

Exposure map submit

Your goal: Assemble and submit a completed environmental exposure map for Problem 4.

One product: Complete environmental exposure map integrating pathway diagram, dose data with threshold comparison, mitigation recommendations, citations, and at-risk population label, plus one sentence using the T1 practice coliform test to say what a total coliform result and an E. coli result each mean for drinking water.

Question: Your Problem 4 exposure map has to convince a real community, not just a toxicologist, so how do you combine your pathway, dose data, and mitigation into one cited document that a parent or a city council member could actually read and use?

Start the work

Compare where mitigation acts, whom it reaches, when it works and what it costs; a release percentage alone cannot establish the best health protection.

1. Read T1's practice coliform plate record, incubated in the invented record: count total coliforms and E. coli separately, convert each to colonies per 100 mL, and say what each result means for drinking water.
2. Combine your pathway diagram, data analysis, and mitigation notes.
3. Label the source, pathway, dose, and at-risk population clearly.
4. Add citations for your data and threshold values.
5. Check that the map communicates risk to a non-expert.
6. Submit the exposure map and confirm it appears in your tracker.

Save the same map locally if the route is absent. Label original practice and record actual public-data, official milestone, tracker and submission status as pending.

Words you will use

mitigation

An action intended to reduce a harmful exposure or its consequences.

pollutant

A substance or mixture in the environment that can cause harm under relevant conditions.

PM2.5

Fine airborne particles generally 2.5 micrometers or smaller in diameter.

micrometer

One millionth of a meter.

emissions

Pollutants released from a source.

source-side

Acting on the generation or release of a pollutant.

receptor

A person or other organism that may encounter a pollutant.

receptor-side

Acting where people encounter pollution rather than stopping its source release.

exposure pathway

The chain from a source through a medium to contact with a person.

inhalation

Taking air and substances in it into the respiratory tract by breathing.

exposure

Contact between a person and a pollutant.

dose

An amount received, with the dose type and time period specified.

potential inhaled dose

The amount entering the nose or mouth; it is not all necessarily absorbed.

internal dose

The amount that crosses an absorption boundary into the body, such as into blood.

risk

The chance of a harmful outcome under specified exposure conditions.

hazard

The potential of an agent to cause harm.

vulnerability

A feature or circumstance that can increase susceptibility to harm.

at-risk population

People identified as a concern using evidence about exposure or susceptibility.

concentration

Amount of a substance in a stated volume or mass of a medium.

CADR

Clean air delivery rate, a particle-cleaning capacity rating used with room size.

filtration

Removal of material from a stream, such as particles captured from air.

ozone

A reactive gas that can irritate the lungs.

feasibility

Whether a plan can be implemented under its practical constraints.

tradeoff

A gain in one consideration accompanied by a cost or limitation in another.

coverage

Which people, places and times an intervention reaches.

maintenance

Continuing work and supplies needed for a system to function.

phasing

Introducing an intervention in stages over time.

cost-effectiveness

Benefit relative to cost, requiring a defined benefit measure and comparable time period.

conditional prediction

An expected direction or outcome that depends on stated assumptions.

claim

The recommendation or conclusion being defended.

evidence

Information used to support or question a claim.

reasoning

The explanation connecting evidence with the claim.

CER

Claim, evidence and reasoning presented as a connected argument.

toxin

A poisonous substance produced by a living organism.

bioaccumulation

Buildup of a substance within an organism over time.

biomagnification

Increasing concentration across levels of a food chain.

exposure map

One document joining a pathway, evidence, limits and proposed responses.

medium

The air, water, food or other material through which a pollutant may move.

target organ

An organ affected by a substance under relevant exposure conditions; naming it does not prove injury.

susceptibility

How readily a person or group may be affected under stated conditions.

microgram

One millionth of a gram.

cubic meter

A volume equal to a cube one meter on each side.

milligram

One thousandth of a gram.

24-hour average

A value representing concentration averaged over one full day.

percentile

A position in an ordered distribution, expressed relative to one hundred parts.

