset. When the player wants to perform the action with the tool, they will need to be “holding it” after selecting it from their inventory, and then proceed to select the asset they want to perform the action on. At this point the view will change to a new “mode” where the view is specific to that particular action on that particular type of asset. The view would be a zoomed in screen pretty much the same as described earlier for controlling and interacting with equipment but specific for whatever the user is doing at the moment. For example if the user wants to collect pH data then they will need to have the pH meter unlocked and in their inventory, then they must select the pH meter from their inventory, be within a reachable distance from the plant they want to sample, then select the particular plant they want to sample and at this point the UX would change to this new action mode and view, where for pH it would show a close up view of the pot and substrate of the plant with the pH meter sticking into the substrate, the display on the meter would display the actual substrate pH value with subtle animations of the pH value adjusting and changing on the meter’s display to the value of the substrate, the player can view this value from the meters display and the game would also automatically log it on that plants info UI. The player would then hit a back button or click somewhere away from the plant to move back to the original gameplay mode and view where they would again be holding the pH meter and can proceed to select another plant to sample or can select another tool to use from their inventory or just put the pH meter away and move on to a completely different type of task. Another example would be selecting pruning shears or fiskers from the inventory, going through the same plant selection process as the pH meter tool and then be brought into the action mode and view for that tool with that type of asset which in this case is shears and a plant to trim, so the view in this case wouldn’t be the pot and substrate as in the previous example but rather the overall plant structure with its leaves and branches, giving the player the ability to perform the action of defoling and cutting back the plant by clicking on the specific part of the plant they want to make the cut with their tool at. This is something that we would have to work on figuring out a good system for automation in later game stages when a player has hundreds of plants to take care of and doing such a task manually with each plant individually would not be a good game play mechanic. These are just two basic examples for how tool interaction flows would work but this basic concept of selecting the tool from the inventory, being within actionable distance from the asset, selecting the asset, going into the action view and mode, performing the action, backing out of the action view mode, and finally continuing to another asset or different task all together, is the same loop and flow that would be in place for all tools in the game. For tools that are for measuring or interacting with the general growing environment then there will be no specific area required to perform actions, as soon as the player selects one of these tools from their inventory, it will instantly go into its action mode and view where the player can view the sensor or tool similar to the pH example before with the display animating the represented value with realistic and natural movements. These will be based specifically off where the player is currently located when they selected that tool from their inventory and this location will affect the value that they get. For example a thermometer might read a lower temperature far away from the canopy and lights but if selected right next to one of the grow lights then the value displayed in the action mode view would be higher to reflect this accurate value deviation.

For the Google Earth street view mode, the player will still have to select the specific plant or asset they want to interact with further. This will just be done through a click and the game will go into what action mode view or any other predefined view that we develop, then backing out of this view and back into the overall section where players could select other plants within that area or move onto the next section Google Earth style to select any of the asset within that specific area.

Yes I very much like the idea of hints, tips, and guides along the way to help inform and lead players in the right direction throughout the early learning curve of the game and these types of mouse-over tooltips and help for what a player would need to gain insight into the specific blank field or aspect of the game would be incredibly valuable and should be implemented in any logical and natural way.

The specific action mode details such as these for pruning can all be worked out and brainstormed in a separate session as that will need to be its own dedicated project considering the scope and scale of the number of these unique and specific action modes we will have to design.

For hour to hour gameplay I envision the main goals and motives for the players being a loop of completing the routine, daily, minute-to-minute activities and gameplay mechanics in order to complete daily or progress based goals, challenges, objectives, tasks, etc. in order to receive rewards that then allow upgrades to different aspects of the players progression (either player ability or tool/equipment unlock and purchase) thus unlocking and opening up new actions and activities to complete and reinforcing and continuing the overall loop. This minute-to-minute activity completion leads to further progression in the game this allowing the player more abilities and options for optimizing and evolving their grow on an hour-to-hour basis, which in turn will also reinforce the minute-to-minute gameplay by creating more and more activities to be completed. The hour-to-hour gameplay will really be about building out your setup, optimizing all aspects of it, going through trials and experimentations to gain more insight and knowledge, and using that to build our and optimize your setup more, thus creating a constantly reinforcing gameplay loop. Players will feel accomplished after optimizing and building out their system to the best and maximum capabilities based off of their current progression and general knowledge of the gameplay mechanics to build the best system they can and feel good about the future prospect of their crop and eventual growing career and genetic grandmastery.

1. I think these goals should be explicitly given to the player either as clear objectives. I would like to have a cohesive, creative, and realistic underlying logic and "story" around the world in the game but we can develop this logic and "story" and how it applies to these objectives both in their own separate sessions. For now lets just finalize this concept of clear, story influenced objectives as the overarching and basic idea for the nature of these goals. The game will surface these goals in an logical and creative way that is a creative link to the in game world's "story" that we can brainstorm further in later sessions. The timeframe of the game is one of the key core mechanics that I still need to figure out as I am conflicted on how this concept should be implemented. I don't want players to have to wait the real world length of time to complete a growing cycle as this takes months, but I also don't want to make it so fast that its can be exploited by players as a flaw in the core gameplay loop. I have considered the ideas of a player adjustable scale for time so they can decide how the in game time takes compared to real world time. The simple concept of making the possibility for issues and negative consequences to happen at a much faster rate relative to the players speed up of in game time but I feel like this will also eventually be figured out how to be exploited by players to become obsolete as a defector. I am struggling here trying to develop a entertaining, realistic, and evenly balanced & fair mechanic for handling time in the game and this still needs to be further defined more.