NAAQS

National Ambient Air Quality Standards, with pollutant-specific levels, averaging times and forms.

standard form

The statistical rule and time period used with a standard level.

threshold comparison

A comparison with a named benchmark whose substance, units and time basis must fit.

citation

A nearby source label plus enough information to find the source.

twofold dilution

A dilution that halves concentration under the stated ideal assumptions.

endpoint

The last position meeting a stated response rule in a series.

blank

A comparison sample without the target material under the stated method.

carryover

Material unintentionally transferred from an earlier sample to another.

total coliforms

A group of related bacteria, mostly harmless, used to check water treatment and pipe systems.

E. coli

Escherichia coli, a coliform whose presence in drinking water points to possible fecal contamination.

chromogenic medium

A growth medium whose ingredients make different kinds of bacteria grow in different colors.

membrane filtration

Passing a measured water volume through a filter that traps bacteria, then growing the filter on a medium.

colonies per 100 mL

A count scaled to 100 mL of water, the volume the drinking-water rule examines.

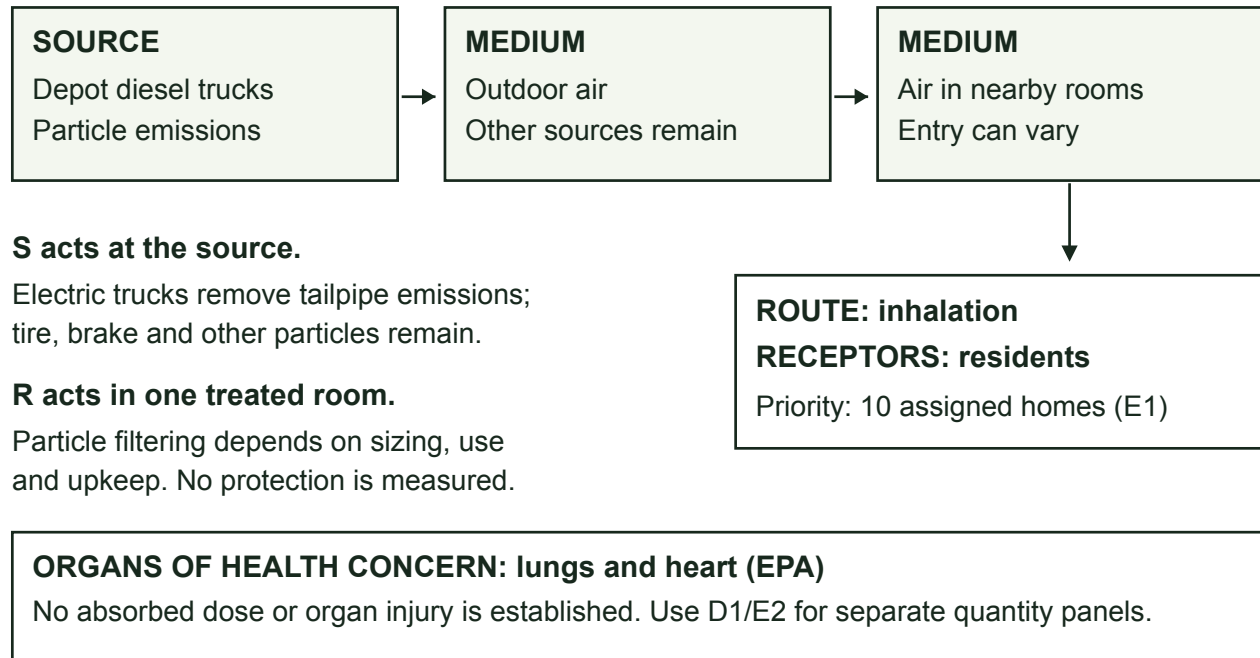
repeat sample

A follow-up water sample required after a total coliform positive.

V1: original Birch Court exposure pathway

V1: original Birch Court exposure pathway

Possible movement only. No actual location, transfer rate or injury is shown.



Original planning diagram. E1 gives the text equivalent; D1 supplies separate invented quantities. No real location or person is mapped.

Text description: Original pathway: depot diesel trucks release particles to outdoor air; some outdoor particles can enter room air; residents may inhale particles. Lungs and heart are organs of health concern, not measured injury. Source S acts at the depot; receptor R acts in one treated room. Arrows represent possible movement, not measured transfer or source attribution.