2. I like all of the proposed rewards in this section with the inly exception being that I think new seeds/clones/genetics/etc. should all be acquired by breeding, trading with other players, or through in-game "season" drops and should not be a reward for completing goals or objectives. I think it will be a lot more fun, entertaining, and customizable for each player if we give players the ability to choose their unlock and progression path through whatever design means we need to develop. The skill tree, research tree, equipment tree, etc. are all good progression ideas but we should attempt to innovate further on this to develop something the truly adds value and engagement to this game specifically.

3. All aspects proposed in this section are pretty much exactly what I envision. The early game build out would involve all of those aspects you listed including the new need to balancing resources and not overwhelming their current systems capabilities. I like this general example idea for the early game experimentation and optimization, these are exactly the kind of self realizations I want players to be making in these early game play scenarios.

4. A player can end a typical session feeling like they made progress by engaging in any one or combination of the aspects you listed here. I feel like the main one will be to have sense of comfort in leaving their setup and plants unattended until their next gaming session. Maybe this can play back into the core time mechanic that I mentioned needing to develop earlier. When a player playing the game, the in game time will move faster relative to the real world time but then time spent away from the game will be treated equally to real world time so that 12 hours away from the game in the real world equate to 12 hours away from the game world as well. Giving players the ability to gain a since of accomplishing their daily cultivation tasks for maintaining the healthiest and best possible plants, after optimizing their setup with any new equipment or abilities, after exhausting all of their current resources and ability to progress further, they must finally feel a since of comfort and security in knowing that they can turn the game off for a certain amount of time and their plants will be the same or healthier then we they left. Just like leaving a real world cultivation setup or grow for the day, the satisfaction is in accomplishing all of the objectives, tasks, and optimizations possible for that day in order to guarantee the best possible chances for future success, then that anticipation and excitement for seeing that hard work and daily success build up into the cumulative end goal of the highest quality and best yielding genetics possible. The ultimate satisfaction/payoff/reward comes from finally harvesting the plants that the player has meticulously worked so hard to grow and optimize and seeing the results from all of that time and hard work, knowing that this new enhanced genetic will open new doors and allow the player to progress even further in the game and continue evolving their always growing cultivar and breeding program.

1. For Baseline Time scale I am thinking a good starting point would be 1 week of in game time equaling 1 hour of real world time. This is just going to be the starting point as I feel this is the best scale to use for now but as game development deepens and especially as initial versions of the game become playable and testable, this time scale can be subject to change and adjustment to further refine it into its optimal ratio. At this level a full grow cycle could take anywhere from 8 to 24+ hours of real world gameplay time which I feel is a good balance of challenge but still a rewarding payoff.

2. Player-Controlled Time Acceleration will have a few different levels available initially with these options also being fluid and subject to further change and optimization as testing and game play begins. For initial levels I think “real-time”, 0.5x, 1x, 2x, 4x, and 8x would all be good starting points as these ratios play into the week to hour scale nice and evenly. The “real-time” time scale would be for players that want the most authentic and realistic experience as this would be an exact 1:1 representation of game time and real world time, every hour of in-game time is equivalent to 1 hour of real world time. The 0.5x level would be for players that want a slightly accelerated game play but not as fast as the baseline level. 1x would be the baseline level that we talked about above. 2x would be 2 weeks (or 15 days) of game-time for every 1 hour of real world time which I feel is a good next level beyond the baseline timescale. The 4x level would align to 1 hour of real world time being equal to 1 month or 4 weeks (30 days) of in-game time which I feel like is a nice arbitrary ratio that players would enjoy. And finally 8x would be the most extreme with 1 hour of real world time equating to 2 months (60 days) of in-game time, which in theory would allow players to go through a full grow cycle within two hours of real world time gameplay. I envision the UI controls for this being a slider with predefined levels that it snaps to as you move up or down and these levels on the slider would match up to the ones I just described. Even though it's not totally accurate to a real world calendar, for the simplicity of how the math works out, let's use 6 days for a week, 30 days for a month, and 60 days for 2 months, and like this for every month of the game's “year”. This 30 day and 60 day timeline will enable us to perfectly match it to the 60 second minute and 60 minute hour with our time scales and different levels. Baseline would be 1 week (6 days) of gametime to 1 hour of real world time (1 day : 10 minutes); 2x would be 15 days or 2 weeks to 1 hour (1 day : 4 minutes); 4x would be 30 days or 1 month to 1 hour (1 day : 2 minutes); And 8x would be 60 days or 2 months to 1 hour (1 day : 1 minute). I think scaling the game time levels in this way will be an intuitive and useful way of developing the time mechanic.

3. I believe the consequences of time acceleration should be based around logical and natural challenges and problems that a grower would run into if not given enough time to properly care for their crop. For instance, speeding the game up to the max 8x mode would mean that in game time is moving at 2 months for every real world hour, or approximately 1 game time day for every 1 real world minute, which would be an extremely hard pace for a player to maintain quality and accurate crop care without significant and very reliable automations in place. Daily tasks such as irrigation, pest and disease scouting, growing condition evaluation, tracking intra day changes in crop and environment variables, etc. All daily tasks such as these and any other mechanic we decide to build into the simulation will all be designed and created with this pacing and trade-off in speeding up the game in mind. I believe resources and other expandables should be consumed and depleted at a consistent level across all time scales and this should not change but play into the challenge and trade off of speeding up the game. If a player only has a big enough water reservoir to facilitate a few days of irrigation without needing maintenance then the player would have to continue dealing with this maintenance task every few minutes which in itself would become a trade off. Also if a player only has so much fertilizer in their inventory and need to mix up a new tank every few minutes then this fertilizer reserve in their inventory can quickly get depleted within a few minutes and cause a period of time where the players crop would go without any fertilizer until the player can resolve this issue, and at an accelerated time scale the rate of days passing with this issue continuing can accumulate very quickly if the player is not observant or not fast enough to act. So the ideas around limiting the time acceleration and helping to discourage abuse is to implement a buffer for when players change their time level. Maybe buffer isn't the right word, but the system I imagine is something where if a player wants to change the level of their time scale, the game will enact an automatic and mandatory amount of time that the player now has to stay locked to this new time level, not allowing them to quickly revert if they notice their conditions quickly degrading from the accelerated time. This will keep players from causally using this feature as an exploit and force them to really think about and commit to speeding up the game if that's the risk they want to take. I also imagine the same kind of “buffer” for when the player wants to decrease and slow the time back down. There will be an implemented amount of time that it takes for the time scale change to actually take effect in the game world, further limiting its ability to be used as an exploit. This is particularly true for players that would want to speed up the game rapidly and then try to quickly slow it down upon this first sign of a problem, fix the issue and quickly go back to rapid speed. The game would eventually slow down to the level they have chosen, but not until after this “buffer” period, and by that time (especially with a highly accelerated time scale) the player's crop could be in severe danger. So players would really have to make sure speeding up the game and for how long they want to extend this period for is a decision they do not take lightly or without weighing all of the potential consequences. We would obviously need to implement warning screens and alerts that explain these consequences whenever a player goes to use them.