T1: reading a coliform test from practice sample records

This is an invented practice record. No water was sampled, filtered or grown for it. It shows how a chromogenic coliform test is read, so you can compare it with the LB plates from April 8.

In membrane filtration, a measured volume of water passes through a thin filter that traps bacteria. The filter then sits on a chromogenic coliform medium and is incubated about 24 hours at 35°C. On this kind of medium, *E. coli* colonies grow blue or purple, other coliforms grow pink or red, and colonies of bacteria that are not coliforms stay colorless and are not counted.

E. coli is itself a coliform. Total coliforms are all the coliform colonies: the blue or purple ones plus the pink or red ones. *E. coli* is the blue or purple colonies alone.

Practice sample K: 25 mL filtered. The filter shows 3 blue or purple colonies, 8 pink or red colonies and 2 colorless colonies.

Practice sample M: 100 mL filtered. The filter shows 0 blue or purple colonies, 5 pink or red colonies and 4 colorless colonies.

Colonies per 100 mL = colonies counted $\times$ (100 $\div$ mL filtered). Work total coliforms and E. coli separately for each sample, and leave the colorless colonies out of both.

EPA uses total coliforms to check whether treatment and the pipe system are working; a total coliform positive leads to repeat samples. E. coli points to possible fecal contamination, and EPA's health goal for it is zero, so an E. coli positive is the more serious result. Federal rules examine 100 mL and ask only whether each is present or absent, so the per-100-mL numbers are practice arithmetic.

April 8's LB plates could not make this distinction. LB has no indicator, so colony color does not identify the bacteria, and a colony count on LB cannot say whether coliforms or E. coli are present.

E1: make a pathway that names its limits

An exposure map joins a pathway, data and a proposed response. It must say what each number represents and what the evidence cannot establish.

For original recovery, continue the fictional Birch Court traffic case. No previous student work or real monitoring is assumed. D1 supplies new illustrative numbers, not results from April 8 or April 9.

The pathway is diesel-truck emissions, outdoor air, air entering nearby rooms, and breathing by residents. Inhalation is the route. Outdoor air and room air are media, not organs.

EPA links fine particles with lung and heart effects. Label lungs and heart as organs of health concern, not as measured injury in this case. Do not draw all inhaled particles moving into the heart.

V1 supplies the same pathway as an original diagram. Arrows show possible movement toward exposure, not a measured transfer rate or proof that the depot caused every particle.

Birch Court has 20 invented homes. Ten are assigned children or residents with a lung condition. They are the priority group because the case combines nearby exposure and susceptibility. Use no personal details.

D1: original data record and a separate dose scenario

These numbers are instructional inputs, not a public dataset or measurements. Record D1 as their source. Three illustrative outdoor PM_{2.5} daily averages are Day A: 20, Day B: 40 and Day C: 60 micrograms per cubic meter.

Each row represents an assigned 24-hour average at the same fictional location. Identify the lowest and highest values with units. Three rows cannot describe a community over years.

Keep all three rows and their units in your map. Add the E2 benchmark beside them. Do not label these numbers Cleveland readings, personal exposure or evidence of a real source contribution.

A separate original scenario assumes air actually breathed contains 40 micrograms of PM_{2.5} per cubic meter throughout a 10-hour period. Assume 10 cubic meters of air are inhaled during that period.

Potential inhaled amount equals concentration times inhaled air volume. Calculate it with units and state its 10-hour period.

The air-volume and breathing-zone assumptions are supplied only for arithmetic. They are not measured, recommended breathing rates or inferred from the outdoor daily rows. No body-weight-normalized or absorbed dose is supplied.

E2: compare the same quantity and time basis

For this practice, use the EPA table read in September 2026. EPA lists a 24-hour PM_{2.5} standard level of 35 micrograms per cubic meter. Its form uses the 98th percentile of daily concentrations, averaged over three years. Cite EPA NAAQS Table beside this benchmark.

A percentile locates a value within an ordered distribution. The 98th percentile concerns the high end of the daily record; it is not the largest of three classroom numbers.

Subtract 35 from each daily value. A negative difference is below the published level and a positive difference is above it. These are numerical comparisons with the published level only.

Three invented daily values do not establish whether an area meets the standard. Actual monitoring methods, complete records and the regulatory form are absent. Do not call a home compliant, safe or unsafe.

The amount you calculate from the D1 breathing scenario is an inhaled amount. The 35 micrograms per cubic meter benchmark is an air concentration. Different units and quantities cannot be compared directly.

Put the dose scenario and concentration comparison in separate labeled panels. No personal dose threshold is supplied. The threshold-comparison requirement is met as a bounded concentration comparison, with this dose gap visible.

E3: explain health relevance without promising safety

PM_{2.5} means fine particles generally 2.5 micrometers or smaller. Some particles come directly from sources; others form from gases. A traffic pathway alone does not identify every source.

EPA distinguishes potential inhaled dose from internal dose. Some inhaled material is not absorbed. Your calculated inhaled amount does not tell how much reaches blood, a target organ or a biologically active site.

Exposure and health response depend on the pollutant, timing, amount and susceptibility. A higher assumed inhaled amount does not reveal the probability of illness without matching response evidence.

Some EPA inhalation risk methods use air concentration directly with matching reference values. Do not convert every air value to body-weight dose or treat a concentration standard as a dose limit.

A reader asking whether a child is safe needs an honest limit and a useful next step. State that this practice cannot assess an individual; actual air and exposure evidence are needed.

R1: preserve both mitigation strategies

Use actual April 9 mitigation notes when available. Otherwise use these original planning assumptions. They are not an implemented plan or proof of prior completion.

Source S replaces the depot diesel trucks with electric trucks at the end of year 2. Its assigned cost is \$60,000 through year 2, with charging, availability and maintenance included.

Receptor R supplies one suitable particle filter for one main room in each home this year. Its first-year cost is \$20,000 and year-2 electricity and filter costs total \$4,000.

Add R's two years, then add S and R, and compare both totals with the invented \$100,000 two-year budget. Keep the shared time period and unresolved later maintenance visible.

EPA explains that electric vehicles remove tailpipe emissions but retain tire and brake particles. Room filters may reduce particles while used; coverage, sizing and replacement matter. Neither option supplies a measured dose reduction.

Recommend S, R or a sequence with a reason and a limitation. Show where each acts on V1. Do not promise a percentage reduction or rank illness prevention per dollar from these inputs.

C1: assemble one complete map

Warmup: what is missing from your map now? Answer both starting questions: which three pieces must come together, and why should a number have a nearby citation?

Lay out your pathway, data and mitigation records first. Mark each actual, original practice or missing. Use E1, D1 and R1 together for recovery; do not mix invented rows into actual results.

Your map needs a title and status, pathway arrows, source and media, inhalation route, organs of concern, dose panel, data/benchmark panel, priority population and both mitigation notes.

Cite D1 beside each invented concentration and dose assumption. Cite E2 and the full EPA table URL beside 35 and its standard form. Cite R1 beside the fictional costs and schedules.

Keep source labels attached to each quantitative claim; a distant link list alone leaves the reader guessing. Include a short source bank so the reader can open the public references.

Compact recovery may use one page, but it still needs the full product: diagram, labeled dose with limits, concentration comparison, citations, population and both mitigation strategies. A single recommendation alone is incomplete.

Q1: test readability and revise

Use the exact self-check: Your exposure map is scientifically accurate but a parent reading it says they cannot tell whether their child is at risk or what to do. Is the map complete? Why or why not?

It still needs clearer communication. It must explain the relevant concern, what is unknown and what action or evidence could help. Clarity does not require an unsupported yes-or-no safety verdict.

Partner route: exchange the map and record one confusing label the partner actually identifies. Rewrite it and keep the before and after. Do not invent a peer response.

Solo route: use this supplied comment: I cannot tell whether the inhaled-amount number is a dose, a concentration or a safety limit. Rewrite that label with units, time and the E2 comparison limit.

Extension: write one plain-language paragraph for a parent or council member. Mark the single most useful decision claim and explain why its evidence and limit matter.