4. I want to rethink the way the offline time progression is dealt with and place a lot more control and choice into the players hands with this decision. No matter what the game and its underlying simulations will behave completely equally and uniformly across all users and at any point of gameplay or offline time progression. With that being said, when developing this offline time progression mechanic I believe players should have the choice for the time scale and its level to be whatever they determine, if that is an accelerated time scale and all the way down to completely paused and stopped so that no time is passing in the game while a player is away. This way players can decide and have the ultimate piece of mind when exiting the game and saving for the session that their farm is behaving exactly how they want. If a player is just going to be gone for a few hours and wants the simulation to run for that amount of time so that their crop is ready to harvest when they get back, then they can do this, but if a player knows they will be gone for multiple days and doesn't want to worry about their crops while they are gone, then they can completely pause the game while away and be ensured that their crop progression and state of their grow will be exactly is how they left it. This leaves the choice up to the player and gives them the option and risk/reward of leaving the simulation running so that their crops can progress in the background and not have to spend in-game time waiting for plants to grow and complete a harvest cycle. But on the other hand also knowing that if they do not come back to check on them in time and their system doesn't have robust automations and failsafes then their crop can be completely lost when they get back. I envision the most “hard-core” “authentic” players will always leave the game in “real-time” mode and never pause the simulation while offline, thus creating the most realistic representation of a growing setup as possible with the simulation always operating in a 1:1 ration with real world time and the simulation never pausing even while offline.

5. I believe all of these growth and cultivation cycles and stages should be treated the same as the rest of the simulation with all of these processes taking the equivalent of their real world timeframe and mapping it to whatever in-game time scale they are using. This seems like the most logical and “accurate” way to handle this mechanic within the simulation. Growing cycles and post-harvest stages are all treated under the same time-scales and acceleration mechanics as everything else in the game. Players can then choose if they want to spend the extra time in veg to get bigger plants overall, causing them more real world time and thus creating this balance and payoff concept built into the time mechanic. The same goes for post-harvest activities like curing. A player can experiment with curing times and note the difference in quality by the difference in overall time curing and then base their decision of the payoff of spending more time curing in order to have the payoff of increase quality ( up to a realistic and biological point before quality then begins to degrade again).  
  
6. Again, I think most of these processes and aspects of the game should follow as closely as possible to their real world timeframes and scales (within a fun, playable reason) so that they accurately reflect. The only one mentioned here that I see on its own separate timeline and scale are the “season drops” as these will be timed up to real world dates and times. The season drops will be for all players equally at the same time so this needs to be on a more global and standardized timeframe, while the other processes mentioned are all happening independently in each player’s own unique game all at completely different times. These concepts and processes still need to be developed and thought of better so that they align with all of the games principles and themes but I believe we can design in such a way that they can be properly integrated within the game simulations timescales and built within this.

7. To add one more layer to this timescale dynamic, I envision this also becoming a big part of the online multiplayer leaderboard challenges as all of these different timescales allow for a massive number of different game dynamics and unique challenges for players to overcome and compare their abilities with each other. Not only can these leaderboards have all of the categories I mentioned in a previous document but also subcategories within all of these for the different timescales, or having the different timescales as their own categories. The possibilities here really are endless and I think this is where the player community will really shine and decide on what characteristics or combinations of them will correlate to “skill” and “talent” in the game and what will be valued by the community of players as worthy challenges and competitive adventures to pursue.

1. I like this concept for the baseline time scale and think that this can be finalized.

2. For “real-time” I do understand that this would be incredibly slow for an “fun” “casual” game but that is not what player base this timescale is meant for. I envision this timescale being for the hardcore, simulation or growing enthusiast that wants to experience the most realistic, most accurate to the real world, and most time dedication, for the ultimate payoff of cultivating a 1 to 1 simulation of an actual real world grow cycle. This would not be how the game is intended to be played or how the main features and gameplay mechanics will be designed but this mode is just intended as a novelty, ultimate challenge, and most comparably accurate simulation to a real world grow facility. To clarify the different time scales and how they align to in game “weeks” and “months” my goal for this is to make the different predefined levels on this timescale slider to be logical and aligned to whole numbers and values, specifically around time standards. I am not so worried about the timescales actually being 4x or 8x or that they follow a consistent ratio to each other but rather that they align to easy to remember and intuitive real world time frames. In this way I really like the 6 day week and how this perfectly aligns to 10 minutes. 12 days of game time lining up to 5 real world minutes for the next level up on the timescales is also something that I really like but we don't necessarily have to call this “2 weeks” as this may get confusing to players and hard to remember and relate to their real world time frames. Its easy to remember that 1 hour of game time equals 5 minutes of real world time though and maybe this would be a better way to approach describing and naming these different timescale levels of the multiplication description we have currently planned. The next level I like being 30 days of game time to 1 hour of real world time or 1 day of game time to 2 minutes of real world time, and I like the idea of the fastest timescale level being the 1 hour to 1 minute or 60 day to 1 hour timescale level. We can name and describe these different levels in whatever way we want it does not have to be within the “week” and “month” naming conventions, or based of multiplication like we have now, but rather these convenient, whole number, evenly divided timescale levels that I think players will have a more intuitive way of thinking about this.

3. For the buffer/lock-in system I envisioned both a lock-in and a transition period on top of each other, really forcing the player to analyze and consider engaging in these time acceleration features before engaging in them. To me the time acceleration features are not to be used all the time and are a convenience factor for players that can efficiently use them but I want to really drive the concept that these modes can be dangerous and you really should make sure its something that you want to do. We need to further conceptualize and design the specific timeframes for these systems so that they serve the proper purpose without being a deterrent for players and something that returns them off from the game, but the main and core ideas here are what I want to finalize and explain. I also intend on creating very minor but still valuable and correlated variables of advantages and disadvantages to these different time scales with the “real-time” scale having the highest potential for advantages and benefits and the 8x time scale having the lowest potential for advantages and benefits. This also creates another risk/reward dynamic within the acceleration mechanism. I don't want this to be dramatic or frustratingly unfair to players that it takes away from the game but I also want to build in a very, very slight motivation for players to approach the game in the most realistic and accurate way to how they would approach a real world grow. This could be as simple as designing the genetic expression to be different depending on the different time scales with “real-time” level offering the greatest potential and the most accelerated timescale level having the lowest potential but never to the point that its feels unfair or frustrating to the player but rather a understood dynamic that a player has to choose their path within. An example could be the “real-time” scale giving the genetic the potential to reach 28% THC if grown to its utmost quality and 25% if grown at the fastest timescale level to its utmost quality. This would play into the economic or reward potential for the players crop with the 28% offering greater rewards but at the payoff of the much longer growing cycle waiting period. Obviously these ratios and algorithms would have to be extensively tested and designed so that they offer value and enhancement to the acceleration mechanic and overall gameplay dynamics. There are also many other “variables” that I envision having increased or decreased odds based on the timescale acceleration and we need to develop and brainstorm all these concepts further.

4. Yes players would have their own choice of any of the predefined timescale levels as well as the additional “pause” level for ultimate security and peace of mind. Upon logging back into the game and selecting the game save that the player wants to return to, the game will simulate all of the different discrete and various events that had happened while the player was away. To help the problem of this being computationally intensive I propose a system of the game loading an initial amount of the back logged simulation when the player first loads in and begins to show the player an accelerated time lapse of their grow starting from when they left the game and their grow the last time. As the game is showing the player this time lapse of what has been happening to their grow while they were gone, the game is also simultaneously simulating the rest of the grows events that happened and prepare those to be presented in the time lapse as they chronologically appear in the player's grow simulation. So its a combination of loading the complex and computationally intensive simulation in the background while still entertaining, informing, and in a way distracting the player from this loading time by presenting them with a time lapse of everything that has been happening to their grow while they were gone. This serves multiple purposes by not only informing the player of all of the events and stuff that has happened to their grow while they were gone but also by giving the game time to compute all of this complex simulation dynamics while engaging the player with this entertaining time lapse of their updates and changes. I envision at the end of this time lapse a more detailed and data driven recap screen would appear giving the player a complete and comprehensive breakdown of everything that has happened since they were away.

5. Yes I like all of these concepts and feel like the time and plant growth/process durations can be finalized at this point.

6. The time and other processes are finalized and have a solid foundational concept to their mechanics.

7. Yes I think this would be a very valuable addition to the player driven leaderboard and competitive landscape. I should have laid out the initial concept for this idea in a different document.

Upon reading through the section on the commitment & inertia I realized that the transition inertia period can also serve as the commitment period and we should just aim to design and develop this feature in that way. If we just treat the transition inertia period as a time when the player also can not change their timescale level then it basically acts as the commitment period and having both of them becomes redundant. Lets update that aspect of the document. Also lets add a part about how the game will communicate time and present it to the player. I envision this aspect of the game also being flexible based on the player's choice. I can imagine an overall time display somewhere on the screen and then I can also imagine many other UI elements that may involve time being displayed. The other note I want to make about this system is that anywhere that the time or date is displayed in the game the player will have the option to click on any one of strings and it will toggle either game time or real world time for all of the date and time elements in the game. The player could then click on any one of the strings again to toggle back and fourth between these two ways of displaying the date and time. We will need to design this in a clear and intuitive way so that players can always easily tell what mode they are displaying and that it is instantly recognizable but this is more for UI design phase.