L1: next-bench preparation is paper-only here

L1 is later preparation, separate from the 80-minute map block. The daily prelab names six twofold dilutions and the last well darker than a blank. Actual materials, concentrations, equal final conditions, timing, safety and disposal need a teacher-approved protocol.

For arithmetic practice only, use an invented dye stock of 64 milligrams per liter. Calculate the six successive halvings with units. This is not a preparation recipe.

Original appearance record: blank clear; the stock and wells 1, 2 and 3 are dark. Well 4 is pale but darker than the blank. Wells 5 and 6 match the blank.

Apply the assigned visible-color rule to find the last positive well. Pale does not mean negative when the blank is lighter. This pattern is invented, not an actual endpoint or validated detection limit.

A reused tip can carry higher-concentration material into a later sample and shift an apparent endpoint. A one-well shift is possible, not guaranteed. Fresh tips do not replace the full approved protocol.

Bring the actual assigned detection-limit table when requested. April 8's culture plates do not predict a dye, analyte or method endpoint. Missing authentic tables and method matches remain pending.

April 13 is graph drafting in Activity 4.1.3. Your teacher will confirm which day and protocol the bench preparation belongs to; do not infer permission to perform it.

P1: actual submission and official work remain separate

Today's task is to finish Activity 4.1.2 Analysis of Water Contamination, submit the map in Lab Reports and confirm your Problem 4 milestones. Confirm the actual assigned portion with your teacher.

The 4.1.2 introduction involves bacteria, DNA isolation, PCR and gel interpretation. The 4.1.3 procedure requires eleven tests on two waters using its actual Student Resource Sheet and teacher directions.

That work also needs health-effects notes, actual results, research, peer comparison and further contamination/remediation research with 4.1.2 findings. This PM2.5 map does not complete those water investigations.

Actual public-data analysis is still required this week. Obtain the assigned EPA or CDC record, high and low values, higher-exposure group reason and pathway/risk analysis. D1 does not replace it.

April 8 pathway preparation and actual photographs/data, April 9 mitigation and unfinished validation work stay separate. Weekly public-data analysis still applies.

At the review stage, check actual progress, fix flagged map labels and record missing milestones. Mark Problem 4 complete only when its genuinely assigned work is complete; a practice map is not proof.

After actual submission, confirm the map appears in the tracker and save the myPLTW confirmation or progress screenshot requested by the task. If access or completion is missing, record pending status instead.

Open the linked April 12 BI assignment and check its posted requirements and deadline. Use the teacher-confirmed April 12 Lab Reports route in your enrolled section. Save the same complete map locally if unavailable; do not claim submission.

April 13 is the next graph task; April 14 is catch-up, with later Activity 4.1.3 and dose-response work separately scheduled. Keep actual dataset and teacher scope available for that next task.

M1: a different worked label repair

Original model: a workshop uses a water-based colored dye in sealed display tubes. A planning sign reads: Sample45, limit36, safe. No human exposure or test result exists.

The supplied model record means an invented liquid concentration of 45 milligrams per liter. The 36 milligrams per liter value is an invented display-color criterion, not a health threshold.

My revision reads: Original display model: 45 milligrams per liter is 9 above the classroom color criterion of 36 milligrams per liter. This says nothing about human safety.

The pathway panel says sealed tube, no stated release or human contact, and no dose estimate. I cannot invent a completed exposure route just because a chemical is present.

I cite model M1 beside all numbers, name the missing exposure evidence, and propose checking the actual display handling plan with the teacher. This repairs meaning rather than promising protection.

Try the decision

Your original map contains a potential inhaled amount in micrograms for a stated scenario and a 35 micrograms per cubic meter air benchmark. What should the label say?

- Keep the quantities separate, compare daily air values only numerically, and state the absent personal dose threshold.
- Divide the inhaled amount by 35 and declare that every resident is unsafe.
- Hide the dose assumptions when labeling the map so it looks simpler.

Explain your choice using the reading. Discuss it or say it to yourself. This practice does not add another submission.