My initial thoughts for player progression mechanics are based around a few different concepts that can each be related to main pillars of SDT (Autonomy, Competence, and Relatedness) as you will be able to conclude from these thoughts. To begin I plan on having a variety of progression types integrated into the game such as various parts and combinations of: character-centric progression, equipment and resource-based progression, narrative and world-based progression, unlock-able content and feature progression, meta-progression, skill and mastery-based progression, time-based and engagement progression, player agency and choice-driven progression. I will now go into how the different progression mechanics I am thinking of fit into different bits of all of these categories starting with character-centric progression. For this, although players will not have a visible or customizable “character” they will have an overall identity in the game that can be progressed and enhanced through gameplay over time and one of the main ways this will be conceptualized in this game is through an intricate skill tree that will be visually represented by a marijuana plant or as the culture refers to them, “Trees”. This will comprise seven main categories or leaves of the tree each with a different level of complexity and depth and each of these leaves will be composed of multiple points or nodes. Leaves that are relevant or categorized similarly could be placed on the same branch of the tree to help create continuity and coherence among the different pathways of progression in the game. Each leaf and even more detailed, each node will unlock a new ability for the players to explore but it will also bring in a new challenge and aspect of the game that players will need to monitor and think about so that the upgrades are constantly balancing with the difficulty of the gameplay. I am envisioning the tree looking like a cannabis plant with the different leaves on the plant representing the seven different categories with the most important, most complex, and most in depth category representing the biggest main leaf and the rest of the categories following this same concept of importance with less important categories getting proportionally smaller leaves. I will include a basic sketch picture to help conceptualize and allow you to understand this concept in a very basic initial concept form. The seven categories I am envisioning in order of importance are: Genetics, Cultivation, Environment, Construction, Harvest, Science, & Business. Genetics will be the main most important pillar as this is the biggest and most crucial aspect of player development. Examples of different nodes within this skill tree branch include: Seed Bank (players genetic library), Plant Sex (identifying male vs. female plants), Mothers (having a dedicated stock of plants to clone from), Breeding (crossing plants with each other), Pheno-hunting (selective plant selection based off of expressed traits), Bio-Modifications (feminized seeds, autio-flower strains), Advance Techniques (tissue culture, micropropagation), etc. Each time a player decides to unlock one of these nodes they will gain the ability and actions around the concepts and techniques for that node, but it will also be a new mechanic introduced into the game that the player now also has to add to their long list of aspects to manage. This approach of slowly introducing more and more mechanics and aspects of the game as the player decides to unlock them, is a good way to gradually introduce them to the different concepts, not overwhelm them with challenges and mechanics to overcome that they do not yet understand, and to maintain a balanced dynamic of abilities and problems to overcome and avoid. For example in this genetics branch when a player decides to unlock the plant sex node, they will gain the ability to start having dedicated male and female plants in their grow for the purpose of cross breeding, but the game will also introduce a new mechanic of randomized male and female genetics when starting from seed and the player will now have to be observant of this fact and make sure they do not allow males to mix in with their females and unintentionally pollinate them and greatly reduce the quality of their final yield. The next branch of the skill tree would be Cultivation. This is everything to do with growing the plants and the different techniques and ideas that are used in this area. Nodes for this branch could include: Irrigation (watering strategies and techniques), Fertilization (fertilizer additives, mixing, and dosing), IPM (pest and disease management), Propagation (taking cuttings from mother plants and rooting them), Plant Work (defoling, training, topping/tipping), etc. Again unlocking one of these nodes would give the player any of these abilities while also now requiring them to maintain this mechanic within optimal range for the plant's life cycle. The next branch would be Environment which has everything to do with the growing conditions such as: Temperature (fans, A/C units, HVAC, exhaust, heating pipes), Humidity (HVAC, microclimates, dehumidifiers, humidifiers), Light (cycle, type, spectrum, intensity, efficiency), VPD (air flow, humidity, temperature), C02 (levels), etc. The next branch would be Construction which I envision having nodes such as: Plumbing (irrigation lines, fertigation systems, equipment), Electricity (wiring, circuit breakers, panel boxes, overloading and electrical flow), Rooms (building walls, roofs, floors, doors), Equipment (benches, tables, gutters, beds, racks,), etc. The next branch would be Harvest consisting of: Cutting (timing final harvest cut down point), Drying (hanging, rotating, timing), Trimming (shucking, pruning, shaping), Curing (jarring, burping, timing), Processing (packaging, extracting, infusing), etc. I imagine the next branch being called Science and this is all about data collection and analysis. Nodes of this branch could possibly be: Environmental (sensors, meters, and equipment to monitor and read environmental conditions), Crop (sensors, meters, and equipment to monitor and read crop conditions), Analysis (lab testing tools and equipment to understand and make use of data), Research (testing and experimenting), etc. The final branch I envision is called Business and this would be made up of nodes such as: Resources (monitor and balance resource efficiency), Finances (basic reporting and predictions), Market (reputation and status/branding), etc. With these seven core pillars of the progression skill tree I think the game would have a pretty intuitive and well rounded system for upgrading players skills and abilities within the game. This is just my initial ideas and brainstorming for these seven concepts so they may still need your help with reworking and enhancing to better fit my specific game’s needs. Feel free to change category names, node ideas, or anything else within this framework that you think you can generate better than my basic, initial thoughts for the skill tree aspect of the character-centric progression concept. The next concept that I will take inspiration from is the Equipment and Resource-Based Progression. This will directly play into the concepts discussed above for the skill tree branches. Within each of these branches, as players unlock different nodes, different equipment and resources will become available for them to utilize as well as have to manage and optimize. Further beyond that I envision the different categories and areas of equipment that become available throughout the gameplay will also each have their own ways of upgrading, such as being able to upgrade pieces of irrigation equipment like pumps or watering systems, or being able to upgrade grow lights through different components such as heat sinks for efficiency, ballasts for better spread, enhanced bulbs for better intensity and so on. Different consumables could also be upgraded such as fertilizers, pesticides, growing mediums, etc. I would like to apply these concepts to all of the different pieces of equipment and assets that players will be able to use in the game. This goes for everything from grow and cultivation equipment, to post harvest equipment, to breeding and genetics equipment, and everything else in between. I envision these progression mechanics operating around some type of currency or monetization concept so players would use in-game money or points to upgrade specific equipment and such. Players will also be able to not necessarily upgrade resources but they can improve them. This goes for things such as water quality, air quality, electricity amount and reliability, and of course genetic stock (which will always inevitably be on the player) just to name a few examples. The next main concept to cover is Narrative and World-Based Progression. This one will be a bit simpler and have less aspects taken into my game but the main ideas I have are just a very basic storyline around the player starting a cannabis company and traveling through their journey of the business of cannabis cultivation to hopefully achieve the ultimate goal of having the best genetics and reputation in the game for any company. There will be very basic creative elements taken from this idea to generate concepts and ideas for the gameplay but for this progression mechanic the main role I see this narrative and world-based progression system is to help guide the player through different objectives and goals that will actually be secretly teaching them the mechanics and strategies of the game hidden underneath this storyline. I see this playing a role in being able to take the player from the initial house level and naturally progressing them to the larger warehouse facility level. This also plays into the next main concept of Unlockable Content & Feature Progression as this new level isa prime example of unlockable content. The main concept after this is Meta-Progression which will have a couple different aspects taken into this game. This first will be the player's genetic library and stock of strains. As players diligently work to breed and cultivate their ultimate genetic crosses, these newly created strains and cultivars can be permanently documented and stored permanently in a players genetic library. This genetic library will be tied to the players account itself and not any particular save or part of the game. This will allow players to start a new game with genetics they have crafted for a save they have been working on for a long time. This allows players to approach the game more as a sandbox for developing these genetics and that their account and the cultivar they can curate within this is what will bring them success in the game. There will also be somewhat of a persistent unlock system by giving players the ability to start a new game from the warehouse facility level if they have already gone through and completed the initial house “training” level once before. The third way that this game will have meta-progression is through the use of a user/company reputation throughout the game and its marketplace. This will be used not only by the game to calculate your ability to leverage higher prices for products based on your reputation level but it will also directly play into how you are viewed by other players in the online trading marketplace. Sellers and buyers with a very high reputation will be able to charge a higher premium for their products because other users can count on the fact that their products will not have any issues and will be top tier. A player's reputation is directly tied to how well they perform in the game mainly around their final crop quality. If a player constantly completes harvest with top tier quality products then the game's purchasing system will understand that and increase their reputation and also allow them to start charging higher prices for their higher quality. But the opposite can also happen if a player has a lower tier crop after a particular harvest cycle they can make the choice to either sell the product at a lower price and still get something back for all the hard work of their harvest cycle but at the cost of damaging their reputation for selling lower quality product, or they could decide to not sell the product at all at just take the loss completely but at the benefit of not taking any damage to their reputation by selling lower quality product. The same would go for the online marketplace, if players sell seeds or clones to other players and they consistently turn out to be top quality harvesting plants then a players reputation will rise. But if a player sells seeds that do not sprout, generate lower quality plants, have high percentage of males, or sell clones that are infected with bugs or a virus, then that player's reputation will severely be damaged by bringing these destructive products to the market and distributing them to other players. This is why a players reputation would be so important and why it would be critical to verify a players reputation before conducting business with them or you could risk major problems to your operation down the line. The next major concept is Skill and Mastery-Based Progression which will play into this game through players naturally getting better over time through practice, experimentation, understanding, and discussing that will eventually lead to a players own cognitive and conceptual development. Players will also have the opportunity to compete against each other through online leaderboard challenges thus furthering the concept of skill progression by directly comparing your progress and abilities to other player’s. The next concept is Time-Based and Engagement Progression, which will take part in this game by the addition of daily challenges/rewards, as well as seasonal drops and items that can be earned through a tiered system of completing challenges and objectives within the game. The last concept but definitely not the least is Player Agency and Choice-Driven Progression which is basically the entire concept of this sandbox simulation game. Players have the ultimate choice to build out their grow however they think is best creating an almost infinite combination of setups and choices to make. There will very rarely be two players that progress down the same path as the decisions, and actions they have to complete will very quickly push them down different trajectories. These are all my initial thoughts, ideas, and concepts around player progression at this point but like I said above, feel free to change category names, ideas, or anything else within this framework that you think you can generate better than my basic, initial thoughts for these aspects of the progression development for this game.

The acquisition of skill points to unlock these different branches and nodes of the progression tree will take place in a variety of ways. The main way will be through the completion of objectives, goals, tasks and other ways the game directs and challenges players. I envision an overall objective list that progresses and evolves throughout the game that helps guide the players into learning the mechanics of the game, optimization techniques, and competence and knowledge of how to become better at the game and improve their grow all through fun and engaging challenges that the game presents. As a player completes these different challenges, new ones will become available for them to pursue and attempt to fulfil. Each time a player completes an objective they will receive some amount of these skill points that they can then use to unlock areas in the progression tree and start to develop their path through the game. Unlocking new nodes will inevitably lead to more objectives that can be completed, furthering the cycle and loop of striving for skill points and progressing their abilities and features. Another way I envision players receiving skill points are through the successful completion and sale of their final harvested product, kind of as a reward for finally completing the long and demanding cultivation life cycle of their crop. This skill point compensation can be based on how well they performed and the overall outcome of their final crop. This would incentivise players to complete this essential core gameplay loop and to do it at the best possible quality to ensure they receive the maximum amount of skill points and thus can continue unlocking nodes on the skill tree and further upgrading their progression in the game. I can see the actual visual representation of the cannabis plant also growing and evolving as the player unlocks and progresses deeper into the progression tree. There may be more ways we identify later on for implementing players abilities to earn skill points but for now this is the core two ideas I have around this concept.

I definitely have considered this point about needing to clearly define the ability to challenge mechanic to every branch, leaf, and node within the progression tree and I am very determined to generate this essential document but for right now I would like to finalize the initial brainstorming and idea generation process and finish coming up with all the possible options for branches, leaves, and nodes so that we can then take this comprehensive and complete list and begin the more detailed definitions for each one in particular.