Your 80-minute flow

0–5 minutes	Audit the three inputs and answer both C1 starting questions.
5–25 minutes	Read T1's practice coliform record; count total coliforms and E. coli for samples K and M, convert to colonies per 100 mL, and explain each result and the LB limit.
25–40 minutes	Combine the supplied original pathway, data and mitigation, or the actual completed records.
40–55 minutes	Label the pathway and dose; calculate and cite the quantity-matched comparisons. Add the T1 coliform sentence.
55–65 minutes	Use partner or solo feedback, revise one label and answer Q1.
65–72 minutes	Fix flagged items and audit actual milestone status without premature completion.
72–80 minutes	Submit if the actual route is available; preserve tracker and confirmation status.

Your response record

Use these labels on paper or in your document. The space below also works when this page is printed.

Audit the three inputs

Answer C1 warmups and mark pathway, data and mitigation records actual, original or missing.

Use the complete E1/D1/R1 recovery set if needed; actual public data stay pending.

Use this space or the same labeled section in your existing document. Add paper when your table, graph or drawing needs more room.

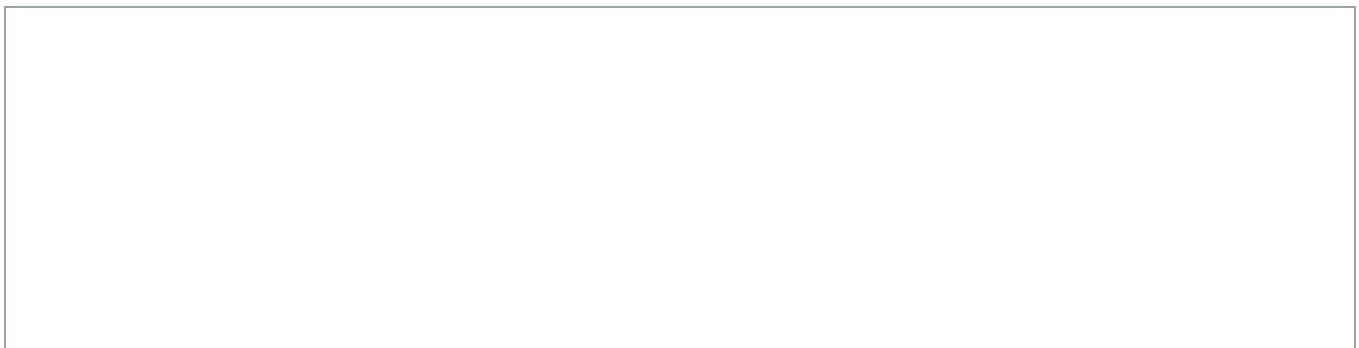


Read the practice coliform test

Use T1 to count total coliforms and E. coli separately for samples K and M, convert each to colonies per 100 mL, and say what each result means under the Revised Total Coliform Rule. Explain why April 8's LB plates could not make this distinction.

E. coli colonies also count as coliforms. Colorless colonies are not coliforms and are left out of both counts.

Use this space or the same labeled section in your existing document. Add paper when your table, graph or drawing needs more room.



Assemble the full exposure map

Combine V1 or your actual pathway, all D1 rows or actual data, the dose panel, E2 comparison and R1 mitigation in one document.

Label source, media, route, organs of concern and priority group. Cite every number and keep simulated and authentic inputs separate.

Use this space or the same labeled section in your existing document. Add paper when your table, graph or drawing needs more room.