The ideas I have around the node unlocking mechanics are more closely tied to the idea of unlocking the concept itself. Each of these unlocks would then come with a whole new mechanic and dynamic for the player to have to now consider and optimize for. For example the temperature node will now unlock this general concept for the player gamewide, meaning they will now have to monitor, control, plan for, and optimize all aspects of temperature for their grow. A player's ability to do all of these aspects of the temperature mechanic will be limited upon initial unlocking of the node and depending on their concurrent upgrades in equipment and tools. Unlocking the temperature node will now generate a temperature mechanic and simulation into the players grow that they will now have to learn to account for but their ability to actually gauge the temperature accurately or consistently will be based off of their current progression of equipment that can complete these functions such as thermometers, fans, A/C units, heaters, meters and measuring tools, etc. If a player unlocks the temperature node but doesn't have a thermometer to actually measure the temperature then they will just be left to interpretation and visual cues to tell if their grow is operating in the right range. If they do have a basic thermometer unlocked they can use it to get basic, at the moment readings of temperature to use for adjusting and trying to dial into the optimal operating temp range that they are going for. But this most basic simple thermometer will only give you readings when using and looking at it. An example of a later advanced version of a thermometer could be more of a permanent monitoring device that alerts the player if the temp goes out of range. And eventually the furthest progression would be to have temperature sensors and equipment that could fully monitor and automate all aspects of a players temp control in their grow. This is just a quick basic example for one node, but this general concept and idea is what I want to apply to all categories and nodes of the progression tree.

I think there should definitely be interdependencies between branches or nodes of the progression tree. I think this leads to a more connected and synchronous gameplay experience to encourage broader development. I think within the core pillars and concepts I have already brainstormed that their are multiple logical and intuitive ways that they can connect and play into each other. I would like you to develop these concepts and connections for me based off of everything I have described and what you think would be realistic, logical, intuitive, and not overly controlling way to develop this system of interconnectedness between my progression tree categories.

What about the idea of each leaf or category having a specific amount of nodes correlated to its importance and complexity within the game. So for the genetics category there might be 7-10 nodes to unlock and the category may have a way to connect into the most of the other categories based off of this creating a much more complex mechanic for this system. Where as a category like Business having a much smaller influence, complexity, and importance would have much fewer nodes, maybe around 2-3, and also have much less interconnectivity with other categories. I think within this overall idea and concept for the skill tree framework and node design. If you could take this general idea that I just presented and apply it to the game concept elements we have already discussed to create this draft of a skill tree and progression system

My initial thoughts on earned automation concepts are that a lot of these aspects will need to be more finely dialed in and tuned as gameplay mechanics become more defined and especially as in-game testing actually begins. For the initial tedium threshold I feel like this is the main aspect that will require more detailed and well defined mechanics for all of these different gameplay tasks and actions. It is hard to say right now how many hand watering cycles will be tedious as I have not very well conceptualized how this early gameplay mechanic will operate but ultimately I want this to be consistent with real world techniques and science and to always abide by this philosophy whenever possible. I don't want to make a task unrealistically tedious, repetitive, or frequent in order to serve a gameplay balancing system. I also want to make sure this and all systems designed in this game take a real world and physically accurate bias when being developed and that includes to the point of being unrealistically difficult. To further build upon the manual watering example, a player with just a handful of plants should in theory, as long as they abide by proper growing techniques, be able to comfortably handle manual watering this amount of plants, just as a person in real life could easily handle this workload by themselves. The player shouldnt be unfairly penalized or put under extra limitations just because they don't have automations in place. A player that knows what they are doing and is willing to put in the time to go through and hand water their plants everyday, shouldn't be in any way punished solely for the act of not having automation, as long as they maintain this high level of manual watering throughout their plants life cycle. The challenge or burden in not having the automation is the consistent and non-stop pressure to always maintain optimal growing conditions in a simulation that can be operating at an accelerated pace and is centered around accurate plant biology, meaning even just a single day of conditions out of range at the wrong moment in the life cycle can be very detrimental to the players overall ending success. It is this constant and never ending burden of detailed and intricate care that even for just one plant can be daunting. I do not want to make this sound too extreme though, as I stated above, I always want these systems to be designed with a real world accuracy bias. Meaning even if a player messes up along the way and doesn't always keep every parameter in optimal range, they can still finish their cycle with a good quality or even high quality product, but to achieve the ultimate and highest potential of their genetics and cultivar, they will need to keep this conditions optimal. This is part of how a player progresses and gets better over time. Like I said, in theory it's possible for a player to operate an entire grow cycle manually within the best possible parameter ranges, but this would be very difficult and unlikely to happen, thus creating an advantage and enhancement for players that are able to reach these automations. This also plays into a players own agency and path choice, where they can decide what manual tasks are the most inconvenient and annoying for them personally to complete and these can be the first paths of automation they can choose to progress towards. The effects and consequences of these manual tasks going out of optimal range should also not be unrealistically detrimental or punishing to players, such as temperature going a bit out of range each day throughout the grow cycle, causing a slight decrease in final quality but not at an real world unrealistically punishing amount just to try and balance the mechanic of the video game.

1. I would like to completely rework this concept and actually replace it. I want the exterior environment design to reflect a more realistic and accurate visual appearance and eventually an actual gameplay effect. For now both of these levels or maps will have the same basic real world environment surrounding the outside of the building. This can just include a green color for the ground, a blue color for the sky, a static sun, and a day/night cycle that matches the time speed that the player has set for the game. This will just be basic visual landscape for now but I envision later versions of the game using this outside environment as a dynamic in the gameplay. I imagine having multiple different “regions” that a player could choose from, each with their own environmental conditions and mechanics within the game based off of this. A region that has a better natural climate will therefore have restrictive penalties of cost for expansion to balance this out. Each region will have its own unique characteristics for natural environment and climate and this will be balanced out with factors such as expansion cost and employee cost. Each region would also match this theme visually to represent these differences. These are all concepts for future versions though and for this first version it will just be one basic visual representation of a blank landscape and it will have no effect on the mechanics of the game. For future versions where these different regions are implemented the player will have the choice at the beginning of the game upon setting up and then will be locked into this region permanently for the rest of the game. This will obviously play into outdoor grow mechanics when this is implemented in later versions. We could also consider fantasy or novel themes for environments in later versions such as in space or on the moon, underwater, in a cave, et. These could even be paid DLC expansions for later versions. As far as the camera movement options I envision this having a hard limit to how far a player could zoom in or out or move away from their grow facility/house. The point isn't to explore or really view anything outside of the house but rather to just give the players an extra perspective and possibly a thematic way of combining the house and warehouse facilities together within a cohesive storyline.