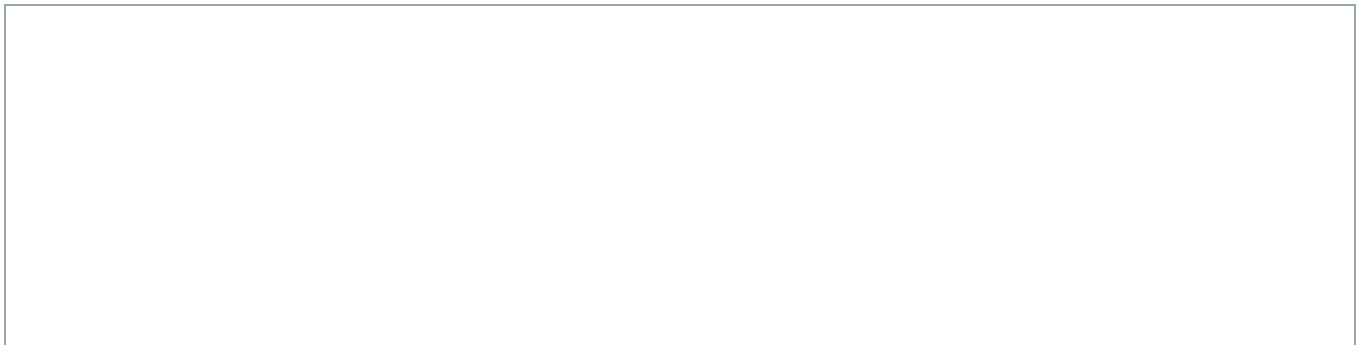


Make quantity and evidence limits visible

Show the inhaled-amount calculation with its 10-hour assumptions. Compare each D1 concentration with E2 and state the standard-form and dose-threshold limits.

Use your actual supported dose record instead if available. Do not apply an air standard directly to an inhaled amount.

Use this space or the same labeled section in your existing document. Add paper when your table, graph or drawing needs more room.

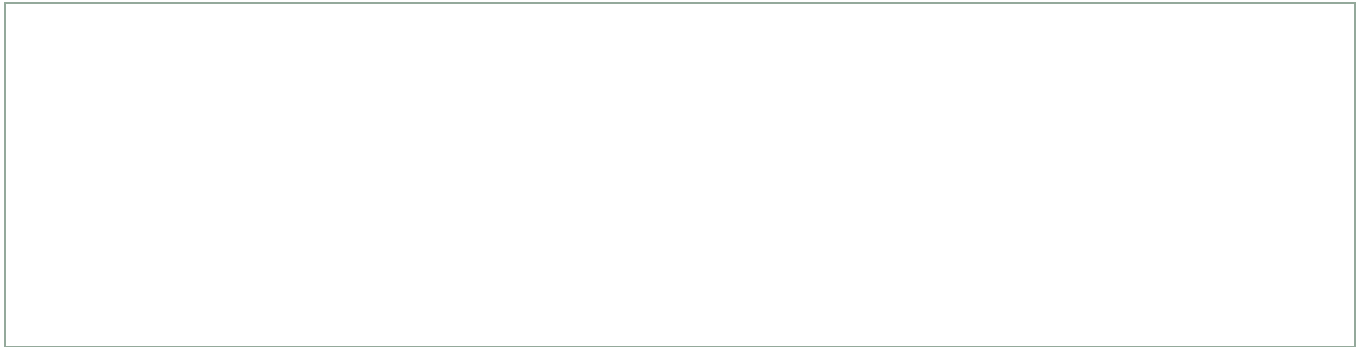


Check the reader and revise

Use an actual partner comment or Q1 solo comment. Record the confusing label, rewrite it, and answer the self-check.

The reader needs the concern, uncertainty and a next step, not an invented individual safety conclusion.

Use this space or the same labeled section in your existing document. Add paper when your table, graph or drawing needs more room.

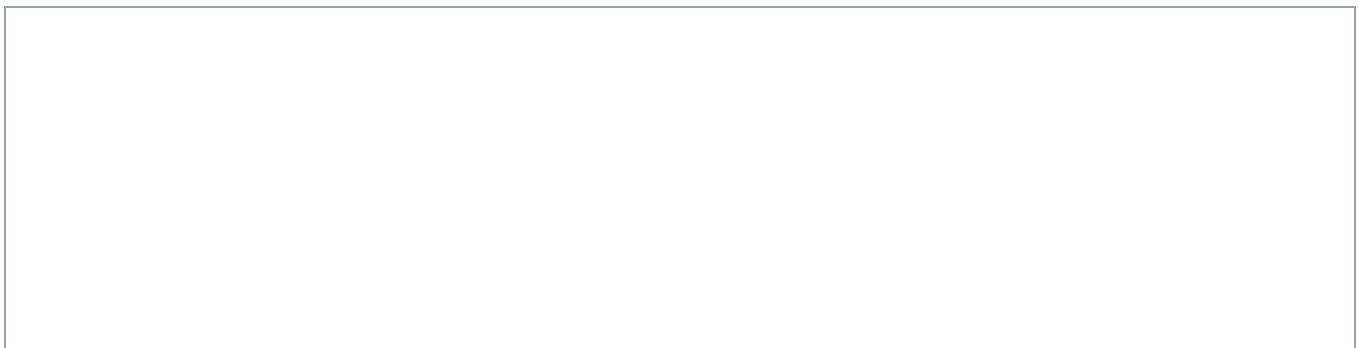


Check milestones and submission status

Check P1, finish the full map, submit only through the actual assigned route and record tracker/myPLTW confirmation when available.

Compact recovery retains every product element. Missing official work or access remains pending; no screenshot is fabricated.

Use this space or the same labeled section in your existing document. Add paper when your table, graph or drawing needs more room.



Prepare the next paper check

Use L1 to calculate six halvings, identify the last well darker than the blank and explain carryover. Record the actual table/protocol and schedule holds.

This paper task does not authorize chemical handling. If ready, complete Q1's audience-summary extension.

Use this space or the same labeled section in your existing document. Add paper when your table, graph or drawing needs more room.

Check your product

- Your exposure map integrates pathway, data, and mitigation.
- The map is cited and submitted to the tracker.
- My map distinguishes original inputs, concentration, inhaled amount and a matching benchmark.
- I preserved both mitigation strategies, a readability revision and honest completion status.
- I counted total coliforms and E. coli separately from T1, converted both to colonies per 100 mL, and explained what each result means and why LB agar cannot tell them apart.

Keep the limit: Original map practice supports source tracing and bounded numerical comparisons. It cannot establish real pollution, source attribution, absorbed dose, individual safety, regulatory attainment or official completion.

Turn in your work

Submit the complete exposure map through the teacher-confirmed April 12 Lab Reports assignment in your enrolled BI section. Confirm the tracker entry and actual myPLTW confirmation or progress screenshot only after the required work is complete.

Save the same map locally if the route is absent. Label original practice and record actual public-data, official milestone, tracker and submission status as pending.

[Open this assignment in Schoology.](#)

Carry forward

Name the quantity, source and limit beside each number; a clear map can guide the next question without pretending to prove safety.

Carry the actual source records and revised map into the April 13 graph task; retain missing official and bench inputs. What quantities and units belong on the axes of the next graph?

Sources and resources

[Open today's page](#)

EPA-EV · Modeling Emissions from Electric Vehicles

U.S. Environmental Protection Agency

<https://www.epa.gov/moves/can-i-model-emissions-electric-fuel-cell-and-hybrid-vehicles-and-equipment-moves>

EPA-PM · Particulate Matter (PM) Basics

U.S. Environmental Protection Agency

<https://www.epa.gov/pm-pollution/particulate-matter-pm-basics>

EPA-HEALTH · Health and Environmental Effects of Particulate Matter

U.S. Environmental Protection Agency

<https://www.epa.gov/pm-pollution/health-and-environmental-effects-particulate-matter-pm>

EPA-FILTER · Guide to Air Cleaners in the Home

U.S. Environmental Protection Agency

<https://www.epa.gov/indoor-air-quality-iaq/guide-air-cleaners-home>

EPA-DOSE · Exposure Assessment Tools by Routes: Inhalation

U.S. Environmental Protection Agency

<https://www.epa.gov/expobox/exposure-assessment-tools-routes-inhalation>

EPA-NAAQS · NAAQS Table

U.S. Environmental Protection Agency; table read September 12, 2026

<https://www.epa.gov/criteria-air-pollutants/naaqs-table>

EPA-RTC · Revised Total Coliform Rule And Total Coliform Rule

U.S. Environmental Protection Agency

<https://www.epa.gov/dwreginfo/revised-total-coliform-rule-and-total-coliform-rule>

CFR-141-852 · 40 CFR 141.852 Analytical methods and laboratory certification

Electronic Code of Federal Regulations

<https://www.ecfr.gov/current/title-40/chapter-I/subchapter-D/part-141/subpart-Y/section-141.852>