2. For the utility view toggle and specifically the X-Ray mode, I do not see this having any place in the house map or level, this will be a feature that players unlock with the expansion to the warehouse. This can be tied into the skill tree or player progression mechanics somehow to ensure that players cannot unlock this ability before they have the warehouse unlocked, as there is no need for it in the house map. The X-Ray view is only for building and constructing facilities from scratch, like the mechanics will force the players to do in the warehouse map. It can be something that automatically gets unlocked when players reach the point of progression to un;ock the warehouse level, thus ensuring players have this core ability once they need it. For the structural elements I envision the ghostly translucency approach the closest to what I want. I can imagine these structural elements being opaque and “see-through” without having to completely change their core appearance such as wireframe or creating just an outline. Different elements that get affected by this utility view can also retain their color and textures while just becoming more opaque and transparent while still being able to see them clearly. For the utility highlighting I really like the idea of color coding for the different utility types. I also really like the ideas around an emissive glow or more boldend outline for currently selected or activated components. I think that these concepts for different styles and visual aspects to planned vs built such as a transparent or more opaque version for proposed component placements and solid or non-opaque versions for already built components. For information display & interaction, I love the idea of filtering and specifically by utility or resource type. I also love the idea of contextual info when hovering over a component, but up to a certain point, I don't think every individual segment of pipe needs to have its own contextual info popup, this can be done in an intuitive and logical way. The concept of problem highlighting is great and we definitely need to implement this feature for all utilities, possibly each with their own specific indicator for problems and for successful connections/flow. For transitioning between normal and utility views, I envision this happening almost simultaneously as the triggering action for this will just be a key press or mouse click to toggle on and off. The interactivity within utility view should be heightened for all of the different utilities selected for the game and should be the core and only way players have of constructing and editing these systems. Because of the information display, interaction, and highlighting, this utility view will also be the player's main view for seeing overarching and major connection and flow issues and mechanics/operations that they have designed.

3. Utilities will definitely benefit from simple flow animations and this is a must have feature for us to implement into the gameplay.I absolutely love all the ideas that were presented in this section and think that all of these could be instantly implemented into this plan. We can also take this logic and philosophies and apply them to any of the core utility mechanics that are needed for this game.

4. For managing clutter I agree with pretty much everything that was presented and laid out here, especially the concepts around the push for verticality within a player's design. I am in 100% alignment that we need to ensure the map scale and confirm when designing and developing the residential house map that there is ample space and realistic proportions for everything. I really like the ideas around designing assets with a clear and logical footprint, implementing a grid system, and developing some type of snapping logic. I also really love the idea of storage items and how they can double as a functional inventory access point. I also really appreciate the continued and persistent point of maintaining cleanliness and a pristine aesthetic. For waste management I can see this become part of the core gameplay mechanics where a player can eventually make use of their waste or re-use it in some way to help generate more profit or reduce waste costs. For initial versions we can keep this mechanic simple by providing dumpsters, trash cans, or other disposal methods for players to have to place and repeatedly take their waste to. These waste containers can possibly be assets or equipment this upgradeable and offer more options and benefits to the player.

5. For the cozy element of the game, I have decided to completely abandon and move away from this idea altogether, as it does not fit into the core gameplay mechanics and there is no need for its extra complexity and ensign requirements, so we can expel this idea altogether.

6. The construction system’s grid mechanics will be based around a one foot area. This will act as the base unit and the unit for all aspects of the game. For very small intricate details that need to be more delicately placed I envision a system of being able to snap to the grid on or off as you described. I do envision a toggle on/off for grid snapping as this will be very beneficial. Also all of the proposed snapping points are great and I think can be implemented. For the freeform wall/structure building I definitely imagine much more of the path-based system that was described with possible visual cues for proposed placement, price, and construction possibility. For dimension control, I envision having a system where two of these aspects are locked in such as highest and thickness for a particular asset and then the player can select this asset and build with the path-based system described to any length the desire and can possibly construct in their simulation with each segment being identical to the asset they initially selected. If a player wanted a different thickness or height they would need to select a different asset that represents the characteristics which they may possibly still need to unlock or make available. This concept will apply to all construction and building assets and elements that will be developed for this game. I really like this idea of free form elements being able to snap to existing grid-aligned structures or really any structure in general. I could foresee this feature becoming something that is affected by the snap to grid on/off toggle and which it will abide by these rules. I see this mechanic operating only when players select a particular material or asset and it would in return a paint/apply material tool becomes toggled for the player to use. I like the idea of auto-routing of utilities but I feel like this is a mechanic that can be saved to later upgrades and versions of the game as it is not necessary for the MVP. I do not envision any truly flexible segments but rather assets and components that still abide by the games core grid system and mechanics. I do like the concept of tools specifically for vertical utility runs as this will inevitably become an aspect of the game. I love all the rest of the ideas around the construction UI and validation & feedback and this overall conceptualization of the construction system is quite robust.

7. For the zone definition, I much prefer the concept and ideas you laid out for the sub-zones approach much more and feel this is the system that we need to develop and implement. I could see these parameters and their values updating once every few minutes as they will need to help contribute to a physically, and biologically accurate simulation that we are attempting to develop. I really like the idea of a heat visual map and think this should definitely be implemented if possible, as well as expedited implementation of any other visual cues described in this section or that would logically and intuitively make sense within this framework.